Unifying Game Ontology:

A Faceted Classification of Game Elements

Michael S. Debus

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Title:
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Candidate:
Michael S. Debus
Alliancevej 32, 2TV
2450 Copenhagen SV
Denmark
+45 50 38 45 13
michael.s.debus@gmail.com

Supervisor:
Espen Aarseth

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Resumé

I mindst hundrede år er spil blevet defineret og klassificeret. I de sidste to årtier er der dog opstået en forøget forskningsmæssig interesse for hvad spil er og består af. For at at udvikle en mere entydig terminologi for spil og deres bestanddele, undersøger denne afhandling spillets ontologi i to henseende.

Med en tilgang inspireret af Wittgenstein, belyser jeg de forskellige betydninger der knytter sig til udtrykket 'spil'. Jeg fremlægger en ikke-udtømmende oversigt over fem underliggende ideer, der tjener som områder hvor man kan finde spils såkaldte familie-ligheder: spil som genstande, forløb, systemer, holdninger og ud fra deres udvikling og distribution. Jeg introducerer dernæst en række ontologiske begreber, for at kunne eksplicitere den forståelse af spil, som tages i anvendelse i denne afhandling. Spil er 'specifikker' – samlinger af anonyme 'partikulærer' – som enten kan være materialiseret (som genstande) eller instantieret (som forløb). Jeg vil dernæst, ud fra en ludologisk tilgang, undersøge spils underliggende formelle system.

En række begreber fra biblioteksvidenskaben danner rammen for en analyse af de distinktioner der bliver anvendt i seksten forskellige spil-klassificeringer. Ifølge biblioteksvidenskaben er distinktioner iboende egenskaber ved den genstand de klassificerer. Dermed kan de anvendte distinktioner betragtes som spil-elementer. En endelig liste med seks elementer er dernæst yderligere klassificeret i et facetteret klassificerings-skema, som i modsætning til de mere almindelige hierarkiske systemer, er mere åben for fremtidige justeringer, såvel som for at tildele facetterne såkaldte 'multivokale' udtryk, der kan bidrage til yderligere betydnings-afgrænsning. På baggrund af denne klassificering observerer jeg, at anvendelsen af klassificerings-skemaer holistisk på spil er en umulighed, idet især moderne digitale spil indeholder mange forskellige bestanddele. I stedet bør klassificeringer kun tage individuelle bestanddele i betragtning. Jeg diskuterer og kritiserer eksisterende klassificeringer og identificerer tre primære mangler. (1) at flere forskellige dele sidestilles på ét niveau af opdelingen, (2) at der i klassificerings-skemaet inddrages uformelle aspekter og (3) at de forskelle der anvendes synes uklare og utilgængelige.

Klassificering-skemaet kan ikke kun anvendes i den humanistiske spil-forskning. Psykologien forsker i effekterne af 'voldelige computerspil' og drukspil, men ofte uden en omhyggelig skelnen mellem spillenes forskellige bestanddele. Derudover kan arbejdet med at kvalitetssikre spil også anvende klassificeringen til udviklingen af en mere detaljeret terminologi til brug i spørgeskemaer og analyse-redskaber.

Abstract

Definitions and classifications of games range back at least a century, but especially in the past two decades research regarding games and what they consist of has gained more interest. With the goal of developing a clearer terminology for games and their elements, I set out to explore the ontology of games in two main ways.

Adopting a Wittgenstanian position towards games, I discuss concepts behind the term ‘game’. I identify a non-exhaustive list of five underlying ideas that serve as areas in which family resemblances of games occur: Games as objects, processes, systems, attitudes, and through their development and distribution. I continue with the explication of my understanding of games in the present project by applying ontological concepts. Games are ‘specifics’ – groups of anonymous particulars – which can either be materialized (as objects) or instantiated (as processes). I will then take a ludological position and examine the underlying formal system of games.

Using library studies’ concepts as a framework, I analyze the employed differences for distinction of seventeen game classifications. Following library studies, differences are inherent properties of the subject they classify. Thus, the employed differences are considered elements of games. The final list of six elements is further classified in a faceted classification scheme, which’s advantages, as opposed to the more common hierarchical ones, are easier future adjustments, as well as the assignment multivocal terms to various facets for delineation of meanings. The result of this classification is the observation that the application of classification schemes holistically to games is impossible, as especially contemporary digital games combine many different parts. Instead, one should only consider individual elements for classification. Existing game classifications are discussed and criticized, identifying three main shortcomings: (1) the conflation of several differences into one level of division, (2) inclusion of informal aspects into the classification of elements, and (3) the inaccessibility of employed differences.

The developed classification is not only useful for humanistic game studies and game analysis. In psychology the effects of ‘violent videogames’ and drinking games have been researched, mostly without careful distinction between particular game elements. Furthermore, quality assurance can benefit as well from a more detailed terminology for the development of questionnaires and analysis tools.

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I dedicate this dissertation to my parents Christine Debus (née Achenbach) and Dietmar Paul Arnold Debus.

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Chapter 1:
Introduction

In early 2019, I volunteered with some board game enthusiasts to playtest a board game in development. In *Posthuman 2* (Mighty Box Games, forthcoming) up to four players are thrown into a post-apocalyptic world. After reaching a safe haven (in the series' first game), they have to set out to explore the immediate environment, which is inhabited by mutants. Players create their own gameworld by 'exploring' actions and placing tiles, maneuver through it and encounter mutants in combat and story encounters, while gathering points to come out on top at the conclusion of the game.

As it is common practice in game development, my role as a test-lead included asking the players questions about the game, how their experience was and what they would improve. When asked about what he liked about the game, one participant responded 'That there are different victory conditions'. As a game scholar, this answer confused me initially. In fact, the only way to win the game was to achieve the most points by the end of the game (either after round 15, or when the last mutant boss is slain). The participant noticed my confusion and elaborated: 'I mean, of course there is only one victory condition, but what I mean is that it is possible to accrue points in more than only one way'. I understood what he meant the first time, but nonetheless the situation led to a discussion about victory conditions, end conditions and goals in games.

Game terminology is vast, often inaccurate and sometimes complicated. What *are* the relationships between victory conditions, end conditions and goals? How can we distinguish between particular elements of games to measure individual effects? What concepts are necessary and important for a sufficient game literacy?

Without rigorously developed and delineated terminology, none of these questions can be answered satisfactorily. Scholars, practitioners, journalists and the general public remain like the questioner and the questionee in the aforementioned playtest: they understand each other coincidentally, while actually suffering from disagreements about the concepts behind terms they use. Game ontology research decomposes terminology that is often developed by gaming communities, with the rise of digital games as their driving force, and constructs more accurate conceptual models of games. First and foremost, it examines what games are and what their most general features are. This dissertation aims to advance this area of research by examining existing models and by synthesizing them into one comprehensive model that can be used as a basis for a coherent terminology in and conceptualization of games.

1.1 Motivation and Contribution

In the summer of 2019, a familiar discussion erupted after acts of violence in public places in the United States. Some participants of this debate, especially conservative politicians and media outlets, blamed video games with violent content as a cause for mostly young male adults to become perpetrators of mass shootings. These claims are scientifically questionable; studies finding effects on aggressiveness were not conducted under scientific scrutiny, and some findings were so insignificant that they only measured a minor increase in willingness to put hot sauce onto other participants' food (Markey & Ferguson, 2017). Even though early studies question the claimed correlation between video games with violent content and real life violence (e.g. Sherry, 2001), the belief that video games cause real life aggression remains a political weapon to distract from real causes of mass shooting.

Studies supporting a connection of videogames and violence suffer from inaccuracy regarding holistic videogame artifacts. To use an old, but prominent, example, Anderson and Dill (2000) compared the levels of aggression in players after playing *Wolfenstein 3D* (id Software, 1992) and *Myst* (Cyan, 1993).[1] If adherence to scientific rigor was given the games should not simply be marked as "violent" and "non-violent" respectively. The "violent" *Wolfenstein 3D* is a holistic digital artifact with many elements. It has a materiality, ranging from the computer circuits to the input interface of mouse and keyboard, and the output interface of the screen. It contains an underlying formal system that the computer runs, translating the player's input. This system contains particular affordances, rewarding and punishing states. It includes players and non-player characters who pursue these states. This pursuit could be simultaneous or separated in turns, and the pursued goals could be the same or different ones. In this case, the player must reach the end of the game, while the opposing non-player characters try to remove the player: the gameplay is simultaneous, and goals are asymmetrical between player and non-player characters. The game also has a visual layer in which the formal system's entities and states are represented in particular ways. In the case of *Wolfenstein 3D* the opponents are mostly represented as soldiers. Individual mechanics, such as the removal of other entities in the game, can be portrayed in different ways: in this case red pixels emanate from the removed entities, but a different visual representation is theoretically possible.

The breakdown of individual aspects of video games could be conducted in even more detail. However, it should be clear that labelling a video game as 'violent' should instantly raise the question,

[1] This brief discussion omits one of their studies, which is based on self-reported measures of participants. This method itself has been critiqued (e.g. Markey & Ferguson, 2017).

what aspects of the game are violent? I argue that in common discourse those video games that include the depiction of violent acts are considered violent video games. If that is the case, and if we *assume* that there is a correlation between playing these games and engaging in real life violence, why are the findings between violent television and such games different (lower in games) (cf. Sherry, 2001), even though similar depictions of violence are present? Is the difference measured by Anderson and Dill maybe not related to the depiction of violence but a stressful situation that includes potential removal from the activity by other entities in the game? If so, we could compare Dodge ball and a walk in the forest and observe the same difference in aggression levels.

Similarly, psychologists concerned with the drinking behavior of college students have pointed out the connection between participation in drinking games, excessive alcohol consumption (Pedersen & LaBrie, 2006) and negative drinking outcomes (for a review see Borsari, 2004). Further investigating the motivations for participation, researchers noted the heterogeneous nature of drinking games and started identifying different types (e.g. LaBrie, Ehret, & Hummer, 2013; Zamboanga *et al*., 2013). This is an important step, as, just as with video games, treating drinking games as one homogenous phenomenon will not lead to sufficient results in regard to the motivation of players. In one study, for example, two out of three possible answers for drinking participation refer to getting drunk or getting someone else drunk (Borsari, Bergen-Cico, & Carey, 2003). Instead of examining the drinking aspect of the games, studies should start asking what aspects of the game make players play *this* rather than *that* game. If intoxication was the reason, players would be chugging shots as quick as possible. The current popularity of games such as Beer Pong, Flunky Ball, Stack Cup, or Corn Hole (amongst others), however, indicates that particular games are played for other reasons than intoxication. Now, why am I discussing video game violence and drinking game participation?

What both examples lack is a detailed terminology and understanding of what elements games consist of. Anderson and Dill compared two games that were not only different in their representational levels, but also in their underlying formal structures, while drinking game research mostly neglects individual differences between drinking games and focusses instead on the common factor: the consumption of alcohol. While I chose two examples from psychological studies, others could point towards the necessity of such terminology in player experience research, communication within the game development process, or in teaching "ludoliteracy" (Zagal, 2011). This is not to say that psychologists fail at researching games. Instead, it is game studies' task to conceptualize games in a sufficient way so other fields can research them with the scrutiny that they require. This is the area to which this dissertation aims to contribute, by examining existing models and approaching their synthesis into one comprehensive model: 'the Unifying Game Ontology'.

By creating a classification system for game elements that distinguishes and explicates on the lowest levels, this dissertation aims to create a toolkit for researchers, practitioners and the broader public alike. With this toolkit, psychologists will be able to design studies more accurately. Instead of comparing the effects of two holistic games, they will be able to decompose individual games for their components and test effects of individual components. To return to the earlier example of *Wolfenstein 3D*, the toolkit will enable researchers to more closely examine where potential effects originate from: the game's representational layer, or its underlying formal system? Within the formal system, is it the 'killing' that has an effect on players, or is it the potential of being killed? Similarly, practitioners will have a more sophisticated basis to discuss particular components they want to implement into a game among themselves, as well as with their play testers. Instead of asking broad questions, this toolkit will enable them to reflect on which element of the game they wish to gather information on and design their questionnaires accordingly. Lastly, in my eyes, game analysis will be the main beneficiary of this classification model. With it, it will be possible to take particular parts of games and decompose them into all their functions within the game by looking at them through the facets of this classification model. With the complete classification system, it will also be possible to abstract away individual layers of games and examine them individually. What is a die in the formal system of games? It is a random number generator. How is it different from other randomness generators? A die has a particular materiality and representational layer. Is it possible to substitute a die with anything else? This depends on the specific function a die fulfills in each formal system of games.

Unfortunately, it will not be possible to cover all aspects of games within this one dissertation, which is why ‘Unifying Game Ontology’ has two meanings. It is a process as well as the goal. Unifying Game Ontology is the process of critically analyzing game ontological works, and it is also *the* Unifying Game Ontology (UGO) that will contain more classifications of elements than this project will be able to cover. The UGO is a first step towards a comprehensive model of game ontology that will be applicable across scientific fields and perspectives. The results of this project will form part of a future, comprehensive UGO, and constitute the first contribution of this dissertation. The second contribution is to be found in the process of UGO. The discussions that take place during the process of creating the present classification, as well as its limitations and other identified aspects of games that could not be covered, form the second contribution, which will serve as a basis for the classification of the remaining game elements.

1.2 Approach

This dissertation seeks to examine the ontology of games. According to Hofweber (2014), the discipline of ontology has four major areas of interest: the study of ontological commitment, the study of what there is, the study of the most general features of what there is, and the study of meta-ontology. Ontological commitments are consequences that come with the adoption of particular world views and positions. Meta-ontological questions are those that discuss what ontology is in general, or what a particular ontology should try to, or is trying to, achieve. This dissertation is primarily interested in the examination of the most general features of games. To contribute to the development of a detailed terminology for games, this project aims to develop a classification of game elements. To do this, it will also be necessary to touch upon the question of 'what there is' in regard to games.

I will explore this question through the analysis of what will be called 'underlying ideas' in popular discourse, as well as game studies literature. As the analysis will demonstrate, different uses of the term 'game' are based on different underlying concepts, so it will be necessary to distinguish between these concepts within this dissertation. The underlying idea of a 'game object' will refer to the physical items (as well as code) a game consists of. It must be noted that the game as a 'holistic object' also includes the underlying formal system and the game's representational elements. This is a combination of underlying ideas of the term 'game', which is common in popular discourse. Other underlying ideas will be explicated such as games 'as process', 'as attitude', or 'through development and/or distribution inheritance'.[2] The main contribution of this thesis, the outline and development of a classification scheme for game elements will take a top-down approach, analyzing existing game ontological literature. These analyses intend to accommodate the broadest possible range of concepts

[2] Due to these different perspectives on the concept of games, it is necessary to explicate how games will be referenced in this dissertation. If I refer to an abstract system of rules that is individuated in many different ways, its name will be capitalized, but not italicized: Soccer, Tetris, Beer Pong, etc. References to games in this way carry an inaccuracy with them, as it is not clear exactly how the abstract system is individuated, what materials are used and which rules are part of the individuation. This, however, will not pose a problem as long as one of the individuations of the abstract systems includes the property that was referred to for a particular argument. For example, we can play Soccer with only six players on each team instead of eleven, but this fact does not interfere with claims about the game's two-team structure. Games that can be explicitly referenced, i.e. those that have a developer and a release date, will be referenced in a commonly accepted way within game studies (e.g. *Mario Kart* (Nintendo, 1992)).

within one model, while retaining a comparable level of formalization. The top-down approach of synthesizing existing models was chosen for two principle reasons. First, creating a classification based on a particular set of game-objects limits its applicability to only those and very similar objects and would only add to an already long list of such game ontological works. I believe it is time to examine existing works for their usefulness and potential for combination. Second, by creating a classification scheme on the basis of X games, claiming the examination of 'the real ontology of games' would neglect the perspective towards 'games' as mere social constructs (see below). The current project accepts that 'games' are socially constructed. Furthermore, each study of game-objects is merely another social construction and representation of those phenomena currently (and locally) considered to be games.[3] By choosing to accept this, this project generates broader applicability through the inclusion of differently constructed models of games.

I adopt what may be called a 'Wittgensteinian position towards games' within game studies. This means to accept that the concept of games is not formally definable and that the entire set of what we call 'games' does not share any essential properties. Instead, the phenomena we subsume under the term 'game' are related through properties that Wittgenstein – for lack of a better expression – calls "family resemblances" (1958, para. 67). These properties overlap between some members of the family, but not all of them, and they start and end at random. Examining 'games' then is nearly impossible; how could we examine a group of things that is inherently dissimilar? Epistemically,[4] no study can claim exhaustive knowledge or applicability to all games.

[3] I use the term 'phenomena' to describe games in a neutral way, to avoid the terms 'objects', 'artifacts', 'processes', or 'activities'. This is not to connote games inherently with phenomenology or the necessity for them to be experienced. Other possible terms would be 'things', which would strongly connect games to 'objectness' again,'beings', which could indicate a connection to living beings, or 'entities', which cannot be used as the same term will describe a game element later in this project.

[4] The terms 'epistemic' and 'epistemological' will be used interchangeably in this dissertation.

Due to this epistemological observation, it is possible to identify two *ontological* positions towards games: either it is impossible to make generalized claims because there is no group of objects that actually share common properties – the 'realist Wittgensteinian position' – or the concept of games is a social construct which changes and morphs across cultures, locations and time – the 'social constructivist Wittgensteinian position'. The current dissertation is only marginally interested in the further discussion of these issues, but rather a synthesis of existing models into an applicable system. Consequentially, I must choose one position for the limitation of claims and results. By this I mean that the possibility of examining games from both perspectives lies outside the scope of this project. In this project, 'games' will be considered a concept that is a social construct with fluctuating appearances and meanings. For example, the digital artifacts commonly referred to as 'walking simulators' have arguably little in common with a 'classic game structure' (cf. Juul, 2005), but have sparked a bigger debate about gameness (cf. Grabarczyk, 2016). While commonly accepted games include forms of struggle such as competition, these artifacts lack goals or challenges and often provide the player with little more than navigational exploration of a gameworld. Accepting their structural dissimilarities, the debate they triggered is an indication for the cultural re-negotiation of the game concept.

Some of this game-concept's properties and parts are then applied to phenomena in our real world or creation processes thereof, turning them into games in a given spatial, cultural and temporal environment. In other words, there are either phenomena that the game-concept is applied to and which will consequentially be considered games, or humans create artifacts with the game-concept in mind. This means that I am not taking a realist perspective, claiming to identify the essential properties of 'the real game object(s)', but only the elements of the game-concept as it appears in the analyzed literature. In other words, the Unifying Game Ontology is the ontology of a particular version of the social construct 'game'.

The advantage of this position is that it directly acknowledges the multifaceted nature of games, and the implicit claim to not cover *all* games but only the decided upon subset of phenomena that are considered games. I must also emphasize that, by taking this position, this project develops a classification of game elements based primarily on modern, mostly Western games. In this context, ‘modern’ will signify the past fifty to one hundred years. This is a relatively accurate delineation as this project is limited by the method of using existing ontological works, the earliest of which dates back to 1907. A disadvantage is that I must presume that researchers are capable of conceptualizing the ontology of the social construct ‘game’ by analyzing the real objects that this construct covers and produces. I must also accept that this examination is and can only be limited to a generalized idea of what the game-concept covers. This means that the resulting classification will not be applicable to all game objects ever or everywhere invented, but only to those that were previously considered ‘games’ and examined by researchers.

1.2.1 Previous Ontological Works

This project is not the first to examine the ontology of games, their elements and classifications thereof. The literature on how to define games is vast and will not be covered in more detail here (for an overview see Stenros, 2017). Of greater interest to this study are examinations of parts or elements of games. Some studies are concerned with what games are constituted of on a higher level and usually distinguish between two or three main layers (e.g. Aarseth & Calleja, 2015; Aarseth & Grabarczyk, 2018; Hensel, 2011; Mäyrä, 2008). Other approaches have developed models for game analysis and what aspects of games (and their surroundings) might be of interest (e.g. Consalvo & Dutton, 2006; Hunicke, LeBlanc, & Zubek, 2004; Konzack, 2002; Montfort, 2006). Many studies focus on the classifications of the underlying formal system of games (e.g. Aarseth, Smedstad, & Sunnanå, 2003;

Elverdam & Aarseth, 2007; Klabbers, 2003; Zagal, Brown, *et al*., n.d.), while others classify individual parts of games (e.g. Aarseth, 2005, 2012; Autenrieth, 2010; Costikyan, 2013; Debus, 2016; Gazzard, 2009b; Grabarczyk, 2018; Järvinen, 2003; Juul, 2010a; Nielsen & Grabarczyk, 2018; Nitsche, 2007, 2008; J. H. Smith, 2006; Tychsen & Hitchens, 2009; Vella, 2016; M. J. Wolf, 1997), or particular types of games (e.g. Hinske, Lampe, Magerkurth, & Röcker, 2007; Mueller, Gibbs, & Vetere, 2008). Yet others employed natural language processing to arrive at an understanding of how common language conceptualizes games and how games and game elements can be clustered according to common language (e.g. Raison, Tomuro, Lytinen, & Zagal, 2012; J. O. Ryan, Kaltman, Fisher, *et al*., 2015; J. O. Ryan, Kaltman, Mateas, & Wardrip-Fruin, 2015a; Zagal & Tomuro, 2010). These approaches are complemented by many design oriented studies that try to conceptualize elements of games in a way that is more applicable for game developers in practice (e.g. Björk & Holopainen, 2005; Dormans, 2012; Elias, Garfield, & Gutschera, 2012; Ellington, Addinall, & Percival, 1982; Salen & Zimmerman, 2004).

An in-depth discussion and critique of each individual category, item or concept within the ontological models goes beyond the boundaries of this dissertation. Björk and Holopainen's *Patterns in Game Design* (2005) alone, for example, encompasses about two hundred patterns. Instead, useful and applicable concepts will be discussed and utilized in my later classification of game elements. In the following paragraphs, I will highlight some general disadvantages that were identified in previous studies more generally. These disadvantages are: (1) the inaccessibility of individually employed differences of algorithms that produce visualizations of models with too many dimensions to be interpretable by humans, (2) the conflation of elements and layers in a classification that should be treated individually by a universally applicable classification of game elements, and (3) internal inconsistencies or incompletion of models.

To date, the most extensive quantitative approach towards an understanding and classification of games is Ryan *et al.*'s application of natural language processing (J. O. Ryan, Kaltman, Fisher, *et al.*, 2015; J. O. Ryan, Kaltman, Mateas, & Wardrip-Fruin, 2015b; J. O. Ryan, Kaltman, Mateas, *et al.*, 2015a). The authors used latent semantic analysis (a natural language processing technique; henceforth LSA) on Wikipedia articles of nearly 12,000 digital games (J. O. Ryan, Kaltman, Fisher, *et al.*, 2015). Briefly summarized, LSA parses the articles and gathers words used to describe the games, under the assumption that "words with similar meanings will occur in similar contexts and that related texts will be composed of similar words" (J. O. Ryan, Kaltman, Mateas, *et al.*, 2015b). Through this analysis, and the elimination of words with, for example, only syntactical function, the algorithm can display games that are semantically related. This application provides two practical tools that can be used by practitioners, researchers, teachers, etc. to discover similar games. *Game Space* is a three dimensional representation of the algorithm's findings of game relatedness (see J. O. Ryan, Kaltman, Fisher, *et al.*, 2015). Users can explore this space via an interface that displays individual games as white dots, which makes them appear to form clusters within space. *GameNet* uses a text based interface that enables users to type in the name of a particular game, and the application will display similar and dissimilar games (J. O. Ryan, Kaltman, Mateas, *et al.*, 2015a).

Ryen et al.'s use of LSA and the resulting visualizations are extraordinarily useful for the explorative purpose they were designed for. However, with the detailed analysis of games and their elements in mind, the use of machine learning poses one major problem. While the results of the LSA application can be visualized and researchers can see which games are similar according to this analysis of language, it is impossible to get an answer to the question *in what ways* particular games are similar. As the authors state themselves the "[…] LSA model is by itself largely uninterpretable; it is too high-dimensional to visualize and its 207 dimensions are themselves obscure linear formulas that characterize complex statistical phenomena" (J. O. Ryan, Kaltman, Fisher, *et al*., 2015). In other words, the visualizations are always a reduction to make the dimensions comprehensible and the actual differences employed between games are ultimately hidden within the black-box of the algorithm. The model and its visualization enables us to see that *Eggerland Episode 0: Quest of Rara* (HAL Laboratory, 1996) and *Xenoblade Chronicles X* (Monolith Soft, 2015) are semantically related, but we are incapable of obtaining more information about how and why they are related.[5] The Unifying Game Ontology constitutes a more qualitative approach towards game similarities as it tries to answer how and why games are similar, by searching for the differences that were employed onto games and their elements in existing ontological works.

The second disadvantage of conflation of elements can be observed most strongly in design-oriented ontological works (e.g. Björk & Holopainen, 2005; Costikyan, 2013; Dormans, 2012; Elias *et al*., 2012). First of all, it must be stated that these approaches are not explicitly concerned with the ontology of games. Instead, they attempt to conceptualize games in particular ways that are helpful for practitioners to develop artifacts that trigger the intended experiences. Thus, any formal ontological critique towards them is misplaced, to some degree. However, they are still useful as implicit ontological works, as these more practically-oriented models often classify and list elements for the purpose of practical implementation. Any further discussion and analysis must therefore not be understood as a critique, but rather as an attempt to formalize these, often informal, lists. To exemplify the conflation of multiple elements, an examination of Björk and Holopainen's "paper-rock-scissors" (2005, p. 398) pattern is useful.

[5] Another disadvantage of this approach includes particular inaccuracies that the analysis of language by a machine brings with it. For example, requesting similar games to *LittleBigPlanet 2* (Media Molecule, 2011) from *GameNet* a surprising amount of games with the word 'Bubble' in its name show up. Due to the inaccessibility of individual dimensions, I can only hypothesize that the reason for this is the necessity to collect items hidden in bubbles in *LittleBigPlanet 2*, which leads to semantically related descriptions of the game and the supposedly related set of games.

They define this pattern as "[s]ets of three or more actions form cycles where every action has an advantage over another action" (ibid.). This is essentially a possible formal description of the game Rock-Paper-Scissors. They also refer to players' tactics and the formation of a "*Meta Game"* that "can be used to allow players to gain knowledge of their opponents' strategies" (idem., pp. 398-399). The problem with this pattern is that it does not describe elements of the game itself, but this meta-structure that evolves from smaller elements. The meta-structure is that "there is no winning strategy" (idem., p. 398) and the authors reduce this situation to the presence of actions that form a circle of superiority. It is, however, easy to imagine a situation in which such a pattern emerges not from possible actions, but properties of particular game elements. For example, a hypothetical strategy game might include three units: swordsmen, pikemen, and cavalry. All units have the same actions available: move and attack (remove the hit points of another entity). In this game, swordsmen beat pikemen as they have higher armor values; cavalry beats swordsmen because of higher life points; and pikemen beat cavalry due to higher range and an attack bonus against cavalry. While all units have the same actions available, a paper-rock-scissor pattern emerged from the properties of the individual entities. Thus, it is possible that this pattern can be implemented through more than just actions. Furthermore, Björk and Holopainen also presume the existence of entities with different actions available and the example presumes the existence of entities with different properties.

The Unifying Game Ontology aims to describe these lower level elements of games that can be used and combined to form such meta-patterns. The paper-rock-scissors pattern does not magically emerge from a circle of action superiority; it evolves from the combination of existing entities within the game, their particular properties and available actions (we might call these mechanics). In other words, to arrive at this pattern designers cannot simply implement the pattern itself, but must alter elements of the game that must be considered inherent to the object, instead of strategical meta-structures that evolve from a combination of these elements. The purpose of this example is to show that their patterns (often) describe compounds of smaller individual elements and properties that form a particular structure, which can be used as a short cut by practitioners who are interested in the implementation of larger, practical structures.

The third disadvantage of existing models can be demonstrated by the *Game Ontology Project* (GOP) (Zagal *et al*., n.d.). The GOP is, so far, the most exhaustive ontological model of games. It consists of four top-level elements, which are filled with hierarchical structures that were developed simultaneously with publications that try to solve particular problems within games, such as their arrangement of spaces (Fernández-Vara, Zagal, & Mateas, 2005) or time (Zagal & Mateas, 2010). Perhaps because of the connection between its development and particular publications and research questions, the GOP's development, unfortunately, has not progressed since 2015. It is currently in a state that includes many "proposed" and "out of date" categories. The GOP also suffers from conflation in some categories. For example, they list "to evade" as a sub-class of "to move" within "entity manipulation" (Zagal, Brown, *et al*., n.d.: To Evade). Here, the authors include the purpose of a particular act of movement as an employed difference between sub-classes. To do so is problematic as purpose is difficult to establish: if a player accidentally avoids another game element, did they evade or move? How can we even determine the intention of a particular player? However, to return to the third disadvantage of internal inconsistency, the authors also include "to collide" in their entity manipulation (Zagal, Brown, *et al*., n.d.: To Collide). Within their own system, collision should not be described as a form of entity manipulation, as it is a combination of a "move" manipulation and the "pseudo-physical rule" "solidity" (Zagal, Brown, *et al*., n.d.: Solidity).

The purpose of this brief overview is not to dismiss all previous works as inapplicable. Many of them have a particular purpose that leads to certain disadvantages or inaccuracies. Instead, this overview serves as a suggestion for how to utilize existing game ontologies for a more formal model and indicates that the Unifying Game Ontology sets out to fill a gap, as one model that describes parts of games on the lowest level of complexity and highest level of formality.

1.4 Overview of this dissertation

This dissertation seeks to develop a classification of game elements that is capable of accommodating multiple perspectives onto games and that can be adjusted to the needs and interests of particular researchers, methodologies, studies and fields. It further aims to construct a part of this classification. Instead of creating yet another model through a bottom-up approach that analyzes X games for their elements, I intend to utilize existing models and analyze them for common concepts. In order to do so, I ask the question: *What elements are games considered to consist of and how can they be synthesized into one coherent model*? To elaborate, this means that this dissertation examines games through existing literature. This top-down approach was chosen to extensively draw from existing classification literature and to improve applicability. By drawing from and synthesizing models that were developed through direct examination of games, I expect applicability to a broader range of empirical objects (games). While particular games will be discussed occasionally to exemplify this applicability, the primary empirical basis for this project are existing ontological works.

Chapter Two will start the examination of game ontological literature from an open-ended, inclusive position towards games. I will analyze the common and academic use of the term ‘game’ to understand how it is used. These different uses of the term will be called its ‘underlying ideas’ and include games as objects, processes, attitudes, rule systems and games conceptualized through development and distribution inheritance.

Chapter Three will then develop the understanding of games within the current project by applying concepts from general ontology. I will introduce the term 'game-specific' through a discussion of games as objects or processes and how properties can be retained over time. It conceptualizes games with one name not as a single object, but as a group of particulars. The chapter will conclude with an explanation of this dissertation's empirical scope in regard to games.

In Chapter Four I will identify elements of games through the analysis of existing game classifications. I will describe and derive concepts from literature on library classification schemes. According to this literature, good classifications are built on inherent properties of the classified subject and not properties external to the subject, which are called *accidents* (Sayers, 1944, pp. 56–57). Assuming this is a truism, I go on to analyze seventeen classifications of games for the differences they employ, in order to identify the highest-level concepts for further classification, which are considered game elements in this project. Of course, the assumption that all game classifications are good classifications is false, and accidental classification criteria (cf. Sayers, 1944, pp. 56–57) will be eliminated during this process. I will identify sixteen employed differences, which will be narrowed down to six high-level concepts that will serve as top-level "facets" (Vickery, 1960) in the Unifying Game Ontology's classification system for elements of the underlying formal system of games.

Chapter Five will then utilize these six elements as the highest level of a faceted classification scheme (cf. Vickery, 1960). The advantage of faceted classifications is that they are more easily altered than hierarchical systems and capable of accommodating different perspectives onto the same subject (or object). In other words, the Unifying Game Ontology is designed to be altered in future iterations. Such expandable ontological models are also called "typontologies" (Karhulahti, 2015a, p. 6). Each of the highest-level facets will be discussed in a section that includes a literature review of applicable existing classifications. These sections will describe the employed differences and exemplify them with games, without claiming quantifiability.

Chapter Six will conclude this dissertation by summarizing its achievements, discussing shortcomings and direction for future research. Most importantly, it will explicate particular perspectives that were excluded from the construction of the present classification scheme, in order to easily indicate the possibility of future additions to the Unifying Game Ontology.

Chapter 2:
What We Call a Game

"From the material already cited, and those that follow, it would not be impossible to defend the position that a game is whatever we decide it should be; that our definition will have an arbitrary character depending on our purpose."

Avedon and Sutton-Smith (1979, p. 2)

In this chapter, I will conduct a selective conceptual analysis of the term game. For this, I will switch between the examination of colloquial language about, and using, games, as well as certain perspectives from game studies onto games, to examine the underlying concepts behind the term 'game'. It is selective, as I am not claiming to have achieved an extensive list of uses and understandings. In fact, I chose to exclude certain uses of the term game explicitly, as will be discussed later. I will begin with a description of how game studies as an area examines a phenomenon that has multiple elements, to illuminate that, as scholars, we need to make sure to explicate very carefully which aspect of games we examine. I will then continue to show how my approach resembles Sutton-Smith's "seven rhetorics of play" (2001) methodologically. Ultimately, I will examine how the term 'game' is used in at least five different ways: As a system, an attitude, an object, a process and through resemblances based on development and distribution.

This selective conceptual analysis will lead to the observation that even in 2019, nineteen years after the formation of the field of game studies and nearly a century after presently famous approaches towards games, we still do not clearly delineate what we understand as games and what aspects of them we examine. This is actually of utmost importance, as Aarseth already pointed out in 2001: "We all enter this field from *somewhere else*, from anthropology, sociology, narratology, semiotics, film studies, etc. […]" (Aarseth, 2001b; original emphasis). What was indicated early by Aarseth, was fourteen years later confirmed by Melcer *et al*. (2015) who analyzed 48 core venues and identified 20 different, major themes in games research. They include "Game Design, Serious Games, Game Based Learning", "Educational Institutions, Computer Aided Instruction, Software Engineering", "Narrative, Art and Interactivity", "Humans, Neural Networks, Software Agents", "Artificial Intelligence, Decision Making, Planning", amongst others. Martin (2018) even adds two additional communities ("Effects-Communications" and "Medical Health"), which were not identified in the former study. This leaves us with 22 study communities that are interested in games or closely related phenomena, such as the player or artificial intelligence agents. Despite these studies and the early identification of the field's diversity, it appears that the belief persists that some perspectives on games are 'better than others' or even 'the right ones'. Some scholars (e.g. Keogh, 2014) attack others for normativism, for the attempt of finding a definition of games (e.g. Juul, 2005). Yet others identify an inherent digital essentialism in game studies which we should overcome (e.g. Tobin, 2015).

Ultimately, digging trenches within our still new area of research is counter-productive. After all, many of the disagreements in game studies can potentially be traced back to "pseudo disagreements" (Næss, 1966, pp. 85–89), in which two participants of a conversation refer to different meanings of the same expression (or in our case term), and thus only disagree on a verbal, not on a factual basis. Aarseth pointed towards the possibility and danger of such disagreements in at least two instances (Aarseth, 2014b; Aarseth & Calleja, 2015). He rightfully states that some scholars are interested in games as objects and others in games as process, and that the unspecified use of either perspective leads to said "pseudo disagreements" (Aarseth, 2014b).

For example, in the debate between ludologists and narratologists (with contributions to the debate from Eskelinen, 2001; Frasca, 2003; Jenkins, 2004a; J. H. Murray, 2005; M.-L. Ryan, 2002; amongst others), one side advocates the examination of games as (ludic) systems, and the other as a digital objects which, as “game/narrative hybrids” (Aarseth, 2014a, p. 189), of course also include narratives. First of all, Aarseth (2014a) is right in stating that the unreflected application of theories from another field to a new object is problematic. Second of all, neither side (or game studies in general) specifies their object (or process) of interest more carefully, but simply use the term ‘game’ instead, which leads to the here mentioned disagreements. Of course, many scholars in and around game studies do define what they are interested in (cf. Stenros, 2017). However, what is lacking in these cases as well, is the further discussion of what ontological commitments, methodological problems and epistemological limitations any given position brings with it. The only way to avoid such disagreements is to accept the various facets of our object of interest (‘games’) and carefully define not what games are generally, but what aspect of them the current study will illuminate and which perspective one will take, as Calleja exemplified: “Before we begin our discussion of experiential narrative I would like to clarify the media objects I am referring to in this paper when I talk about games” (Calleja, 2009, p. 2). As mentioned in the beginning, this careful delineation of my object of interest, and not making an essentialist or normative claim, is the purpose of this chapter.

To arrive there, I will examine in what ways the term ‘game’ is employed in common language, how the underlying ideas of what a game is differ across contexts and situations, and show that and how game scholars have identified these underlying ideas explicitly or implicitly. This illuminates the intricacies of the term and how we frequently oscillate between different ideas and levels attributes that we consider game-like. This approach is similar to Sutton-Smith’s observations about the ambiguity of play and his seven “rhetorics of play” (2001), as will be discussed in Section 2.2.

2.1 Games in Context

"It means context sensitive. It's sensitive to context!"
"In fact, it would seem to me, that these give me just what I need, at that moment in time! Oh, I see what he means, context sensitive. Clever!"

Conker's Bad Fur Day (Rare, 2001)

To understand what a game is a rather trivial task in everyday life and in common language. Soccer is a game, as is Ludo. There are card games and games that children play. Everyone understands if we tell them that we bought a game. Maybe it was a board game or a digital one, and the implications of each individual purchase are different. However, we still seem to understand what was purchased. Similarly, we also understand the answer "We're playing a game", when we are confused about an activity that is being performed. A game is not a theatre play and it is (usually) not homework. Many sports are games, but not all games are sport. Some people help themselves by understanding actually serious things as a game, such as business or romance (e.g. Strauss, 2011). Unfortunately, the term is also misused to disguise abusive behavior towards others, such as younger adults and children: 'Come on, it's just a game!'

All these phenomena are considered games by people in some ways. Some of these phenomena appear to be games as a non-serious attitude, others because there seems to be an underlying system that has to be followed or is beneficial to follow. Some of them are what we could call 'digital media', others are physical artefacts. Games have many facets and some people consider some of them more important or 'essential' to games than others. The statement "[…] *Second Life* is not a game" (Kirkpatrick, 2013, p. 42; original emphasis), for example, might cause an uproar from people who oppose strict definitions of games and with it the exclusion of phenomena – like *Second Life* – that could be considered games on the basis of visual and distribution resemblances.

As all of this shows that some phenomena are considered games for different reasons and from different perspectives, and that yet other phenomenas might be described as “borderline” (Juul, 2005, p. 43) or “limit” (Salen & Zimmerman, 2004, pp. 80–81) cases. I do neither agree nor disagree with Kirkpatrick’s statement of *Second Life* (Linden Lab, 2003) as “not a game” (Kirkpatrick, 2013, p.42). Instead, I accept that we have come to call objects and processes ‘games’ in many different ways over the years. In this sense, *Second Life* is simply a game in a different way than Ludo, or *StarCraft* (Blizzard Entertainment, 1998) are. It is not a game in the structured play sense, which has goals and challenges; but it is a game in the sense that it was developed in similar engines, distributed in a similar way and shared many audio-visual attributes with what we could call ‘classic digital games’.

In the current approach I take a Wittgensteinian (1958, pp. 27–28) position towards games. Wittgenstein, in a more general discussion of the usefulness and sustainability of definitions, uses games as an example for phenomena that cannot be defined. Instead, he argues, the phenomena we call games are related through “family resemblances” (ibid.), which are properties that some games have in common, but not necessarily all of them, and yet different games might have different family resemblances. It is the goal of this chapter to identify areas in which such family resemblances can occur, through the analysis of common uses of the term ‘game’. Wittgenstein, here, makes a first and foremost epistemological claim: We cannot define games by properties that are inherent to all of them, but simply have to accept that the term ‘game’ is a “language game” (ibid.) which exists through said family resemblances. Thus, we cannot *know* what games are. We can try to explain this lack of possible knowledge from two ontological perspectives: ‘The term game covers objects and processes in the real world that have no one thing in common’, or ‘The phenomena we call games are social constructs with properties dependent on particular circumstances'. I have tried, here, to paint a picture of a Wittgensteinian-realist versus a Wittgensteinian-constructivist perspective.

Following the realist perspective – and accepting Wittgenstein's observation – the term 'game' is in fact a useless concept, as it covers real objects and processes that are in no determinable way alike. Following the constructivist perspective, different societies and cultures will consider different phenomena games. Even more so, different people will consider different phenomena games (and not-games) depending on their upbringing, social and cultural environments and other circumstances.

To put it differently: The 'class' of games encompasses many phenomena. What I am interested in, is the sub-categories of this class. By this, I am not aiming at a classification of games in genres or by material aspects. I am interested in the very concepts behind different kinds of 'gameness' itself. Why do some people call these phenomena games, while other people strongly object? What underlying ideas support each of the positions? By identifying (some of) these sub-classes of gameness, I hope to be able to point out more specifically what parts of the vague term 'game' I am interested in. Ultimately, I am not seeking to participate in the realist versus constructivist discussion. For the current project, the presumption is simply that there are certain and objects and processes that we call 'games'. Whether these phenomena are labeled as such due to social construction, and will thus change over time and from society to society, or if the term 'game' covers a range of objects that should not be considered 'the same', is not a question I can and will answer here. I simply accept the fact that games share certain family resemblances and seek to identify and discuss some of them.

Despite Wittgenstein's claim, the question of how to define this group of seemingly diverse phenomena has puzzled scholars over the decades (e.g. Arjoranta, 2014; Caillois, 1961; Huizinga, 1949; Juul, 2005; Karhulahti, 2015b; Suits, 2014; Wittgenstein, 1958). Instead of stepping into the same trap and getting lost in the vast discussion of whether we can, or should, define games, this chapter seeks to discover in what different ways objects, systems, processes, media, etc. are called games and highlights the relationships between these phenomena. Thus, the goal is not to list and discuss existing definitions of games (instead see Stenros, 2017). However, some definitions will be used as examples to show how a given perspective is present in game studies and beyond. This will also show that several underlying ideas can be present in the same definition. The intention here is not to single out particularly good or bad examples, but to show that the vagueness and underlying ideas of common language were identified and singled out in specific cases. Juul (2005, pp. 44–45), for example, describes games as both objects and activities. He states that “the game *as an object* is a list of rules with the property that a computer or a group of players can implement unambiguously […]” (2005, p. 44; original emphasis), which can be interpreted as both, the underlying idea of games as objects, as well as systems or rules. These two perspectives will be understood as two separate underlying ideas of games in the current examination, and their ontological and epistemological commitments will be illuminated in Chapter 3. While Juul serves as only *one* example and in fact identifies these two underlying ideas of ‘games’, others either avoid, ignore or conflate them, and thus neglect the necessity to specify their object of interest.

Ultimately, my approach shares the goals of Sutton-Smith’s work, namely the reflection on the underlying value system attached to play and research about play. The next section will describe his approach and show similarities and differences to my own project.

2.2 Games and Ambiguity

Sutton-Smith eponymously observed an “Ambiguity of Play” (2001). He observes the use of seven “rhetorics of play” in existing research that is interested in the subject of play. These represent "underlying ideological values" (idem., p. 8) or "ways of thought" (ibid.) about play. His intention was to establish coherence amongst the field of play research, by discussing these rhetorics, their origins and implications. The specific contents will only be listed briefly[6], as they are not of further importance to the current endeavor, i.e. I will refrain from making comparisons between rhetorics of play and underlying ideas of game, even though this could be subject of future endeavors. Much more interesting is Sutton-Smith's method of identifying underlying ideologies in the use of the term play.

[6] While this list generally refers to his book, he also provides a more extensive summary than the present one (Sutton-Smith, 2001, pp. 9–11).

Rhetorics of play as progress	In this rhetoric play is used as a means of progress and development (e.g. skills, but also moral systems) for children and animals, but not adults.
Rhetorics of play as fate	This rhetoric is applied to gambling and games of chance more generally. Sutton-Smith states that it rests on the believe that human life is not in its own hands, and thus this value system is connected to lower socio-economical classes, as such beliefs do not appear in the intellectual elites.
Rhetorics of play as power	Most commonly applied to sports and contests, this rhetoric applies to activities that represent conflict and serve the purpose of fortifying “the status of those who control the play or are its heroes” (p. 10).
Rhetorics of play as identity	When play is used as a means to create an identity for a community or group in forms of festivals and celebrations, Sutton-Smith speaks of it as the rhetorics of play as identity.
Rhetorics of play as the imaginary	This rhetoric highlights the value of imagination, playful improvisation, and creativity. The most prominent group of players in this rhetoric are pretending children (p. 129), but also literature and art fall under it.
Rhetorics of the self	This rhetoric refers to solitary activities such as hobbies, which might or might not be initially understood as play, but fall under the category for their recreational effects.
Rhetorics of play as frivolous	The frivolity rhetoric labels play as something useless or foolish. It is an antithesis to the other rhetorics in that it neglects any purpose or gain of play.

Table 1: Seven rhetorics of play after Sutton-Smith (1997).

In addition to these categories, Sutton-Smith divides the rhetorics into two groups. According to him, the rhetorics of progress, imaginary and self are modern rhetorics, some of which consider play as leisure activities of free choice (2001, p. 10). He contrasts this with the "ancient" rhetorics that include frivolity, fate, power and identity. While it might be counter intuitive to use the plural for each of the seven rhetorics, he points out that all of them represent a category that subsumes other rhetorics of the same general underlying ideological values (Sutton-Smith, 2001, p. 11).

The idea of these underlying values is the most important aspect for my project. However, I want to delineate my approach from Sutton-Smith's to the extent that I do not presume any intentional or ill-willed attempts of persuasion. He states that

> the word *rhetoric* is used here in its modern sense, as being a persuasive discourse, or an implicit narrative, wittingly or unwittingly adopted by members of a particular affiliation to persuade others of the veracity and worthwhileness of their beliefs. In a sense, whenever identification is made with a belief or a cause or a science or an ideology, that identification reveals itself by the words that are spoken about it, by the clothes and insignia worn to celebrate it, by the allegiances adopted to sustain it, and by the hard work and scholarly devotion to it, as well as by the theories that are woven within it (Burke, 1950).
>
> (Sutton-Smith, 2001, p. 8; original emphasis)

He further mentions the rhetorics displaying "underlying ideological values attributed to these matters [of play]" (Sutton-Smith, 2001, p. 8; MSD) and states that "[t]he popular rhetorics are large-scale cultural 'ways of thought' in which most of us participate in one way or another, […]" (ibid.).

Examining the discourses in which the term game is used, the following sections will strongly subscribe to the latter idea of different, implicit "ways of thought" (ibid.) about a phenomenon. However, I want to distance the current examination from the term rhetoric. The reason for this is that I do not presume any kind of (even underlying) "persuasive discourse […] to persuade others of the veracity and worthwhileness of their beliefs" (ibid.). Of course, every scholarly work tries to convince the reader of their "veracity and worthwhileness". However, the difference I make here is between the rhetoric that underlines the individual study, and an attempt of convincing someone that one underlying idea of what games are is 'the right one'. In other words, every study – whether explicitly or implicitly – must argue for its own worthwhileness. This argument might or might not be connected to the individual underlying idea of what a game is. For example, let us assume that observations are a better method to study certain forms of the process of children's play, whereas anonymized surveys are better suited to study adult sex-games and their rules.[7] Scholars conducting either of these two studies might argue for their method (explicitly) and about the ontology of games (implicitly, by adapting one or the other subject of interest, as well as methodology). However, it must be clear that any persuasion in the debate between game and play studies, as well as the ontology of games, might occur implicitly, but that I do not insinuate intention behind the choice of one or the other perspective. Instead, I believe that game studies scholars accidentally adapt a vagueness of the term 'game' and the oscillation between its meanings that come with it. What I do not want to insinuate is an intentional attempt to persuade others – even though this might happen automatically or as a side effect – by using a certain underlying idea of what a game is.

In the following, I will combine the ideas of an "underlying value system" and a "way of thought" (ibid.) and examine *underlying ideas* of what games are in different discourses and contexts. Ultimately, the following sections will show that the question 'What game did you play yesterday?' refers to an object, and the potential follow-up question 'How was it?' – while 'it' technically refers to the game, and thus an object – actually requests information about the event or process of playing the

[7] I am consciously using the conflated terms play and games here, indicating the positions that studies towards these topics might take. The two hypothetical studies could both use the terms 'play' and 'games', as the point of this hypothetical example is that a reflection about terms and ontology rarely occurs.

game. This shows how, in everyday language, we oscillate frequently between different underlying ideas of thought about what a game is, without even noticing it. As pointed out in the beginning of this chapter, this oscillation becomes (and became) problematic in game studies, as it permeated game research through the lack of specification of the underlying way of thought regarding the object of interest, and an interesting future endeavor would be the identification of underlying ideas of games in recently published game studies venues, not to point fingers at inaccurate scholarship, but to draw a map that helps understand and advance the field, as a continuation of Sutton-Smith's work.

It must be noted that this will not be an exhaustive list of underlying ideas of games. Consulting the oxford dictionary regarding the term 'game', for example, covers not only the upcoming underlying ideas, but also someone's "kicking game" in American Football, or "wild mammals or birds hunted for sport or food". The following discussion will be limited to a list of, admittedly subjectively chosen, meanings that appear most obvious, represented in game studies, and closely related to the phenomenon studied here. Game as (the flesh of) hunted animals, for example, might be related as hunting could be a sport, many of which are considered games, but ultimately the animal itself as 'game' has no obvious connection to what I seek to inquire here. While an extensive analysis of *all* game terms could possibly lead to interesting conceptualizations, I have to apply this limitation due to the scope of this chapter. After all, its intention is to point towards the importance of delineation of the term 'game', not a chapter about 'the ambiguity of games'.

So far, I focused on the uses of the term game in the English language. As Huizinga already pointed out, "[w]ord and idea are not born of scientific or logical thinking but of creative language, which means of innumerable languages […]" (1949, pp. 28–29). He points towards the distinction between the word and what it stands for and that the words we use have evolved, not been carefully designed. One language might highlight aspects of an object or concept with three different words, while another language refers to all three of them with the same word. Thus, the examination of other languages might bear additional, also interesting results[8]. Danish, for example, distinguishes between *spil* and *leg. Spil* refers to a game in the sense of a structured activity, whereas *leg* describes a freer form of play, oftentimes exemplified through children's play. Both nouns are transferable into verbs, and thus you can '*spille et spil'* and you can "*lege en leg*" – you game a game and you play (a) play.

Yet other languages make no distinctions between these terms. In German, for example, uses the noun *Spiel* and the verb *spielen* for nearly all game or play related activities.[9] To distinguish between '*at spille'* and '*at lege'*, Germans could add the prefix *herum*spielen, to indicate a less goal-oriented or less structured activity. However, this solution comes closer to *fiddling around with something* than it actually translates the Danish verb '*at lege'*. One can argue that the lack of linguistic distinction leads early German inquiries to slight conflations of the conceptually distinct phenomena of play and games (e.g. Jünger, 1959), and even that the Danish people are historically more playful, as they developed a more nuanced terminology of related terms. A quite similar non-distinction is present in Romanian between the verb '*a juca*', which mainly means to play, and '*Joc*' (game). 'He is playing a game' translates to '*el joaca un joc*', displaying the same inaccuracy in the distinction between play and game as in German. In both, German and Romanian, 'play/game' can also be used as possible movement in a mechanical structure. If a screw is not completely fixed in a machine, it has 'S*piel*' in German and it '*se joaca*' in Romanian. The use in a mechanical context is also present in French, with the expression 'du jeu' for the same situation. Furthermore, the term '*Spiel*' can refer to a theatrical performance in German, as the actors are 'Schau*spieler*' in a '*Schauspiel'*, but the play can also be

[8] Huizinga, in his book *Homo Ludens* (1949, pp. 28–45) discussed the basic terms of games and play more extensively and in more languages than will be possible here. However, some of the meanings that will be discussed here are not present in his examination.

[9] An exception is the theatre play, which is a *Theaterstück* (a 'theatre piece') in German. Nevertheless, the actors still *spielen* (play) a role.

called a '*Theaterstück'* (a theatre piece). Interestingly, the Romanian dance '*Hora*' is also played: '*joaca Hora*'. Salen and Zimmerman's rather technical definition of play as "free movement within a more rigid structure" (Salen & Zimmerman, 2004, p. 304) describes very fittingly the earlier mentioned movement of mechanical parts in a structure. Applying it to the German '*Schauspieler*', one could argue that they move inside the rigid boundaries that the narrative and form of the script presents them with, or as Gadamer (1960, p. 114) pointed out: "Even a play remains a game–i.e., it has the structure of a game, which is that of a closed world." In the case of the Romanian dance '*Hora*' this application is harder to justify: Do the participants freely move within the rigid boundaries of a dance? The use of '*a juca*' for '*Hora*' also depends on the region in Romania, as well as the folkloristic connectedness of the individual person. A person less familiar or interested in Romanian folklore would say '*a dansa Hora*' (to dance Hora).[10] It should be clear that the concepts of play and games are conflated in many languages, and that English makes a distinction not as detailed as Danish, but more detailed than German and Romanian.

The distinction between play and games has been made numerous times in different ways (e.g. Avedon & Sutton-Smith, 1979, pp. 6–7; Caillois, 1961; Salen & Zimmerman, 2004, p. 72; Walther, 2003). Most famously, Caillois (1961) describes different forms of play as *paidia* and *ludus*, where *paidia* describes the less structured, free form of play, and *ludus* refers to a more rigidly structured form of play, the latter resembling *spil* more than *leg*. He further distinguished four types of play and games *Agon*, *Alea*, *Mimicry*, and *Ilinx*. Following Caillois, *Agon* describes competitive play, *Alea*

[10] There are at least two possible reasons for this conflation of '*a juca*' and '*a dansa*'. First of all, '*a juca*', has multiple meanings: mainly 'to play a game', but also 'gambling', and 'to dance' (Ionescu-Ruxăndoiu, 2012, p. 159). Thus, '*a juca*' (dance) in relation to '*Hora*' might have been replaced by the more modern verb '*a dansa*', which is also used for modern dances and dancing in discotheques, in recent history. This could also explain why persons that are more folkloristic tend to use the old term '*a juca*'. Another possible reason is the conflation that Romanian has with other language families: In many of the Slavic languages, which have influence on Romanian as well, the words 'game' and 'dance' originate from the same word stem (игра).

describes play that involves chance, *Mimicry* describes play as imitation or role playing, and *Ilinx* describes play activities that include vertigo.

Nearly fifty years later, Kampmann (2003) – a Danish scholar – defines play and games as follows: “Play is an open-ended territory in which make-believe and world-building are crucial factors. Games are confined areas that challenge the interpretation and optimizing of rules and tactics - not to mention time and space.” For him, play and gaming are matters of transgression. To reach play, one must transgress the “non-play world”, to arrive in a “play-world” (Walther, 2003). This “play-world” (ibid.) can be freely imagined or take the form of a sub-system (for example a gameworld as presented by digital games). The second transgression occurs with the additional imposition of rules onto the “play-world”: “Not only does one surmount the other of non-play in order to settle the space of play. One also transcends the open territory so as to impose a rigid pattern of dynamics onto it” (ibid.). Thus, for Kampmann ‘gaming’ occurs on a different, a higher level than ‘playing’, as it implies the interpretation and optimization of rules. Playing, on the other hand, is not connected to the interpretation of a system, but to the imagination and upholding of a different space (and time).

The following selective conceptual analysis will focus on examples of the English language, but refer to other languages if useful. This leads to the inclusion of the above discussed differences between the terms games and play in some languages, while others, such as Romanian and German, do not make any distinction. Still, it became clear that the concepts of play and games are closely related, and thus it would be a mistake to completely avoid references to works and uses that include play, during the discussion of games. As my aim is to examine the underlying concepts *behind* the term *game*, the inclusion of other languages, despite their inaccuracies, seems to be a beneficial endeavor, instead of relying on one particular language.

2.3 Games as Rule Systems

In game studies, rules have been a prevalent topic. Many scholars consider rules an important aspect of games (e.g. Avedon & Sutton-Smith, 1979; Juul, 2005; Suits, 2014) or even equate games with their rules (e.g. Ellington *et al*., 1982; Parlett, 1999). We can generally distinguish three kinds of rules when it comes to games (see Autenrieth, 2010; also Suits, 2014; Szasz, 1974). “Constitutive rules” (or structural rules) (Autenrieth, 2010, pp. 41–43) are those that are necessary for the game to take place at all. They describe the setup of the game, as well as the start- and end-conditions. “Operational rules” (or deontic rules) (ibid.) are actions that players *can*, *cannot*, or *must* take during gameplay. Lastly, “prescriptive rules” (or strategic rules) (ibid.) are those rules that are not necessarily followed, but rather prescribe what is generally necessary to ‘play the game well.’ Suits (2014, pp. 39–40) delivers a similar threefold distinction of rules based on how the game punishes the non-compliance with rules. According to Suits, if a player does not follow the constitutive rules, they are simply not playing the game. Operational rules are enforced by the game through penalties; and breaking the prescriptive rules simply means that one is ‘not playing well’. Szasz’ (1974) most important addition to these rules are ‘social rules’ that describe what one should and should not do during the game. However, if we understand ‘playing the game well’ not only in a ludic, but also in a social sense, we can subsume this dimension under the rules of ‘playing the game well’ (prescriptive rules). Rules can also be understood as the interpretation of a system by a user. Aarseth and Grabarczyk (2018, p. 14), for example, state that

> […] we might say that rules are what the player infers from the mechanics she is presented with. Rules can be understood as mechanics that the player perceives, while mechanics are embedded in

> the structure independently of what the user thinks of them. Rules are either interpreted mechanics, or postulated norms.

While this new perspective opens up an interesting field of inquiry about rules in digital versus analog games (arguably, rules in digital games must be deducted from the hard-coded software, whereas in analog games players must consult the rules before they can start playing). For now, I will return to exploring the common underlying ideas of games.

Soccer is generally considered a game. Whether we observe children playing in a schoolyard with backpacks as goal posts, or we are in Copenhagen's *Parken* and observe a game between FC Copenhagen and their rivals from Brøndby, we will always recognize the game that is played as Soccer. But why? These situations are quite different. The children might play with a different number of players, a smaller field, not even a 'normal' goal shape (e.g. a missing horizontal bar). However, if you ask anyone what these kids are doing, they would respond: 'They're playing Soccer.'

The reason for this is that Soccer can be referred to as an abstract system possibly described by rules, some of which are more important than others. One can argue over the order of this hierarchy; the number of players, for example, has a different importance than the number of teams or balls in the game. If we accept that Soccer is a particular system described by rules, people can identify Soccer as long as the activity adheres to a minimum set of 'core rules' within the total amount of rules than can be created around Soccer. 'Core rules', here, are a hypothetical set of rules to which players must adhere to if they wish to play a certain game – in this case, Soccer. The concept of 'core rules' can be contrasted with 'house rules', which are rules that alter the initial version of the game by agreement between the players before or during play. Literally speaking, the 'house rules' of a family with young children playing *Ludo* may be that, if the game is played in their house, the children cannot be kicked off the board.

One could argue, for example, that Soccer ceases to be Soccer if played without goals (both physically and also as a synonym for 'points'). This would either remove the possibility to score goals, or remove the idea of scoring itself, and ultimately render the game unwinnable. Similarly, one could posit that *Ludo* ceases to be *Ludo* if players cannot be kicked off the board. With this, the excitement would be removed from the game – and the reason why the game is called 'Don't get mad' in other languages.[11] These core rules would be part of both the constitutive as well as the operational rules, but would not necessarily include all of these two kinds of rules. Theoretically, it should be possible to determine the 'core rules' of a given game, within a given society or community, through an empirical study. This, however, would still be a generalization that excludes more subjective views of what constitutes a given game. Therefore, we must accept that it is subjective to each person or community which exact rules are the core rules. Yet, even if the core rules of a game are relative, what remains is the fact that both situations – the children in the yard and the teams in Parken – are identified as instances of Soccer, even if we change a majority of the rules from professional Soccer, which is played for 90 minutes, by two teams of eleven players, with one ball, two goals and three substitutions per team, etc.

Such abstract systems can be altered and adjusted to particular situations. In a way, this is the beauty of Soccer and other popular games: You can adjust them so that they can be played professionally, with rigid rules, but also more loosely and spontaneously – all you need is four bags, a

[11] For example, German (*Mensch Ärgere Dich Nicht* – 'Human don't get upset') and Romanian (*Nu te supăra, frate* - 'Don't get upset brother').

tin can, and preferably at least two players. However, the idea of core rules also implies that there is a certain threshold at which people would no longer identify the activity as Soccer.

While this is the beauty of the system Soccer, other 'games' are identified through the *discovery* of an underlying system, instead of its artificial construction. If we, for the sake of the argument, accept their claims as valid, self-proclaimed 'pick-up artists' researched and formulated the rules of human mating habits and termed them *The Game* (Strauss, 2011).[12] Here the use of the term game as an underlying system is inversed to the case of Soccer. Simply put, the rules of Soccer were *intentionally* developed and distributed, while The Game is something that has arguably always been a natural system, was termed a game for the very discovery and formulation of its rules and mechanics. This is similar to Elias *et al.*'s distinction between "deliberately designed" and "classic games", the latter of which evolve over time (2012, p. 4). They originally employ this difference onto computer games (deliberately designed) and other games, such as "classic" card games (evolved). In this dichotomy, Soccer is considered an example of a game that has evolved. It appears that this distinction only works when two games are compared to each other. For example, in contrast to The Game, Soccer is deliberately designed, whereas Soccer is evolved in comparison to *Warcraft 3: Reign of Chaos* (Blizzard Entertainment, 2002). It is clear that this distinction is arbitrary and ultimately inapplicable on a general level, as card games were also 'deliberately designed' at some point. Yet the distinction between Soccer and The Game shows one game that *actually* evolved naturally (The Game) and one that was deliberately designed at some point and evolved from there (Soccer). However, some people strongly object to the practice of calling the matter of love and intimate relationships a game, which leads us to a second underlying idea of the term game.

[12] While Strauss named his book "The Game", I will use the term not to refer to the book, but the 'discovered system of getting intimately involved with people'.

The study of games as mechanical systems has, for some scholars, become known as 'Ludology'. The limitation 'for some scholars' is necessary, as Ludology has become to mean different things over the years, as "words have a natural tendency to take a life of their own" (Frasca, 2003, p. 93). Aarseth (2014a) points out three of these meanings in his take on the formation of Ludology. According to him, Ludology "can refer to (1) the study of games in general, or (2) to a particular approach to game research, or (3) to a movement active in the years 1998-2001" (2014a, p. 185). He dismisses another meaning early on: Ludology as the contrast to Narratology in game studies (ibid.). Originally, and in the area of game studies,[13,14] Ludology was simply meant to "[…] describe a yet non-existent discipline that would focus on the study of games in general and videogames in particular" (Frasca, 2003, p. 93). Considering this, Ludology is not particularly concerned with mechanical systems, but simply with games as such. Leino, for example, observed that Gadamer was "[…] perhaps the first Ludologist in that he was more interested in 'games themselves' than in the players, […]" (Leino, 2010, p. 71). However, the connection between Ludology and mechanical systems is founded in the Ludologists' main argument against the application of narrative theory to games without further reflection: In games, the "dominant user function" is configurative instead of interpretative (Eskelinen, 2001). From here, it is easy to equate the configurative user function with "the mechanics of game play" (Jenkins, 2004a, p. 118). Whether this conflation was justified, or if it is yet another example of terms that have taken "a life of their own" shall not be further discussed at this point. The important aspect of the evolution of the term Ludology is that it serves as an example in which the term 'game'

[13] I use the term 'area' here, as there is no consensus about whether game studies is – or should be – a field, a discipline, or something else, due to the consequences that each situation would entail for teaching programs, funding, and research. The Department of Media, Cognition and Communication at Copenhagen University held a symposium on the matter in May 2015 under the title *Grounding Game Studies*.

[14] Outside of game studies the term was already used as early as 1982, "albeit scarcely and with a different meaning" (Frasca, 2003, p. 93; in reference to Juul (n.d.)).

(Ludology as the study of *games* (Frasca, 2003)) became synonymous with 'mechanical system' for the critics of the so-called Ludologists (Ludology as the study of *gameplay mechanics* (Jenkins, 2004a)).

2.4 Games as Attitude

The reason why one might object to calling love or intimate relationships a game is that one way of understanding something as a game connects it with negotiable consequences (e.g. Juul, 2005), and with this, a non-serious attitude towards such activities. This is a problem as love and intimate relationships are commonly understood as serious matters involving real consequences and feelings. The 'pick-up-artists' do not share these beliefs. For them, becoming intimately involved with another person is a mere matter of specific approaches, techniques and statistics. The fact that this 'game' might have strong emotional consequences for the other person involved is irrelevant to the pick-up-artist. Thus, in this scenario, the underlying idea of games as attitude of non-seriousness is one-sided. The pick-up artist adopts this attitude voluntarily, rendering love 'just a game', while the other person is not even aware of this attitude.

A concept that comes to mind is Suits' famous definition of games, and a "lusory attitude": "to play games is to attempt to achieve a specific state of affairs [prelusory goal], using only means permitted by rules [lusory means], where the rules prohibit use of more efficient in favour of less efficient means [constitutive rules], and where the rules are accepted just because they make possible such activity [lusory attitude]" (Suits, 2014, p. 43). This definition includes more concepts than just an attitude, and appears to exceed the "games as attitude" title of this section. However, if we isolate the lusory attitude, we can see what is wrong with the aforementioned one-sided perception of intimate relationships as games: The pick-up artists adopts the lusory attitude, rendering it 'just a game', while the other person is not even aware of it. However, having such an attitude due to non-serious consequences is not necessarily one-sided.

Bateson (1987) described a similar phenomenon in animal play stating that the "playful nip denotes the bite, but it does not denote what would be denoted by the bite" (1987, p. 186). This disconnection from what an act in play would mean outside of play is similar to the non-seriousness of framing intimate relationships as a game, but concerns all subjects involved.

Imagine a game in which victory is decided by who steals the most of the opponent's furniture from the house. After two days, the winner will be chosen and the furniture will be returned. If a neighbor were to call the police, they would be most likely put a stop to it, but after explaining that the act of removing the furniture from another's house is all part of an agreed upon game, the police would leave the players alone. They would understand that no one was *actually* stealing. Here, the act of removing furniture from someone else's house does not mean one is actually claiming ownership over it. Yet outside of play, the *same* act of removing furniture denotes the act of stealing.

While examining whether or not certain races should be considered and called games, Suits (2014, p. 201) describes a similar situation in which a police officer tries to stop the lead runner in a 100-yard dash:

> 'Halt!' cries a police constable to a man who is being hotly pursued by another. 'In the name of the law.'
> 'Why?' responds the runner who is the lead.
> 'Because,' the constable replies, drawing abreast of the runner and beginning to puff a bit, 'you appear, *prima facie*, to be some kind of felon.'
> 'Well, I am not,' answers the lead runner. 'I am Roger Bannister, and the man rapidly closing the gap between us is another miler.'
> 'Ah!, says the constable, and goes about his business.

A burglar running from a police officer, he states, is superficially closer to a 100-yard dash than the dash is to Chess or Golf (ibid.). He includes the 100-yard dash into the category of games because he is not able to ascribe it to any other category. Ring Around the Rosie is, for example, more a theatrical performance than it is a game (idem., p. 200). Suits argues that if an activity is examined and fits his definition of a game, then it shall be considered a game, until proven otherwise, even if it is not considered part of the “hard core group” (idem., p. 202) of phenomena that are actually called games. Given this *prima facie* evidence, he argues, it becomes the critic’s task to prove that the 100-yard dash is *not* a game.

In terms of the underlying idea of games as attitude, it is interesting that in Suits’ example, the acts inside the game appeared to mean something else to the police officer than to the voluntary participants in the activity. The non-serious attitude towards the game detached the acts within the game from their possible meaning outside of the game. The idea that games are confined and detached from the world outside is famously called “the magic circle” (Salen & Zimmerman, 2004, pp. 92–98). Salen and Zimmerman postulated the term, derived from its brief mention by Huizinga (1949, p. 10). According to them, the magic circle is a spatio-temporal delineation of the game from “the ‘real life’ contexts that it intersects” (Salen & Zimmerman, 2004, p. 94). It “[…] takes place in a precisely defined physical and temporal space of play. Either children are playing Tic-Tac-Toe or they are not” (idem., p. 95). The magic circle separates the game from the outside world with spatial boundaries, such as playgrounds or playing fields, as well as temporal boundaries, as it starts and ends at specific times. Furthermore, all activities inside the game are play, and thus not ‘real’. Most importantly for the current examination of games as attitudes, Salen and Zimmerman refer to Apter (1991) to explicate the safety and non-serious consequences of play: "In the play-state you experience a *protective frame* which stands between you and the 'real' world and its problems, creating an enchanted zone in which, in the end, you are confident that no harm can come" (Apter, 1991, p. 15). Thus, we voluntary engage in an activity that we perceive as non-serious and non-harmful.

Bateman defines play as "[…] an *attitude* we adopt towards uncertainty" (2011, p. 54; original emphasis) and games as "[…] *processes* that make use of this disposition [the attitude], contriving, simulating or even suppressing contingency so that we might interpret what results" (ibid.; original emphasis). While actually defining *play* as an attitude, he further defines games by making use of this very attitude. Invoking Huizinga (1949) and Malaby (2009), Bateman also states that "[…] when we play – in games or in life – we are adopting a particular attitude towards our activity, one that is fundamentally different from the attitude expected in the formal games of culture (such as the institution of money or bureaucracy) which 'aim to bring about determinate outcomes'" (Bateman, 2011, pp. 52–53). Of course, this definition does not state that a game is an attitude, as Bateman sees *playing games*, first and foremost, as processes or activities that we "[adopt] a particular attitude towards" (ibid.). The definition is problematic as it conflates various underlying ideas, which I will attempt to disentangle.

First, Bateman contrasts play in "games or in life" (ibid.), meaning his underlying idea of what a game is appears to exclude 'life'. Second, it is interesting that he makes an implicit distinction between commonly accepted games, in which a play-attitude is expected, and games in which such an attitude is *not* expected. In other words, he seems to imply a divide between culturally 'real' and 'unreal' games. However, it appears that it is still possible to play in both 'games' and in 'life'. The common factor here, according to Bateman, is the attitude that we express towards the activity (ibid.). He distinguishes two categories: (1) playable games and (2) playable non-game activities. Third, he describes banking and bureaucracy as "formal games of culture" (ibid.), which appears to be yet another category, as the attitude towards these "formal games" is "fundamentally different" from the attitude towards (1) playable games and (2) playable non-games. I will call this third category (3) non-playable game activities. The confusion starts by calling the third category "formal games of culture" (ibid.), as it is counterintuitive to discuss 'non-playable games'. I believe that Bateman, while generally defining play as an attitude towards an activity that can be a game (1) but does not necessarily have to be one (2), also employs the underlying idea of games as systems onto non-playable activities. Thus, categories (1) and (3) are connected in Bateman's theory by the underlying idea of games as systems. The only difference, according to him, is that the attitude towards (3) non-playable game activities is simply not expected. The validity of this third category fails as soon as someone expresses the play-attitude towards such systems. In this case, category (3) collapses and is merged into category (1), resulting in the categorization of banking and bureaucracy as playable games simply because someone expressed a play-attitude towards them.

Bateman makes an initial distinction between playable games and non-playable games, indicating his underlying idea of games as systems or processes (activities). However, he intuitively makes a distinction based on the (expected) attitude that is expressed towards these activities. Consequently, what distinguishes 'real' playable games from non-playable games is the expressed attitude. To render a non-playable game playable, one simply needs to adopt such an attitude. It appears that it is the attitude that can potentially turn every activity into a playable game. Bateman (2011, p. 53) also claims that "[…] even in the case of formal games, play is present in some aspect […]". I assume he implied the above discussion about turning 'non-playable game activities' into 'playable game activities' with this claim. All this means ultimately that, in Bateman's terms, it is an attitude which distinguishes between culturally 'real' and 'unreal' games.

I conclude that a non-serious attitude towards activities can turn such activities into culturally accepted games and that this attitude is more easily expressed towards activities without serious consequences. Acts within a game do not have the same meaning as they do outside the game, which leads to different consequences inside and outside the game. A non-serious attitude can be adopted by all participants of the game, but there are also instances in which only one participant adopts such an attitude, interpreting the consequences of the activity as less serious than other participants.

2.5 Games as Objects

Another way to see games is as physical (or digital) objects. In this line of reasoning, *Monopoly* (Magie & Darrow, 1935) is not the abstract system of rules and mechanics that is translated into several editions of different themes, such as *Star Wars* or *Pokémon*. Instead, the term refers to the physical board, the pieces and the box. When a group of friends decides to play a round of *Monopoly*, one could ask to "fetch the game", by which they do not mean an abstract system, nor an attitude, but a particular object (the box and its contents). A description of the mechanical system would be part of this game, in the form of a rulebook, either inside the game box or on the outside of it. Games as physical objects have become less dominating in current times,[15] where the most popular form of games – videogames – are distributed as digital objects, rather than boards and pieces, or as a CD-Rom in a box.

This position goes hand-in-hand with a larger ontological commitment. One of the debates – and misunderstandings – in game studies is about the ontological status of games as either objects or processes (see Aarseth, 2014b, p. 484). The question is whether we can examine and talk about games

[15] In the UK, digital game sales made up 76% of game sales in 2017 (Entertainment Retailers Association, 2018) and 83% in the United States in 2018 (Gough, 2019).

as one whole object at a given point in time, or if we have to understand them as processes that unfold over a period of time. In this sense, *Monopoly* is not the box with its pieces and rulebook, but instead each individual session as played by the participants. The latter perspective makes generalized claims about a particular game impossible, as the researcher must always take the specific, time-sensitive realization of the game into account (see Sections 3.3 and 3.4).

Interestingly, this distinction has ignored the fact that this discussion has already been held in philosophy. Johansson (2005) defines *endurants* and *perdurants* as very similar to *objects* versus *processes* in game studies.[16] Following Johansson, endurants lack temporal parts and are necessarily wholly present at any given point in time. Perdurants, on the other hand, contain temporal parts and are not necessarily wholly present at a given point in time. For instance, if we were to examine a chair, we would be able to do so wholly at a given point in time (if we disregard the necessity of switching into different perspectives). However, it is also fair to claim that the chair is a piece of wood, which has the temporal parts of a tree, block and finally a chair (let us assume the chair was made out of one piece of wood). To observe the chair as a perdurant, we need to observe the object over a span of time, as not all of its temporal parts are present at one moment in time.[17] We can see that these terms perfectly describe the problem of Soccer as an object that we can examine fully (either an object, or a system of rules), and Soccer as a particular match (all components of the game, including its rules, implemented over time in a match), which can only be examined over a span of time, and which will differ from each instantiation to the other. Yet another perspective could be games as objects that change over time

[16] This distinction has been made on other occasions and also earlier (for example Hawley, 2001; W. E. Johnson, 2014; Lewis, 1986; Simons & Melia, 2000). Some use the terms *contiuant* and *occurrent*, instead of *endurant* and *perdurant*, but the distinction of particulars remains the same: one (endurant/continuant) contains no temporal parts, i.e. does not change over time and can be observed wholly at one point in time, while the other (perdurant/occurrent) contains temporal parts, changes over time and, thus, can only be observed over a span of time and.

[17] For a discussion of how endurant theory explains this kind of change see Section 3.3 '*Endurants and Perdurants, or 'How Games Persist''*, or Hawley's more extensive work on the matter: "*How Things Persist*" (Hawley, 2001).

through cultural influences. In this case, the abstract system of Soccer is a different Soccer than it was a hundred years ago. The examinations and epistemological consequences depend on the position one takes towards these changing objects. However, a closer discussion of how the metaphysical categories of endurants and perdurants influence games and change over time will take place in Section 3.3.

Finally, there are two different concepts of games as objects here. One refers to an actual physical object, the other also applies to an object of conceptual nature, which is concerned with the possibility (or impossibility) to examine something holistically at a given point in time. This second type of object also relates to the previously discussed underlying idea of games as systems. To understand the applications of the term ‘game’ in a colloquial sense, the first type of object is of interest, whereas the second is of interest to a more academic perspective on the ontology of games and surrounding discussions. Examining games as objects enables us to make generalized statements about the behavior of the object. For instance, if the ball in Soccer is out of bounds, the possession will change to the team that did *not* touch the ball last and the ball will be thrown in. However, considering the game as a process, such a generalized statement is often not possible; during games as processes we encounter many situations that cannot be explained by the formal system. For example, the referees might have simply not seen the ball out of bounds and do not rule a throw in. Something that is impossible considering only the formal system of Soccer.

2.6 Games as Processes

‘Did you watch the game last night?’ is not a question that refers to the observation of an object (a boxed game), or mechanical system. Game, here, refers to a *match*: A very specific instantiation of, for instance, American Football. I do not criticize the inaccurate use of *game* instead of *match* in colloquial language, quite the opposite: The fact that we use the term ‘game’ in this instance shows that it also refers to the process of using a specific game system and/or object, in a specific location, with specific participants. Furthermore, the term refers to the whole match, which encompasses 90 minutes of playtime. Thus, the question ‘Did you watch the game last night?’ does not refer to the fact that the Buccaneers have played some other team in Tampa. It is asking whether the person is aware of the events that unfolded during the period of 90 minutes. The question is about the knowledge of the *process* of a specific instantiation of the game system American Football over time (cf. Aarseth, 2014b, p. 485).

To refer to such an event in Danish one would use the word *kamp*. Interestingly, this word appears to refer specifically to sports matches. For other activities, such as a Chess match, Danes would use the word *dyst*. The difference between these two words is a matter of seriousness: A *kamp* can have serious, physical consequences, while a *dyst* is an activity where one would not expect any harm to be done. This non-seriousness and lack of consequences refers back to the underlying idea of games as attitude but is a possible, conceptual sub-category of games as processes.

Scholars who consider games processes include Abt (1970), Avedon and Sutton-Smith (1979), Malaby (2007), Suits (2014), and Frasca (2007). Abt, for example, defines a game as “an *activity* among two or more independent *decision-makers* seeking to achieve their objectives in some *limiting context*” (1970, p. 6; original emphasis). This definition includes concepts such as players (decision-makers), “objectives” and a “limiting context”. These can be understood as additional, necessary elements of a game. Its nature within the object and process dichotomy, though, is clearly described as a process. Suits’ definition includes similar elements, such as rules that prescribe inefficient means towards an end, as well as a player’s “lusory attitude” (2014, p. 43), i.e. the voluntary submission to the rules. Suits also states a game is “to *attempt* to achieve a specific state of affairs” (ibid.; my emphasis), which Stenros (2017, p. 6) identifies as the adoption of the process perspective on games. Similar to Suits, Avedon and Sutton-Smith's definition of games as "[…] an exercise of voluntary control systems in which there is an opposition between forces, confined by a procedure and rules in order to produce a disequilibrial outcome" (1979, p. 7), identifies games as processes of operating a system with particular properties. Finally, Frasca states that "[a] game is to somebody an engaging *activity* in which players believe to have active participation […]" (2007; my emphasis).[18]

A higher level perspective could argue that the process perspective on games is connected to other disciplines such as psychology (see Aarseth, 2014b, p. 485) and sociology. The reason for this is that such approaches to games are aimed at the players, their behavior and perception through the observation of people in the process of playing a game. In this case, it only makes sense to consider games processes; these observations are related to the events and communications that unfold over a span of time, in relation to the game and the particular instantiations its participants engaged with at given points in time.

2.7 Development and Distribution Inheritance

"*Why do we call something a 'number'? Well, perhaps because it has a—direct—relationship with several things that have hitherto been called number; and this may be said to give it an indirect relationship to other things that we call the same name.*"

Wittgenstein (1958, para. 67)

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[18] It must be noted that Frasca does not exclusively define games as activities, as he claims that his definition *also* describes games as systems "[…] with rules that assign discrete values that define gains and losses to certain play performances and events" (2007, p. 71).

Another way to describe and identify games is what I call the development and distribution inheritance (DD-Inheritance). Inheritance, here, shall be understood in the way that people can inherit a house, not in the way that genes and physical properties are inherited through biological processes. In terms of games, this implies that if an artifact is developed and distributed through the same means as another artifact we commonly accept as a (video)game, then this artifact may be considered a (video)game as well. To exemplify this position, let us briefly delve into a recent discussion around games and non-games: the so-called 'walking simulators'.[19]

After walking simulators' rise to popularity, there emerged a debate around whether or not these artifacts are, in fact, games. Grabarczyk (2016, p. 253) delivers a useful overview over the debate and its positions:

> One side argues that by eliminating some of the elements [that are typical for other game genres] walking simulators achieve better aesthetic integrity, become more mature and as such can be understood as an artistic evolution of the medium of the video game. The other side argues, [sic] that at least some of the elements walking simulators remove are essential for video games and thus they simply cease to be video games at all.

Following Grabarczyk, the first position makes an aesthetic judgment that can only be evaluated on the basis of specific aesthetic theories but not generally; the second position makes an ontological claim about videogames, touching upon the oft-debated topic of video game definitions (ibid.). Thus, the argument revolves not around the 'gameness' of walking simulators as such, but around the evolution

[19] I will use the term walking simulator here. This is not to make any statement about the value of games subsumed under this tag. After all, whether a game is 'good' or 'bad' is in the end a matter of evaluation by each individual person. I am following Grabarczyk's (2016) twofold reasoning here. First of all, the term walking simulator appears to be the most popular one, even mentioned by authors who prefer other descriptions of these types of games. Second of all, the term was introduced by *Steam* as a label for a genre, which is important due to *Steam*'s popularity and dominance on the digital market.

or devolution of them. The mere question of whether we should understand walking simulators as games or not can be held on neutral grounds, yet as soon as we discuss the evolution and devolution of them, we include value judgments, which are the reason for the heated debate. I believe that this disagreement and confusion can, in fact, be disentangled on three levels: (1) aesthetics vs. definitions, (2) classification (different artifact vs. sub-type), and (3) definition (structural vs. DD-inheritance).

The first issue has already been observed in Grabarczyk's analysis - one side makes an aesthetic argument, while the other debates video game definitions. If we accept this, then both sides are talking about two different things entirely. Walking simulator supporters argue that these artifacts are a new sub-class to video games, and that they bring a higher aesthetic potential with them. Opponents, on the other hand, do not see these new artifacts as a part of video games.[20]

I believe that both sides are making (implicit) ontological statements, which are apparent in the second and third level of disagreement. The main difference is that the opponents make an explicitly ontological argument, while the supporters skip that step and work with an implicit ontology of video games. The former see the video game artifact defined by its mechanical structure: The reason the opponents do not consider walking simulators as games is that – in their eyes – some important, or too many, elements of this structure have been removed and something else has been created. This position has previously been described in the section '*Games as Rule Systems*' (2.3). The opponents (implicitly) argue that there is a minimum set or essential element in the structure of a (video) game that is necessary for the artifact to claim gameness. One such element is, for instance, a win (or fail) state (see for example Grabarczyk, 2016, p. 254).

[20] The argument that something 'is not a game' is in fact not a new phenomenon, as can be seen in, for example, Consalvo and Paul's (2013) research.

On the second level of disagreement, the opponents want walking simulators to be an entirely different artifact that is detached from video games. The supporters, on the other hand, by arguing that walking simulators evolved video games to higher artistic potential, state that they are merely *a different kind* of video game. To come back to Wittgenstein's metaphor of family resemblances, "different kind of video game", here, means that walking simulators are related to other video games through resemblances that are different from the usually perceived and broadly discussed ones. In other words, walking simulators highlight aspects of video games that are commonly neglected by focusing on their typical features. Where commonly accepted video games are received, accepted and defined through competition, goals, leveling systems, etc., walking simulators make visuals, navigation and (sometimes) story their essential features, while cutting all of the earlier features out. By shifting the focus, supporters argue that walking simulators are capable of evolving the whole class (video games) into artifacts with higher artistic and cultural potential.

Thus, we can understand walking simulators – through the eyes of the supporters – as a new genre of video games. This is the second more or less implicit disagreement: On which taxonomical level should walking simulators be located? Should it be another *class* in the *subdivision* in which video games are located, which are connected through the higher *division* 'games' (opponents), or should they be contained as a *class* in the *subdivision* contained by videogames[21] (supporters)? In other words: Are walking simulators another digital artifact entirely or a sub-type of video games?

[21] More on these technical terms for classification in Chapter 4.

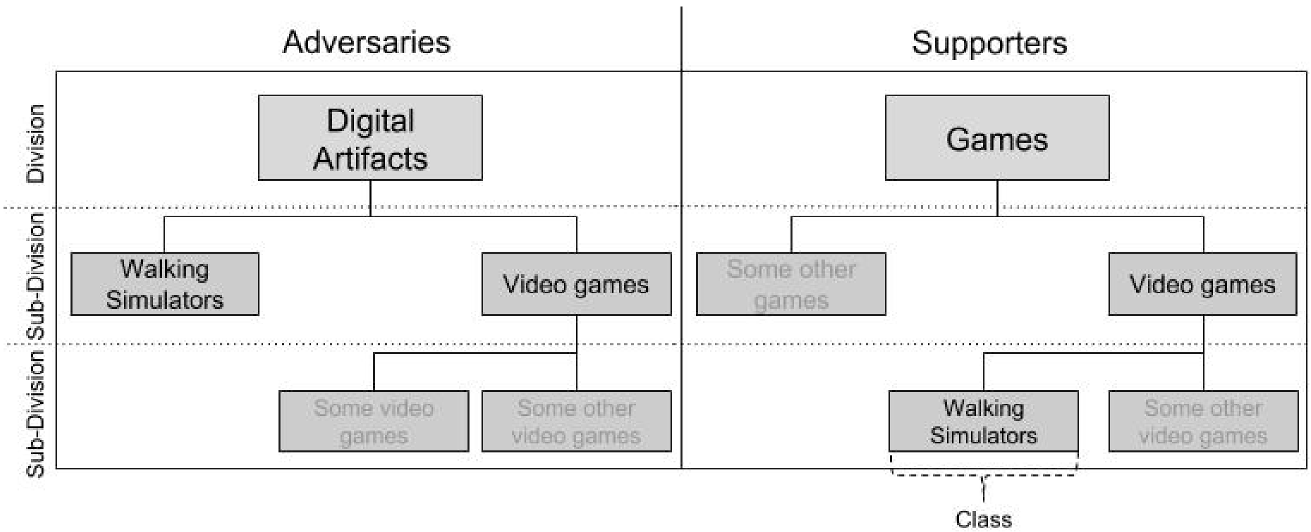

Figure 1: Second Level of Walking Simulator Disagreement.

The third level of disagreement is tightly connected to, and may be the reason for, the second disagreement. To consider walking simulators a different kind of video game, we have to accept that walking simulators indeed *are* video games. The quickest way to accept this is the DD-inheritance. A priori, they appear to be video games, because walking simulators are developed with the same tools, such as the widespread *Unity* or *Unreal* engines, and they are distributed on and for the same platforms, such as *Steam* and home computers.

Using the same tools for the development of new digital artifacts, the developers naturally adopt certain styles in aesthetics, mechanics and controls. These resemblances can lead the audience into the perception of structurally different artifacts as games: They look and feel the same as commonly accepted video games. Furthermore, their distribution on *Steam* strongly connects them to the video game market. Future walking simulators could take this inheritance further, by also entering other distribution platforms such as the *Epic Game Store*, physical stores such as *Game Stop*, and consoles such as the *PlayStation*, *Xbox* and various Nintendo products. In fact, one of the most popular walking simulators *Dear Esther* (The Chinese Room, 2012) was already released for *Xbox* and *PlayStation* in

2016, effectively entering a platform that was historically reserved for commonly accepted video games. As these artifacts are, were and will be distributed over platforms on which commonly accepted games are distributed, walking simulators are directly linked to the titles distributed on these platforms. This is how the connection between new types of digital artifacts and the concept of games is created. Metaphorically speaking, distribution-inheritance is created by placing new digital artifacts on the 'video game shelf' next to commonly accepted video games. This identification of games through DD-inheritance will be elaborated on through 'borderline examples' in the following paragraphs.

Heavy Rain (Quantic Dream, 2010), for example, was declared an 'interactive drama', while simultaneously referred to as 'a game' (see Purchese, 2008). In an interview with David Cage (the designer of *Heavy Rain*) (Kietzmann, 2010), Kietzmann, for example, repeatedly asks about *Heavy Rain* as an interactive drama, also pointing towards one of the achievements included in the artifact: "Thank you for supporting interactive drama". In the same interview, Cage himself returns to calling the artifact a game. It is clear that the terminology in these cases is inconsistent, and that it would need some explanation on which level the artifact is a game, on which level it is an interactive drama, or if these two are, in fact, mutually exclusive. I assume that 'game' refers to two possible underlying ideas (the physical/digital object or its DD-inheritance), whereas 'interactive drama' refers to the artifact's structural level, similar to 'walking simulator'.

The fact that the developers have to specify the difference between an interactive drama or walking simulator and a 'normal game' displays the DD-inheritance that these digital artifacts bring with them. In an audio-visual sense, they are the same, but structurally they are not: They are games, because they were developed in engines like *Unreal Engine*, but they are not because they have no goals, such as winning by controlling areas, removing tokens or collecting items; they are, because they are sold on *Steam*, but they are not because they lack a fail state or a threat to the player's being in the game. In other words, they lack what Leino describes as the "gameplay condition" (2009), meaning the player, when playing a game (as opposed to playing *with* a digital artifact), voluntarily submits themselves to evaluation by the game structure, and this evaluation has consequences for the game's materiality (i.e. if the evaluation is 'fail', the game will end). Let me exemplify this in two examples.

In late 2018, *Netflix* released the *Black Mirror* (Brooker, 2011 -) episode *Bandersnatch*, which revolves around a young game developer who adapts a choose-your-own-adventure novel into a digital artifact, and ultimately becomes insane, believing that some higher or alien entity makes choices *for* him. He is not wrong, as, for the first time in the series, the episode gives the user the option to make choices for the protagonist along the story. The choices are prompted through the remote control in the interface of the video-player that *Netflix* uses. The episode has been described as an "interactive film" (Strause, 2019), a term unsurprisingly similar to the earlier description of *Heavy Rain* as an "interactive drama". We could also consult Sid Meier's definition of games as "a series of interesting choices" (Rollings & Morris, 2004, p. 61) and confirm *Bandersnatch*'s similarity to games with it. Interestingly, *Steam* even offers a tag for specifically those games: Choice Matters. This tag has a certain subjectivity and value judgment attached to it. However, it bears some truth if we rephrase it to 'choices impact the paths of a narrative', as will be discussed below.

Other digital artifacts with series of choices were examined by Perron (2003). He discusses interactive movies (as well as "movie games"), their relationship to games and, most importantly, what type of person is needed to view (or enjoy) different types of game-like movies. Perron's distinction between these two terms is based on the user's role in a movie game/interactive movie. In a movie game, the user has to make choices and take actions that influence the present story, such as figuring out how to escape a room. In interactive movies, on the other hand, the user's position is that of a mere onlooker of past events, only capable of choosing which event to watch next.

The term 'user' was chosen deliberately in this case, to subsume Perron's "player" – which describes users of interactive movies – and "gamer" – which describes users of movie games – under one position that is the person who is operating the artifact in question. Later on, I will return to describe the operating position as the 'player' again, but for the current examination of Perron's theory it is necessary to introduce the term 'user', as distinguishing between both terms – as Perron does – employs what we could call a 'two step essentialism'[22]: Through the definition of a gamer as someone who enjoys movie games, not interactive movies, Perron makes a claim about the necessary condition of an artifact to be considered a game.

The two-step essentialism present in Perron's work is exemplified when he considers movie-games and interactive movies as situated on a scale (or dichotomy), with one side being more 'game-like' (movie games) and the other side being more 'story-like' (interactive movies). What makes a movie-game not an interactive movie is the goal-directedness in games. According to Perron, the gamer "goes for the challenge" (idem., p.244), and their ability to "[…] get to the end of the adventure […], to win the game" (idem., p. 243) is dependent on their performance (ibid.). He adopts this claim from the underlying idea of games as goal-directed systems. As this section demonstrates, games do not necessarily pose such challenges, or require significant skill. Also, the connection between a win state and finishing the game is questionable, as the later section '*Goals in Games*' (5.7) will discuss. Perron's dichotomy can also be seen as the difference between a spatial practice (the gamer as "pathfinder" (idem., p. 242)), and a temporal practice (the player as onlooker who "[…] literally views the movie with the remote in hand" (idem., p. 244)). Regarding the player position he states that he "[…] could not see how this would attract and satisfy a gamer" (ibid.). This means that, according to

[22] Of course, the essay was written in the early years of game studies, and by a scholar with a film studies background, which might explain the following underlying (not explicit) essentialist claim. However, it exemplifies how underlying ideas of games can infiltrate and influence research.

Perron, a person who is interested in interactive movies is not a gamer; and further that interactive movies are not games.

The declaration of artifacts, such as *Heavy Rain*, as games shows that the concept 'game' does not necessarily connect to spatial exploration, win states or challenges, but that there are other family resemblances one can draw from. Ultimately, Perron's distinction is linked to how much (perceived) influence the choices and actions of the users have onto the artifact's events. "*Tender Loving Care* is certainly more a story and less a game" (2003, p. 244), as it is more about the user merely controlling in what order the movie unfolds, rather than influencing the events inside the diegetic world (idem, p. 257). Thus, 'gameness', in this context of movie games/interactive movies and following Perron, is related to the possibility of influencing the story's unfolding events. With this, I will return to the 'Choice Matters' *Steam*-tag and briefly examine how much influence choices actually have in two digital artifacts: *Bandersnatch* and *The Walking Dead: Season One* (Telltale Games, 2012).

The Walking Dead: Season One is based on *The Walking Dead* comic book series (Kirkman, 2003 -). A zombie apocalypse has overwhelmed most of human society, and the story follows some of the few survivors. The protagonist is Lee Everett, a former university professor, who has been convicted of killing a state senator. During the first approximately five minutes, the user watches Everett sitting in the back of a police car, apparently being transferred to a prison. The only actions during this period are choices of dialogue and tutorial-like instructions to "now aim at the target in the rear-view mirror". After meeting Ellie, another main character, in a house, the user has to make their first decision with consequences that seem to matter: leave the house right away to "look for help, before it gets dark" or "get out of here once the sun goes down". The user will be confronted with many of these choices during the five episodes of the digital artifact. What they do not know, though, is that none of these choices have a real impact on the story or its ending. Many of them simply lead down one of two narrative paths, which will merge into the same decision again, after a short series of events. The biggest consequence for choices in *The Walking Dead: Season One* occurs before episodes two and five, where the player's choices lead down two narrative paths that, in themselves, produce binary paths again. The user cannot switch between the two larger paths during one playthrough once entered. Ultimately, while following different paths, all choices are binary, and will merge into one stream and a singular ending. In Perron's terms, the user in *The Walking Dead: Season One* is really a player, not a gamer.

Bandersnatch was directed by David Slade and released on *Netflix* in 2018. The user follows the protagonist Stefan Butler, who wants to create a video game based on a choose-your-own-adventure book called 'Bandersnatch'. After a short intro, the story begins and the user is presented with seemingly meaningless decisions: Do you want to eat Frosties or Sugar Puffs? Do you want to listen to the Thompson Twins or Now 2? The latter choice, for example, will lead to a different response by Stefan's colleague Colin later on in the digital artifact. During the watchthrough,[23] the user will likely encounter several of the thirteen endings, which then might force tem back to a previous decision to change their choices. Certain endings can only be reached if a certain attribute was or was not obtained earlier. At one point, for example, the user can only throw Stefan's medication away if they had made his colleague Colin jump from a balcony earlier.

The Walking Dead: Season One also requires the user to use objects in the gameworld, whereas *Bandersnatch* only enables the user to make decisions. This is reminiscent of Perron's conclusion about *Tender Loving Care*: *Bandersnatch* is more a story than a game. However, it is also important to note

[23] The term watchthrough is, of course, suggestive. It is used here in the same sense as 'playthrough' and should rather be understood in the sense of 'finishing one individuation of *Bandersnatch* from start to finish'. The intention is not to subscribe to a particular position in the discussion about what the artifact is, but simply follows the more common perception of *Bandersnatch* as an interactive movie.

that the requested interactions inside the diegesis of *The Walking Dead: Season One* are extremely limited. The player can only use items that are specifically indicated and must use them in a way that progresses the pre-scripted story. Through the more complex narrative structure – and with it the complexity of choices and their consequences - *Bandersnatch* resembles a certain kind of game ('Choice Matters') more than *The Walking Dead: Season One*. *Bandersnatch* has different endings with certain pre-conditions, while *The Walking Dead: Season One* always follows one of two (or in special cases four) paths that all end in the same point. Another digital artifact, *Raven Monologue* (Mojiken Studio, 2018), has even less possibilities for interaction and no choices to offer the user compared to *The Walking Dead: Season One*. It presents the user with animated clips that the user can parse through forwards or backwards. In the comment section on Steam, this digital artifact is called a game by many users (e.g. Gvauz, 2018; iIEricTheRedIi, 2018; Silly Cat, 2018), while others discuss it as an "ART PIECE […] not a game per say[sic]" (NEOchuah, 2019), and a "short interactive sad story" (polkadotdream, 2019). After the structural analysis of both artifacts, I will borrow Perron's terms one last time, to argue that the user in *Bandersnatch* is closer to a gamer than the user of *The Walking Dead: Season One*. Ultimately, the point of this comparison is that if *Bandersnatch* was released on *Steam*, it might just as well be called a game, as a result of the DD-inheritance that comes with the distribution platform.

Finally, let me more clearly delineate the DD-inheritance from the underlying idea of (digital) objects through another example. Leino describes the interactive art installation *Sono reMorphed* (Lintermann and Belschner, 2007) in his reflection on the overlap of interactive art and (single player) computer games:

> It is an interactive installation, which presents the user facing a 180 degrees 3D projection with an

> audiovisual spectacle in the form of shapes and sounds that can be manipulated through an interface that resembles a DJ mixing deck. The shapes and sounds seem to be generated algorithmically on the fly, as new formations emerge in response to new combinations of the sliders and knobs of the interface. Seeing the interface, I could not help thinking of *DJ Hero* (2009), which *Sono reMorphed* predates by two years.
>
> (Leino, 2013, p. 4)

It is noteworthy that Leino directly compares the installation's interface to an established game. If *Sono reMorphed* was not developed by media artists and placed in a museum, but by game designers and put for sale on *Steam*, it might be considered a game and cause just as much controversy as walking simulators have. Leino (2013, p. 5) continues to theorize:

> Compared to the role of the machine in an installation like *Sono reMorphed*, the playable machine that is *Tetris* seems to be able to take on a much more substantial authorial leadership position: it not only tells me what to do, but also judges my performance and responds accordingly.

The subtractive design practices that created walking simulators have removed many of the mechanics that established video games have. *Sono reMorphed*, in comparison to established video games, has been stripped of this "more substantial authorial leadership position" (ibid.). This could make a splendid artistic evolution of video games if placed on the *Steam* marketplace, to make use of the DD-inheritance. The difference with the underlying idea of games as digital objects is that, in the discourse, DD-inheritance can potentially turn any digital object into a game, while not every digital object is necessarily a game.

Chapter 3:
Developing Gameness for the Unifying Game Ontology

As demonstrated in the previous chapter, the term ‘game’ covers a broad range of phenomena. It is important to carefully explicate how one understands the term and which parts of the discussed phenomena one examines. Thus, the goal of this chapter is twofold. First of all, it is necessary for myself to explicate how I understand games and what the following classification of game elements will cover (and what it will not cover). I will do so by applying the basics concepts of endurant and perdurant theories, as well as the distinction between particulars and specifics. Briefly put, endurant theorist considers objects as three-dimensional *objects* that are wholly present within time (thus time is external to objects), whereas perdurant theorists claims that objects are four dimensional *processes* and contain different temporal parts (thus time is internal to the objects). The particular-specifics distinction points towards a general version of a game and its particular instances. Each position and its characteristics influence matters of methodology and epistemology in game research, which I will briefly highlight.

I believe this is a topic that deserves much more attention. However, as the current project is aimed at the identification and classification of game *elements*, this ontological discussion must and will be limited. By applying the aforementioned concepts, and pointing towards methodological and epistemological problems, this chapter will serve as a basis for a more in-depth discussion of metaphysical theories and their consequences for individual projects within game studies. In other words, this chapter functions as an explication of my own understanding of games within this project, as well as a first exploration of this particular area of metaphysics in game studies.[24] The application of these terms can be used to facilitate the exploration of topics in game ontology. This will be exemplified on the basis of two cases.

Endurant and perdurant theory can be useful to illuminate very practical problems in game research. For example, in Debus *et al*. (n.d.; see also Section 5.7) by first asking 'What is the overall goal of the game?' followed by 'What is the player required to do to achieve this goal?' In the case of *Super Mario Bros*. (Nintendo, 1985), different playthroughs of the game produced different (or multiple) answers to the same question, at the same point in time during different individual playthroughs. A player might have to jump over a pit to reach the end of the level, but the player could also jump down from a platform they had reached earlier in order to reach the end. Combined, both goals pose a *necessary* condition for reaching the higher goal (there is no situation in which the player can reach the end without doing one or the other), but each goal individually does not. In the same sense, one of the goals in a particular situation poses a necessary condition, while it does not in a different situation (i.e. the player does not have to jump over the pit if she is on the platform). We termed this problem "Schrödinger's game goals" (Debus *et al*., n.d.), where the equivalent of opening the box was to play the game. Using endurant and perdurant theory, it will become clearer in the Section 3.3 how we can practically conceptualize these ambiguous situations.

The second example explores the domain of multiplayer games. The question at hand is how several players can engage with the seemingly same object, such as *Dota 2* (Valve Corporation, 2013), yet this object presents them with different goals at the same points in time. Here, the distinction

[24] We can consider Leino and Möring's work on "existential ludology" another metaphysical perspective on games (e.g. Leino, 2016; Leino & Möring, 2015).

between specifics and particulars is useful in order to realize that each player is engaging with a different individuation of the same game-specific, and that each one is connected to another individuation (a server), which enables the players' individuations to share some properties, but not all.

3.1 Particulars and Specifics

In order to further explicate my underlying idea of games, I will now use four terms from general ontology: *particulars*, *specifics*, *individuation*, *materialization* and *instantiation*. The first three terms are derived from Munn and Smith's (2008) description of formal ontology. The last two terms will be defined by the product of the individuation.

According to Munn and Smith, whether a discipline is formal or informal depends on the kind of judgments it makes about objects. *Particular* judgments refer to one particular object of a certain kind: '*Magic: The Gathering* (Garfield, 1993) is a very complex game'. The judgment refers to one game and one of its properties. *Specific* judgments, on the other hand, refer to a group of "*anonymous* particular objects" (Munn & Smith, 2008, p. 46; original emphasis): 'Some trading card games are very complex'. The difference is that specific judgments identify a certain property of a bigger group of things, generalizing them into a set of objects. According to Munn and Smith, a formal discipline is concerned with specific judgments. This is due to the opposition of "formal" and "material" in Aristotelian ontology (idem., p.46),[25] which leads us to the "principle of individuation":

[25] Aristotle's dichotomy is not the only way to make ontological distinctions. For an alternative, see, for example, the trifold distinction of *res*, *ens* and *aliquid* (Poli, 1996). Yet for the current purposes the Aristotelian view shall suffice for the clarification of the present use and meaning of the term 'game'.

> Within the later Aristotelian tradition, matter is often identified with the *principle of individuation* of material things (See, for instance, Aquinas' commentary on Boethius' *De Trinitate*, II, q. 4, a.1-2, *Opera* (edition Leonina) vol. 50. Cf. Charlton, 1972.). This means that the matter of a thing is what makes it *this* rather than *that* thing. Even when things have the same properties and, hence, bear the exact same form, they can differ from each other merely by being made up of different parcels of matter. […] Concrete things are particular in virtue of the fact that they are made of matter. To be particular is to exist only once, at some unique location in time and space.
>
> (Munn & Smith, 2008, p. 47; original emphasis)

Following Munn and Smith, formal disciplines are not interested in particular objects, but in groups of them that share the same form. If a discipline takes particular individuations into consideration, it is informal, due to the inclusion of material aspects. This description of 'particular things' enables some interesting observation in the context of games. In light of this quote, let us discuss Chess and two different underlying ideas behind it (objects and mechanical systems).

Strictly following this definition of particulars, Chess as a particular can only refer to one board and its pieces made of specific materials. Yet in reality when we say 'Chess', we do not refer to a particular board, but an abstract entity that is many boards, and other things. We can play Chess with a wooden board, or with humans or pieces of stone. An interesting observation is that when we refer to *one game*, we oftentimes actually refer to a specific and thus to a *group* of things. The creation of genres works in a similar way, but on the basis of more concrete, yet arbitrary criteria (see Clarke, Lee, & Clark, 2017). This leads to one necessary correction: The informal statement about the complexity of *Magic: The Gathering* is in fact a statement about a specific, not a particular. Furthermore, as games can be understood as objects *or* processes, the individuation of a specific can also take two forms. I will consider the *materialization* of a game-specific as turning an abstract object into a concrete object, and the *instantiation* as turning the abstract object into a concrete process. Thus, individuation as 'turning an abstract object into a more concrete one' can either mean turning an abstract object into a concrete object (materialization), or into a concrete process (instantiation). Considering Chess-the-specific, we can conclude that a materialization of Chess is the game put into physical objects, such as the board and its pieces. An instantiation, on the other hand, would be, for example, a match between two opponents. It follows that any instantiation of a game-specific requires a preceding materialization. In other words, there cannot be a game as a process without any material conditions. Additionally, an instantiation of a game cannot be materialized, as it is impossible to turn a process into an object, and vice versa. Thus, it appears that individual aspects of the game-specific can only be *either* materialized (space, board layout, tokens, players etc.) *or* instantiated (mechanics).

In addition to the specific's ability to be individuated, we also use specifics to refer to a set of objects that we consider the same. When I converse with someone about Chess, my conversation partner and I assume an anonymous group of individuated Chess'. The conversation, then, revolves around the Chess-specific. In other words, we do not refer to a particular object, but instead to a 'specific object'. We refer to a set of objects that share some properties through which we identify them as 'the same game';[26] a statement that appears to be very much in line with Wittgenstein (1958). However, he discusses how phenomena within the group 'games' are similar to each other. Here, I argue that similar relations through resemblances occur even within 'the same game'. For example, the individuation of *Ludo* that I refer to is very similar to the individuation of *Ludo* that someone else refers to in conversation, but unlikely the exact same.[27] Thus, while we both speak about *Ludo*, both phenomena are similar in some regards, but different in others. Which properties these are changes from game to game, individuation to individuation, person to person, and so forth. The game-specifics

[26] The connection to set theory should be obvious at this point. It will be discussed later, within the comparison of the game-specific and types and token theory.
[27] Unless we refer to the exact same instantiation of it that we played together.

enable us to converse about 'the same game', but also brings automatic inaccuracies with them. How can we *really* know that the person means the Chess that I mean when they refer to it?

Generally, when we name a game, we refer to the game-specific as an abstract object that is capable of producing a yet unknown, and thus anonymous, group of particulars. Some of these particulars are familiar to us, as we have interacted with a certain set of individuations or heard about them through other means. This is the basis for how we refer to *World of Warcraft*, Ludo, or Soccer. If I were to mention the game 'Klimpern', I would be referring to a specific that is most likely unknown to most people. To most, it is an empty container or an empty "mental file" (Recanati, 2012).[28]

Recanati's intention with the concept of mental files was to defend 'singularism'. Singularism is a theory of philosophy of mind, opposed to descriptivism, which claims that we can refer to objects directly through a relationship we have with them. For example, if I visited Mount Fuji, I would have an "acquaintance relationship" (Recanati, 2012, pp. 20, 23) with it and thus refer to it directly. Descriptivists, on the other hand, claim that reference to objects only ever occurs through a set of properties we assign to those objects. To refer to Mount Fuji, in the descriptivist perspective, we need simply refer to its properties of being the tallest mountain in its country, its location in Honshū, its existence as a dormant stratovolcano, and – simply put – hope that no other object fits the same properties.[29] There are certain problems with both theories that cannot be further elaborated here. Yet Recanati's mental files are useful to understand how properties and parts of unknown games can be gathered, added and saved. According to him

[28] It must be stated that Recanati's theory of mental files is not the ultimate answer to how we relate to things. However, it is useful in this particular situation to understand the nature of game specifics and our relation to them.

[29] As Recanati points out on several occasions, these are epistemological considerations, not metaphysical ones (2012, pp. 4, 5). The descriptivists *do not* claim that objects are simply all their properties. Instead they argue that our reference to and mental storage of objects functions through the use of the objects' properties.

> […] mental files are about objects: like singular terms in language, they refer, or are supposed to refer. They are, indeed, the mental counterparts of singular terms. What they refer to is not determined by properties which the subject takes the referent to have (i.e. by information–or misinformation–*in* the file), but through the relations on which the files are based. The reference is the entity we are acquainted with (in the appropriate way), not the entity which best 'fits' information in the file.
>
> (Recanati, 2012, p. 35)

If I believe that Mount Fuji is located in China, but I have an actual relation with it (e.g. I visited it), my mental file 'Mount Fuji' refers to the actual Mount Fuji, despite the possibility of another highest mountain and dormant stratovolcano in China. In other words, if my 'Mount Fuji' mental file contains the information that it is located in China, this information is simply a "misinformation" (ibid.) stored in the mental file about the actual Mount Fuji. Information to mental files can be added through either perceptual experience or communication (idem., p. 35), and access (e.g. verbal reference) to a given mental file does not require accessing *all information* that is stored in it at once (idem., p. 39).

Klimpern is a drinking game in which the players take turns trying to toss a coin into one of four cups that are placed in the middle of a table. So, your empty mental file may be filled with information regarding its possible materialization (cups, a coin, a table, liquid) and its instantiation (a coin is flung in turns by the players, which may result in chugging of a cup's content by the person left of the thrower, etc.). While enabling you to refer to the specific Klimpern by adding information to your mental file of it, it is also clear that the materializations in my description are not *necessary* for all individuations of Klimpern. Instead of a coin, we could use a bottle-cap, the particular events within one play session may differ, etc. Thus, you might have stored the misinformation 'requires coin' in the mental file of Klimpern, and other information – such as the fact that if the coin lands in the middle of the four cups, the person has to chug all four – is simply missing. Nonetheless, with a simple name and some basic rules, I created a mental file of a game, which can be updated until a near-complete image of the specific is inside this mental file.

The limiting 'near-complete image' is necessary as our mental files will never be able to perfectly align with the game-specific. It is important to distinguish between the game-specific itself, our reference to it and the mental file that we use to store the information about it. The specific is a set of all actual objects of that game, while our reference to it uses only some information of a limited range of these objects that we actually know of and which is stored in the mental file.

This takes us to the next section, in which a discussion of the game-specifics' relationship to other theories will cover the problem of impossible complete knowledge about game-specifics.

3.2 Game-Specifics and Other Theories

The game-specific is closely related to two other theories: Aarseth's "ideal game object" (2011) and the bigger theory of types and tokens (see Wetzel, 2006). The game-specific is distinct from Aarseth's implied object in that the implied object is a mental construct of players engaging in the game, whereas the game-specific refers to a *type* of object. Types are sets of actual tokens (or particulars). I will subsequently discuss the concept of game-specifics regarding these two theories in more detail.

Aarseth (2011) makes a similar distinction between an abstract object and a particular one. Instead of referring to specifics, he discusses an "ideal" and "implied game object" (idem., p. 65). The implied game object is an individual's mental construct of the ideal (or perfect) game object, created on the basis of one particular play-session or set of sessions. As games offer many possibilities for action, it is not possible for one player to access all the possible positions and choices of a game in one playthrough (or ever) (ibid.). Thus, while playing a game, the player creates a mental construct of what the game "ought to be" (idem., p. 66), and bugs and glitches are perceived as parts of an imperfect version of the implied and ideal game object (ibid.). The player can never "claim complete knowledge about an ideal game object" (idem., p.65), as they will only have interacted in one particular way with one particular version of the game (ibid.). This epistemological consideration is as valid for the game-specific as it is for Aarseth's implied game object.

When I examine games for their elements later, I cannot claim to have complete knowledge about any given game-specific (as no one can), only particular. Furthermore, to state that a game has a certain goal, space or any other potential element can only refer to my limited knowledge of the game-specific based on my limited observations of its particulars. There are two methods we can use to counter this complex of problem. While it is of the utmost importance for game researchers to actually play the discussed objects to a level necessary to make our claims (cf. Aarseth, 2003, p. 7), it is, in many cases, equally important to gather information about the games at hand from other sources, in order to arrive at a state of near-complete knowledge of the game's contents. For instance, playing and finishing *The Talos Principle* (Croteam, 2014) once and claiming that its end shows the player's avatar as one of the guardians of the gameworld would neglect the fact that the game actually has several endings. Secondary sources can serve as supplements for several playthroughs. However, this might still mean some parts of the game will remain unobserved. In the following examination of game elements, statements such as 'the game's ultimate goal is to reach a location', will and can only mean that '*to my best knowledge, which is based on a limited amount of gameplay and secondary sources*, this game's ultimate goal is to reach a location'. Due to the effort made to reach complete knowledge of the examined part of the game, it will from there on be the skeptic's task to prove that my knowledge was incomplete or incorrect. Of course, this problem only concerns game scholars who are examining absolute statements, such as the one about the "ultimate goal" (Zagal, Debus, & Cardona-Rivera, n.d.; see also Section 5.7.1) of a given game, or the ending of *The Talos Principle*. In these cases, due to the issues discussed above, we can never be sure that our observations, research or conclusions are actually correct. In other cases, the individual observation of only certain individuations of a game-specific might be sufficient if the conclusions refer to the content of only those individuations.

The difference between Aarseth's implied object and my game-specific is that the implied game object works as a mental construct of the ideal object for one player, as a means to decide what is supposed to be part of a game and how the game is supposed to function generally, and is therefore functionally flawless. The game-specific is not flawless. It describes the set of all actual individuations of a given game as it is, including errors, glitches and bugs. Thus, the game-specific might be what Aarseth refers to as "the real game" (2011, p. 66). However, Aarseth only mentions the 'real game' once, and in the context of us conceptualizing "[…] the *real game* as being without the annoying bugs, and the present version as premature, unwanted stand-in version for the real (implied) thing" (ibid.; emphasis added). Aarseth' rhetoric describes the thought process of a person with an implied object in mind. This person equates 'the real thing' with their own 'implied thing'. After all, Aarseth was concerned with "The Phenomenology of the Game Object" (idem., p. 65). So, we have in fact no clear evidence of what Aarseth would consider the 'real game' or its relation to the implied object. Another problem is that it is unclear what 'real' means in this context.

Aarseth mentions a discussion in the comments of a YouTube video, in which one participant tells the other that they are confusing 'real' with 'physical' (idem., pp. 50, 64). This is just one of the many oppositions to 'real'. It is possible to argue that 'real' is opposed to 'fictional', and also that 'real' is opposed to 'virtual' or 'digital'. In the latter, 'real' appears to mean 'physical' again, whereas its position as an opposite of 'virtual' seems to be closer to an opposite of 'fictional': something that exists independent of another medium. I do not intend to delve deeper into the meanings of the term 'real' and which of these uses is the 'correct' or most defensible one. It shall suffice to point out that the term 'real' bears semantic problems that I seek to avoid here. I will also avoid the connection of game-specifics to realism in philosophy, which would imply that I considere game-specifics ('real games') to "[…] exist […] independent of anyone's beliefs, linguistic practices, conceptual schemes, and so on" (Miller, 2002).

In comparing Aarseth's implied game object and the game-specific, we can conclude that the latter is also explicitly used as a discursive tool between players to refer to the same game in the outside world, whereas the ideal and implied game object appear to be primarily tools for the evaluation of situations and decision making by one player, internally. This leads us to the second theory that is closely related to the game-specific and which can explain the use of game-specifics as generalized versions of a game as points of reference: the theory of types and tokens.

The types and token distinction is mostly discussed in linguistics, but also aesthetics, ethics and philosophy of mind (Wetzel, 2006). The most accessible example of the type-token distinction stems from aesthetics, in which a song is a type – for example *Basshunter*'s song *Dota* – and each individual performance of it are tokens for this song. While the resemblance to the specific-particular distinction is obvious, the type-token distinction also brings a bigger discussion about what exactly types are. Wetzel (2006) gives three "general answers" to the question what a type is: a set, a kind, and a law.

Each of these positions has its pros and cons, followers and opponents.[30] Sets, for example, are defined by extension (ibid.): All members of one set constitute that set. This means that in a hypothetical world in which Basshunter did not perform his song *Dota* at the concert on June 29th 2018 in Halifax, the song would not be the same as it is in our actual world. Others (Bromberger, 1992; Wolterstorff, 1970) connect types to *kinds*, where one position considers types *as kinds* (Wolterstorff, 1970) and the other one sees a type as an "*archetype* of the kind", which "models all the tokens of a kind with respect to projectible but not something that admits of answers to individuating questions" (Bromberger, 1992; as cited in Wetzel, 2006; original emphasis). Another question is whether types should be considered universals (see Wetzel, 2006), which leads me to the relationship between universals and properties.

One statement about the relationship of types and tokens struck me as particularly applicable to my conceptualization of specifics: Wollheim states that "[…] for much time we think and talk of the type as though it were itself a kind of token, though a peculiarly important or pre-eminent one" (Wollheim, 1968, p. 66). This concept of types by Wollheim is very much in line with my understanding of how we use names of games as if referring to particulars, when we are really talking about specifics. Consequently, I consider game-specifics types. Furthermore, I will subscribe to the set-perspective on types, considering game-specifics as sets of *actual* objects. This includes the past, present and future objects of a game-specific, but excludes *possible* versions of it. This is necessary to avoid the previously discussed criticism towards the set-perspective.

As game-specifics are now considered 'types' consisting of sets of actual objects, the term 'game-specific' appears to be unnecessary. However, it will not be dismissed for the pragmatic reason

[30] In the following I will summarize Wetzel's summary of these discussions, which admittedly will not do justice to the extensive works published on the matter. However, this will be sufficient as the goal of this summary is only to show what kinds of discourses exist around the type-token distinction. I will also refrain from summarizing the law-perspective on types, as Wetzel already states that it is impossible to "adequately unpack" the position. Any further attempt to summarize would only mutilate the theory. For a deeper understanding, see Wetzel's entry on types and tokens (2006), and for the law perspective on types, see Peirce's original theory of signs (1931).

that speaking of a 'game-type' might confuse the reader into believing that this term denotes a type of game such as 'card games' or 'videogames'. The term could also be confused with an indication towards genres, as 'first person shooters' and 'strategy games' can easily be considered types of games. Thus, games as types will henceforth remain 'game-specifics'.

Considering both Aarseth's implied object as well as the type and token distinction, it is also important to distinguish between our *reference* to the game-specific, which is based on a mental file created through the interaction with a game-particular and is possibly flawed, and the specific itself, which constitutes all actual individuations of it. When we play a game, we only create one instantiation of a game-specific, using one materialization of it. Our mental file to the game-specific will always be imperfect and divert from others' mental files of the same specific.

The exploration of games as game-specifics – and thus types – is an area that needs further research. Here, I have only touched on the bigger discourses around the type-token distinction, and future works will be able to draw from this introduction to gain deeper knowledge about the phenomena we call games.

I will now introduce the ontological distinction between endurants and perdurants and apply these concepts through examples.

3.3 Endurants and Perdurants, or 'How Games Persist'

The endurant-perdurant distinction is an ontological distinction of phenomena and how they contain properties. Briefly put, endurants are wholly present at any point in time (e.g. a chair), while perdurants have temporal parts and are consequently *not* wholly present at any point in time (e.g. the freezing of a lake) (Johansson, 2005; my examples). Games can also be understood as objects (endurants) or as processes (therefore perdurants) (cf. Aarseth, 2014b). Adopting either of the theories causes problems in statements about games. If we adopt the endurant perspective, it is hard to argue for different properties of a game at a single point in time, and if we adopt the perdurant perspective it is problematic to state that a game has a particular goal, if it is not the game's "ultimate goal" (Zagal, Debus, *et al*., n.d.; see also Section 5.7.1) and thus present throughout the whole process of play. In the following paragraphs, I will elaborate on these two problems.

If games are objects (endurants) they are "necessarily wholly present in each time interval at which they exist" (Johansson, 2005, p. 546). A generalized statement such as 'this game contains the goal of jumping on that platform' is unproblematic, adopting the endurant theorists' position. In this case, considering the game to be wholly present at any point in time, observing a goal in it once justifies the statement. Perdurants, on the other hand, "are necessarily *not* wholly present in each time interval at which they exist" (Johansson, 2005, p. 546, original emphasis). This applies to processes, as we can consider them as spread out in time, similar to how objects are spread in space (cf. Hawley, 2001, pp. 10–11). Consequently, they contain different temporal parts, and the game we examine now merely constitutes the temporal part of the game-individuation that is *now*.[31] This also puts forward the presumption that parts of a given game might be subject to change, and we will only know whether an individual part of the game is present in all of its temporal parts (i.e. the part is *atemporal*) after the game concludes. The only situation in which it would be valid to claim that the game contains the goal of jumping on that platform is if it was the game's "ultimate goal" (Zagal, Debus, *et al*., n.d.; see also Section 5.7.1). The ultimate goals of games are those that players try to achieve from the beginning to the end of the game. In Soccer, the teams want to *win*, *BioShock Infinite* is played to be *finished*, and in Tetris, players try to *prolong play* (Zagal, Debus, *et al*., n.d.; see also Section 5.7.1). Adopting the

[31] This is the "ontological commitment" (Hofweber, 2014) of the process perspective on games.

perdurant perspective, general statements such as 'the game's goal is to X', are only possible for goals – and, more generally, properties – that are active *at all points during play*. In all other cases, if we consider games as processes (perdurants) we would have to modify statements to 'in this temporal part of the game the goal is to X'. Even in the case of ultimate goals, the correct statement would be 'in all temporal parts of this game the goal is to X'.

It is clear that the perdurant perspective raises some issues when making generalized statements about a given game-individuation. A similar issue arises if we continue to the adoption of either endurant theory or perdurant theory and change over time. These positions are discussed by Hawley (2001) in more detail and will, although relevant, be only discussed in limited capacity in this section.[32]

Endurants were described as wholly present at any given point in time, and perdurants as having temporal parts and only partially present at any given point in time (see Johansson, 2005). This might suggest that there are only two different kinds of things in reality (processes and objects), which do and do not have temporal parts, respectively. Unfortunately, it is not so simple, as both endurant and perdurant theory can also apply to objects.

When theorizing about how things persist over time, these positions are in fact orthogonal. Perdurant theorists consider objects as expanding in time, as they do in space (cf. Hawley, 2001, p. 10). Following this line of reasoning, I, as a person, have a temporal part that is a child and a temporal part that is in its late 20s, similar to my having a spatial part that is my foot and a spatial part that is my hand. Endurant theorists claim that I am in fact wholly present in the 1990s as I am wholly present now, as I am wholly present as a complete human body in space with different parts. Both positions have intricacies regarding how things can change over time. The perdurant theorists have it easier in

[32] For a much more detailed account of this issue and its arguments refer to Hawley's original book: *How things persist* (2001).

stating that there are different temporal parts of 'me' that exist at different times. I can exist as a child and as an adult, both with different properties and parts, while still being the same person; this is again equivalent to my hand and my foot belonging to the same body in space, but also being different objects with different properties. It is harder for endurant theorists to explain change, as they cannot claim different temporal parts of the same object. After all, their initial claim is that every object is wholly present at any point in time, so 'I' cannot have a 'child part' and an 'adult part'.

Hawley states that endurant theorists should respond to the problem of change with a "relations-to-times response" (2001, pp. 16–20). In her words, "[w]e cannot claim atemporally that the boy has his tooth as a part, for this claim would be incomplete, […]. Rather, we should claim atemporally that the boy, the tooth, and a certain time stand in the *has-a-part-at* relation […]"(Hawley, 2001, p. 25 original emphasis). Following this, objects contain relations to properties in time. Let me reduce my earlier example of me as a child and me as an adult to my physical size. Describing my physical size as a child and an adult as *relation-to* time properties means that size is not an inherent property of me as an object, but a relation of my size to a given point in time. In spatial terms, this is equal to stating that I am taller than my younger sister and smaller than my supervisor. My size, in this case, is a relation to other objects in the world. The *relation-to time* argument claims that I contain the relation *being [small size] at* to the 1990s and the relation *being [tall size] at* to the present time.

I will subscribe to the endurant position in this thesis for two related reasons. First, endurance theory enables me to consider one game as one object, instead of a multitude of objects due to different temporal parts. Hawley describes this problem of perdurance theory (in relation to stage theory and sameness) as follows: "[…] if we ask how many spherical things have been in the room today, strictly speaking perdurance theorists should count every instantaneous temporal part of the tennis ball, for each of those things instantiates *being spherical*" (Hawley, 2001, p. 63; original emphasis). Similarly, Simons polemically notes that perdurant theorists[33]

> […] try to both run with the continuant hares and hunt with the occurant hounds: while denying that there are continuants they carry on talking as if there were. Outside philosophical seminars a four-dimensionalist never says 'A two-hour phase of me last night was a waking phase'; he says, with the rest of us, 'I was awake for two hours last night'.
>
> (Simons, 2000, p. 62)

It is clear that considering games as processes (and thus perdurants) brings with it the issue that I *cannot* claim 'sameness' between games of the same name, unless I am referring to literally the same instantiation of one game by one player over one period of time. In contrast, the endurant perspective does not force me to consider games with the same name as multiple temporal objects, allowing me to make generalized statements about a given game's parts. This means that, if I state that '*Super Mario Bros.* has the goal of jumping onto this platform', the actual content of that sentence will implicitly be replaced with '*Super Mario Bros.* has the atemporal relation to the goal of jumping onto this platform at an, at the point of inquiry unspecified, point in time'. The implications and application of this position will be elaborated on in the next section.

It is necessary to remember that understanding games as processes means declaring them as perdurants: All processes are perdurants as they contain temporal parts. Strictly speaking, 'perdurant game scholars' cannot refer to any game by its name only, as they always need to specify the temporal part (and instantiation) that they are referring to. Still, it appears that few are willing to adhere to this ontological commitment, or even discuss its implications.

[33] He uses the synonymous terms of occurrants (perdurant) and continuants (endurant), and "four dimensionalists" for perdurant theorists. The term 'four dimensionalists' simply describes perdurant theorists who claim that *everything* has temporal parts, and consequently that there are no objects with only three dimensions. For matters of internal consistency, I will continue using the terms already introduced in my work.

3.4 Application of the Concepts

In this section I will discuss the application of the introduced theories to particular problems in game studies. The endurant-perdurant distinction will be exemplified by *Super Mario Bros.* (Nintendo, 1985), and the question how it can contain different goals at the same point in time. I will then discuss how multiplayer games can be considered ‘the same game’ using the particular-specific distinction, as well as the processes of individuation, materialization and instantiation.

The problem of the perdurant perspective (in general, but also) in game studies can be seen in the example of *Super Mario Bros.* In our work on goals in games (Debus *et al*., n.d.; Zagal, Debus, *et al*., n.d.; see also Section 5.7), we developed a typology that is capable of describing game goals down to the lower levels of gameplay. For example, a goal in *Super Mario Bros.* is to reach the end of the level (reach location). When asking the question ‘How does the player reach this goal?’ we descend into lower levels of the goal hierarchy, encountering a situation in which the player has to reach a platform, or jump on a *Goomba*, or jump over a pit, etc. This becomes problematic in the moment that all of these are possible goals at the same point in time in different playthroughs. Depending which route a player takes, the game may offer the goal of jumping on a Goomba or over a pit at the same point in time.

The endurant perspective led us to have to describe and list each individual goal (jumping on platform, on Goomba, over pit) as a goal of the game, factually leading to an infinite amount of goals that cannot possibly be compiled (or even analyzed). After all, considering the game as an object that is wholly present at any time, all of these goals should be parts of the game and equally valid in every moment in time. Unfortunately, this is not the case. The solution to this problem lies in what Hawley describes as the better response to the problematic of change by endurant theorists (2001).

To reiterate, games as endurants do not inherently contain goals (presuming that games have goals), but relations to goals at different times. *Super Mario Bros.* has the atemporal [relation to the goal jump over pit at one time] and the atemporal [relation to the goal jump on Goomba at another time]. The relations are themselves atemporal and only refer to points in time. The solution of "Schrödinger's Game Goals" (Debus et al., n.d.) is that we do not have to actually list all individual possible goals of a given game, but can use a formula in which the game contains the atemporal relation to the formal goal [reach location] that will be individuated at unspecified points in time.

On the other hand, by solving this problem of change over time, this conception of game goals (or properties of games in the frame of endurant theory) leads to the issue of games not containing any properties at all. In other words, if *Super Mario Bros.* does not have the goal [jump over pit], but only a [relation to jump over pit at time], *Super Mario Bros.* also has no other properties at all (cf. Hawley, 2001, p. 18). It would be an empty shell only containing [relations to *X* at given points in time]. If we want to solve the 'multiple goals in a given game' problem with the 'relations-to-times account', we would also have to claim that *Super Mario Bros.* has no intrinsic (low level) goals at all,[34] but only the potential for relations to different goals at certain times.

One valid objection could be that the example of a goal in a given game is not a property of that game, but a part. According to Hawley, the 'object has-a-property-at' relation is equally valid in the form of 'object-has-a-part-at': "Objects can change their parts as well as their colours or shapes–a boy loses his last milk tooth and later acquires a beard […]" (Hawley, 2001, p. 25).

Endurant theory solves the problem of multiple goals in time. The problem of games (or objects in general) not containing properties but only relations is a trade-off that I am willing to take, as it is

[34] As will be made clear in Section 5.7, higher level goals are less problematic as games (mostly) contain only one at any given time, thus the higher level goals are what Hawley describes as "permanent properties" (2001, p. 18).

conceptually easier to consider games as having relations to properties (and parts) than to consider each individuation of a specific a completely different object. This perspective of different particular individuations of a specific is more prominent in the example of multiplayer games.

To demonstrate this perspective, consider a match between two teams in *Dota 2* (Valve Corporation, 2013). In *Dota 2*, two teams of five players compete on a map with two bases – one for each team. A team wins, and ends the game, by destroying the enemy's main building in the base. In order to destroy the main building, all buildings (towers and barracks) of at least one of the three 'lanes' between the bases must be removed. Without all buildings of one lane gone, the core is invulnerable. This basic set of rules often leads to a situation in which one team has 'pushed' (read: cleared a line of buildings) one or more lanes to the enemy core and made it vulnerable, while the other team is still struggling to destroy one of the lanes.

Using the terminology introduced above, *Dota 2* is a game specific: An abstract object that is the set of all individuations of itself. This specific contains all relations to properties and parts that *Dota 2* needs to be materialized on a machine, as well as instantiated in a match between players. It is then individuated on the computers of ten different players, creating ten particular materializations of the specific. This is simply the code that is installed as electrical current on the hard drives of the players' computers. Using these materializations, the players start engaging with the objects: They instantiate *Dota 2*. Each player now engages with their own individual materialization of *Dota 2* in an instantiation that covers the processes the specific is able to produce. This, however, raises the question of how players are able to compete with each other within the same match.

The fact that each player engages with their own materialization contradicts the idea that players are competing and interacting with each other. Each materialization of *Dota 2* creates different affordances for the players at the same points in time, while some of the affordances overlap. For example, all of the players start out with the overall goal of destroying the core and subsequent goal of clearing at least one lane, but ultimately the afforded or necessary actions for each team and player differ.[35] Here, one could assume that each person is in fact engaging with different objects (cf. the *Super Mario Bros.* discussion above), as these changes and overlaps in properties are contradicting the fact that each player is engaging with an individual particular. How can one's instantiation of *Dota 2* contain another player's instantiation's properties? After all, instantiations are particulars as they use materializations of specifics, and particulars are "*this* rather than *that* thing" (cf. Munn & Smith, 2008, p. 47; original emphasis).

This is where the server comes into play. The server's task is to ensure that the players' individual instantiations share certain properties with each other. While it might appear theoretically, as well as practically, that each person is engaging with a particular instantiation, the server ensures that these instances share certain parts and properties. We can consider one match of *Dota 2* to consist of one specific (*Dota 2*), eleven materializations (the copies of *Dota 2* on the machines, as well as the server) and eleven instantiations (each player's individual play session, as well as the events of the whole match).

[35] I do not argue that it is the goals of games that ultimately make the difference between one game and another. The argument is simply that while engaging in the seemingly same process, games afford different players to do different things, which means that each individual player engages in a different process, rendering each engagement its own process and therefore different from the others.

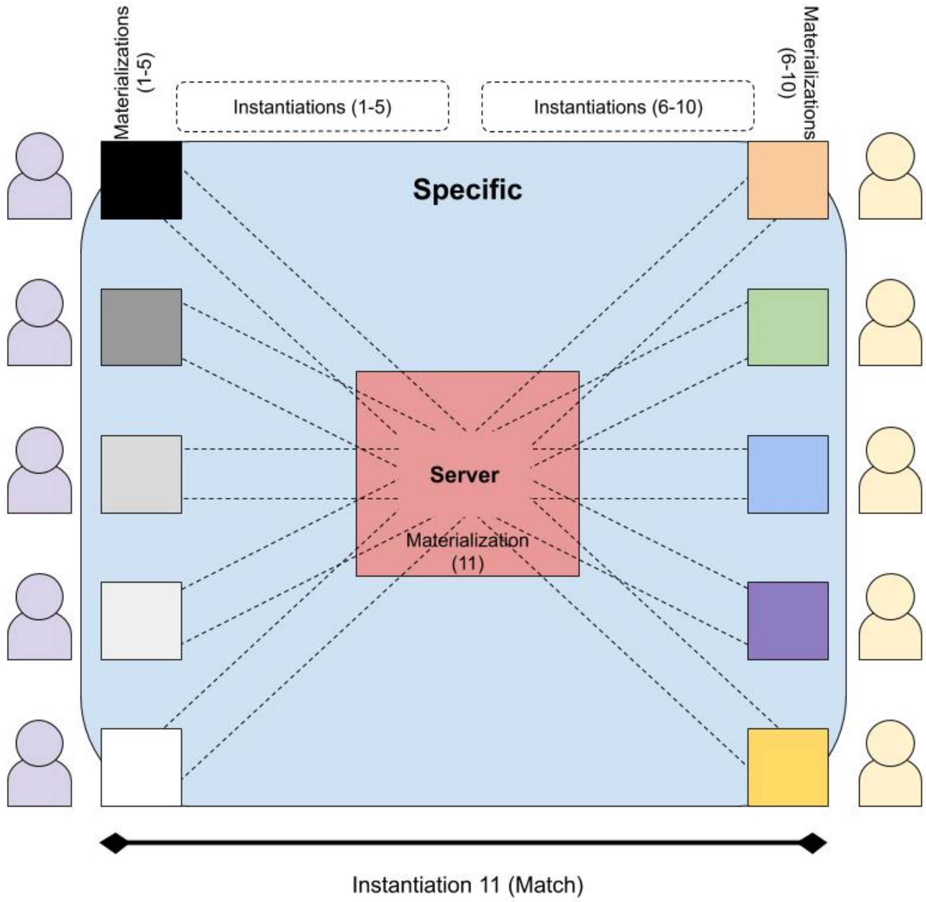

Figure 2: Individuations of Specifics in Multiplayer Games.

The seemingly same game instantiation affords different actions for different players at the same time. This is, in fact, no different from the earlier example of *Super Mario Bros.*, except for the fact that all players are now participating in instantiations that share many properties, all of which accumulate to 'the match'. Nevertheless, because there are different temporal parts (goals or afforded/necessary actions), each player engages with a different perdurant, as all of them contain different temporal parts (at the same time).

To summarize, to consider games as perdurant objects means if two players play the same game at the same time, the game is, in fact, two different objects, as different temporal parts will occur at the same time. To consider games as endurants instead allows us to claim they are the same object that simply has a multitude of relations to goals at different points in time. Thus, *Super Mario Bros.* contains both the atemporal relation to the goal 'jump over pit' and 'jump on Goomba' at the same point in time.

3.5 Games in the Unifying Game Ontology

Up until now, I have discussed games and the term 'game' from different perspectives. It has become clear that the term 'game' describes a multitude of types of phenomena and objects. Each of the identified understandings of the term highlights a different aspect of a multifaceted phenomenon. Games can be understood as an underlying structure in an activity, or as a non-serious attitude towards such an activity. I have also described what I call the 'development and distribution inheritance' – an understanding of digital objects as games, because they were developed and distributed in the same way as artifacts that are already considered games. Most importantly, I have demonstrated that we refer to games as objects, as well as processes. This distinction has been made in philosophical ontology already, as the difference between *endurants* and *perdurants* (Johansson, 2005). I argue that games are not located on either side of the dichotomy; instead, their location depends on the underlying idea of each individual investigation or use of the term game (as one investigation might even use different underlying ideas in different places).

Furthermore, I have argued that when referring to an individual game, we are, in fact, referring to a game-specific. A particular game must exist only once as a physical object, otherwise it would not adhere to the definition of a particular (cf. Munn & Smith, 2008, p. 47). Specifics, on the other hand, are groups of anonymous particulars (ibid.). Thus, when we speak about *World of Warcraft* we are not referring to one particular, but a group of particulars (specifics) instead. This specific can be *individuated* in two different ways: *materialization* individuates the specific into a physical or digital object (endurant), whereas *instantiation* individuates it into an observable process (perdurant).

Games from here on will be understood as anonymous groups of particulars (specifics), if not indicated otherwise. These game-specifics may be materialized in particular objects (the aforementioned endurants) or instantiated in processes that span over time (perdurants). When referring to any given game, such as *StarCraft II: Heart of the Swarm* (Blizzard Entertainment, 2013) or *Apex Legends* (Respawn Entertainment, 2019) in common language, we implicitly anonymize an unknown amount of materializations and instantiations into a game-specific. This process is pragmatic, but can lead to confusion in particular situations. For example, if I were to refer to Settlers of Catan, it matters to the discussion whether I am referring to a digital or physical materialization of the game. Thus, it will be clarified – and should be in other studies as well – which materialization or instantiation is being referred to, *if necessary*. I have also argued that it is impossible to claim complete knowledge of game-specifics, but it is ultimately the skeptic's task to prove that my efforts of reaching (near-) complete knowledge of certain game-specifics have been unsuccessful.

The impossibility to claim complete knowledge over any given game, as well as two methodological counter measures were described. Considering the effort made to gain a near-complete knowledge, as well as the limitation of claims about games to the level of 'my best knowledge and after making this effort', it was left to the skeptic to prove my claim about any given game was incorrect to the point that it renders the particular argument in question invalid.

Last, the problem of change has been discussed concerning games. The endurant perspective on games enables me to make generalized statements about game-specifics and -particulars, as well as assume ‘sameness’ between them. Game particulars are the same in the sense that they contain the same atemporal relations to parts.

3.6 The Empirical Scope of the Present Survey

In this section I will constrain the scope of the present classification of game elements to the mechanical system of games. I will use the "cybermedia model" (Aarseth & Calleja, 2015) and give a brief comparative example of two games to argue that mechanics are inherently formal, which leads to the possibility of implementation across game-specifics without generating sameness between these specifics. Finally, I will discuss the idea of the "orthogame" (Carter, Gibbs, & Harrop, 2012a) of games, excluding elements that could be considered before, after or ‘aside from’ the ‘core game’. An ontology focused on these aspects of games has the broadest possible range of application.

I have demonstrated (Chapter 2) that the term ‘game’ is used with many different underlying ideas, in different contexts, and by different people. I have also argued that all these perspectives and underlying ideas have their own individual justification and necessity for examination. The concept of games covers systems, objects, processes, attitudes and phenomena that have inherited similarities based on their technical development and distribution tools (DD-inheritance). A comprehensive ontology of games would have to cover individuations of all these underlying ideas, if it was to claim full applicability to all concepts of games. The following classification of game elements will focus on a particular subset of underlying ideas of ‘game’ terms. The examination will focus on games as artifacts, not as attitudes towards an activity or the consideration of games through the previously mentioned distribution and development tools. More specifically, the classification of elements will focus on the underlying formal rule systems of games.

This project sets out to develop a formal ontology of games. As Munn and Smith point out, a discipline is formal when it makes specific judgments, not particular ones (Munn & Smith, 2008, p. 45). Informal disciplines, on the other hand, take into consideration matter, which makes a thing "*this* rather than *that* thing" (idem., p. 47; original emphasis). To fulfill the criterion of a formal ontology, it is necessary to remain on the broadest possible level of abstraction that applies to "a group of anonymous particulars" (ibid.). In the following paragraphs I will exemplify why the exclusion of material and signification elements of games is beneficial for creating a formal ontology of games. To do this, it is necessary to differentiate between some characteristics of games as holistic artifacts. The most basic distinctions between such elements usually point out a mechanical or processual system and a semiotic layer (e.g. Aarseth, 1997, p. 40, 2011, p. 58; Hensel, 2011, p. 12; Mäyrä, 2008, pp. 52–55). More detailed models are Aarseth and Calleja's "Cybermedia Model" (2015) with four dimensions and Aarseth and Grabarczyk's "Ontological Meta-Model for Game Research" (2018) with twelve dimensions. For my purposes, Aarseth and Calleja's model suffices, as the meta-model's twelve dimensions can be mapped onto these four more pragmatic ones.

The cybermedia model describes games as the players' perspectives on cybermedia objects. These objects consist of a sign system, a materiality and a mechanical system. According to the authors, cybermedia objects – and with them games – contain "one or more systems of signification" (Aarseth & Calleja, 2015), which can encompass sound, imagery, text and other signs that are interpretable by a player. The materiality serves the purpose of interacting with the mechanical system, as well as representing its state in certain games, such as board games or sports. Game materials can range from items (balls, cards, tokens), game boards and hardware (computer, console) to joysticks and gamepads. They are used to interact with the mechanical system of the game,[36] which encompasses the change of game states and informational conditions (ibid.). As examples for such systems, the authors list raiding, questing or Player-versus-Player battlegrounds.

It is important to note that it is possible to exclude the player as an active agent or necessary part of the game artifact. Although it is easily argued that the player has an crucial role in games 'as played' (e.g. Leino, 2009), considering games as artifacts, the players merely fill a formal position as described by the system. As Aarseth and Calleja (2015, n.p.) state:

> The above three elements [sign system, mechanical system, materiality] form the matrix of relations that describes the cybermedium as object. We express this as the base triangle of our pyramid diagram to signify that it can be studied or considered in isolation from the user (or player, in the case of games), as an artefact.

Using the remaining three dimensions it is possible to argue that – in our contemporary Western culture – it is oftentimes the sign system of a game that makes an artifact *this* rather than *that* game, as can be seen in the comparative analysis of *Kaboom! The Suicide Bomber* (fabulous999, 2002) and *Howard Dean for Iowa* (Bogost, 2003).

These two games are "mechanically the same" (Aarseth, 2011, p. 62), and only differ through their representational layers. In both games the player controls an entity with the ability to affect other entities within a certain range, inside the gameworld. In *Howard Dean for Iowa* 'affecting' means attracting their attention towards a 'Howard Dean' sign and in *Kaboom! The Suicide Bomber* it means killing people. It can then be observed that different sign systems can be added onto the same

[36] Aarseth and Calleja also describe dual-blind Chess in which, they argue, there is no materiality to the game.

mechanical system to create an artifact with a different name. We could conclude that to include the representational content of games into the examination would render the resulting ontology informal, as the representations makes them *this* rather than *that* game (cf. Munn & Smith, 2008, p. 47). However, this would neglect the fact that there are, in fact, formal ways of talking about representation without referring to particular content. It is more interesting to discuss the fact that both games are using the same mechanics, but can still be considered different.

The reason for this is that mechanics are abstract in nature, as they have to be individuated and represented before we can engage with and observe them at all. This has been argued by Möring (2013, pp. 219–232) and Aarseth (2015) in their criticisms of 'procedural rhetoric' (see Bogost, 2007; Treanor & Mateas, 2013). In order to create an ontology of game elements applicable to the broadest possible range of games, it is beneficial to start with the mechanical system. It is easily formalized, and a classification of formal mechanical elements is easily transferable and applicable across different individuations of games. The observation that mechanics are an inherently formal part of video games is not new in game design theory. Dormans, for example, states that mechanics "[…] are amongst those parts of games that are separable from images and sounds and might actually be transposed from one medium to another: a board game might be recreated as a computer game with different art and a different theme without altering the mechanics" (2012, p. 6). One could conclude, in accordance with Juul, that "games are transmedial" (2005, p. 198), as they can be adapted into different media through their formal systems. Nearly fifteen years after Juul's statement, it appears obvious that by 'games' he really meant their 'underlying formal systems', as the statement must be read with caution: it either makes implicit use of the underlying idea of games as rule systems, or displays an essentialist claim of only those elements of games that are transmedial constituting what games actually are. The latter position has been criticized in game studies as neglecting essential characteristics of video games that are similar to other media products (Swalwell & Wilson, 2008, p. 3), and marginalizing certain (video)games that are broadly accepted, played and have had a cultural impact (Swalwell & Wilson, 2008, pp. 67–68; also Keogh, 2014, p. 5). However, this criticism is not directed at the observation of mechanics as inherently formal but the equation of games with these formal systems.

Similar to Aarseth and Calleja's definition of a mechanical system, Arjoranta defines processes, drawing on Bogost (2007), as "[…] a script or a collection of rules for how something is done, be it a mechanical engine, a social organization or a digital game" (Arjoranta, 2015, p. 47). For the moment, it should be accepted that mechanics are one type of process (as indicated by the quote). Arjoranta continues to state that "[t]hese processes are defined by the game rules or, sometimes, by external factors like physical laws, social agreements or cultural assumptions" (ibid.). The critical observation here is that processes (and with them mechanics) do not have to be explicitly described through rules, nor be particular mechanical parts of a machine. Parts of the mechanics might, in some cases, simply be defined by real life physics, such as a ball dropping a particular way after being pitched in Baseball.

Hence, equating the limitation of the current project with the rule system of games would, in some cases, not be enough to describe what the exact scope of this thesis is. In some cases mechanical systems are not explicitly described by rules, but implicitly implemented through physical (or other) laws. In fact, the inverse can also be the case. If, for example, the rules of a game explicitly state that the players are supposed to use a die in the game, the material aspects of the die are irrelevant. Instead, what matters is its function for the formal underlying system as a random number generator. This function can be materialized in many ways, from cards to different sized sticks or stones.

The following examination of game elements, and classification of these elements, will consider games objects that include and generate their underlying mechanical systems through rules or other means, such as physical laws or use of materials with particular properties required for the formal system to function. If there is no purpose for the underlying system in a given element, it will be dismissed as a purely material, representational or other aspect of the game. The benefit of this particular focus is the classification's applicability across individuations of games without impediment by the inclusion of partially informal aspects, such as material or representation. Finally, one more elimination is necessary.

Contemporary digital games, for example, contain many elements that can be formally described, even before the players have reached what we could consider the 'actual game'. When starting the digital artifact *Apex Legends* (Respawn Entertainment, 2019) on a player's home computer,[37] it will show the player a loading screen, followed by a brief intro sequence with the logos of the production and distribution companies. It will then arrive at another loading screen that requests the player to 'Continue' with a left click. After this initial barrier, a screen appears, showing the last played character – or legend – and several menus (see Figure 3: Main Screen of Apex Legends (Screenshot by the Author).).

[37] This description refers to version 3.0.9.10, the last version before the start of *Apex Legends*' second season on July 2nd 2019.

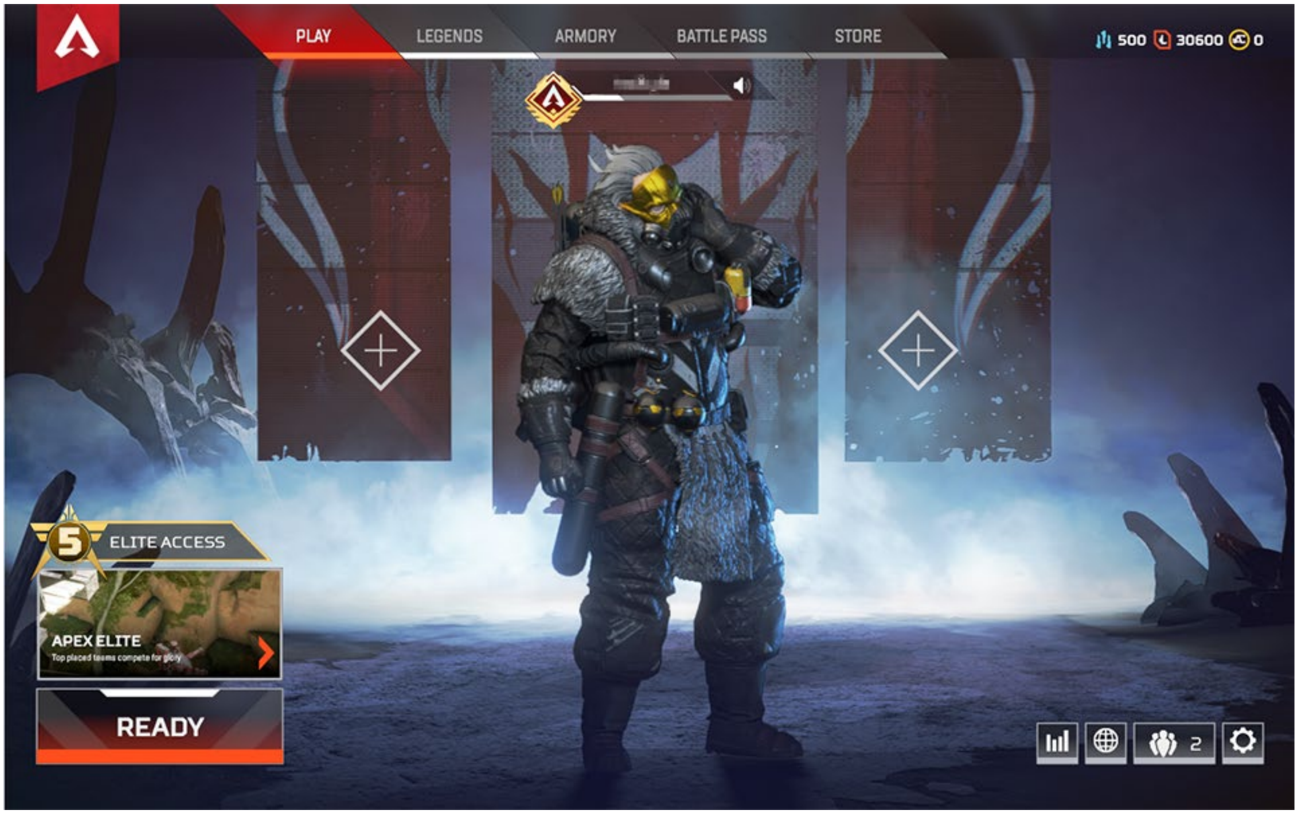

Figure 3: Main Screen of Apex Legends (Screenshot by the Author).

Aside from the 'Friends' tab, options and statistics in the bottom right corner, the main screen offers a store, in which purchases, such as skins and legends, can be made. The battle pass tab shows the progression in the current seasonal battle pass, which lasts approximately three months per season. In the 'Armory' the load out of each legend and weapon can be viewed individually. In 'Legends' the player can view the different legends and their skills. Finally, we arrive at the 'Play' tab, which is the screen currently displayed in Figure 3. Even here, the player has the option to play in 'Apex Elite', which is a mode available if the player finished within the top five teams in their last match. In Apex Elite, only previously top five placed players compete on the map called King's Canyon. The player can also choose to play a normal round of *Apex*, outside of the elite mode, or go into the training arena through the menu on the bottom left. All of these elements can be considered formal elements of the underlying system of the holistic digital object *Apex Legends*, but they are not part of the scope of this project.

In their research regarding the practices colloquially known as 'metagames',[38] Carter *et al.* introduced the threefold distinction between "metagames, paragames, and orthogames" (2012a). According to the authors, a paragame is "[…] that which is performed peripheral to, but alongside the orthogame" and "[…] metagaming refers to play acts that involve or consider resources that are 'beyond' the scope or control of what players consider to be the orthogame" (Carter *et al.*, 2012a, p. 4). Both definitions heavily rely on what the orthogame is, which can now be understood as that which is not beyond or alongside. The authors acknowledge that all these practices are important parts of the games as a whole (ibid.). However, to define 'orthogame', they rely on the emic usages of the term metagame (and other practices), which imply that "[…] there is still a subsection within the game, which is constantly being negotiated, that players might identify as being the very basic game within the entire game" (ibid.) and further that "[w]ith the demarcation of achievements and additional content as a metagame, players imply a 'core' space within the game with which peripheral play acts interact" (ibid.). This notion of the orthogame must not be confused with Elias *et al.*'s understanding of it, who define orthogame as […] a game for two or more players, with rules that result in a ranking or weighting of the players, and done for entertainment" (2012, p. 8). For them, this definition serves the purpose of delineating the "most 'normal' or 'usual' kind of game" (ibid.). A similar idea to Carter *et al.*'s concept of orthogame or a 'core game' was also described by Björk and Holopainen, who describe "the game proper" (2005, p. 14) from the setup of the game. This concept refers to the temporal frame

[38] In this colloquial sense, metagames constitute particular strategies for the improvement of play that are developed within the community of the game, in short: strategies. For a more extensive review of metagame concepts and practices see Debus (2017).

of the 'core game', as the game proper starts after the setup and concludes before the set-down of the game items.

To exclude aspects of games that are not part of this orthogame enables the ontology to cover games across different materialities. While it is common for contemporary video games to have menu structures, shops and customization screens, older games, as well as non-digital games, lack such options. To include them into the ontology would not only display "digital essentialism" (cf. Tobin, 2015), but also render the classification of game elements a rather specialized classification. In conclusion, the following classification will focus on the orthogame of games as previously described, so as to apply it to the broadest possible range of ludic artifacts.

This particular focus of the classification means a list of things will be excluded. Menu structures of the digital artifacts will be excluded, even though they could be formally described and are arguably part of the overall system. Also excluded are most of the elements that were discussed in the screenshot of *Apex Legends (*Figure 3*)*, such as armories, shops etc. I say 'most' as some of the elements are classifiable through other elements that also appear within orthogames, such as loot boxes, through a classification of randomness. Furthermore, what would be described under Aarseth and Grabarczyk's "communicational" level (2018) or Aarseth and Calleja's "sign system" (2015) – the representational aspects of games – are excluded due to the focus on only the underlying formal system of games.

Chapter 4:
Classifying Classifications

In this chapter I identify elements of games. First, I will explore existing literature from the field of library studies, to discuss the advantages and disadvantages of particular classification methods and schemes. I consider ‘library studies’ as literature that discusses the creation of classifications for the purpose of storage and retrieval of knowledge in the context of libraries. This is to distinguish it from the broader field of information science, of which it is a part. This review will demonstrate that there are three main methods of creating classifications: the top-down or philosophical method, the bottom-up or scientific method, and the synthetic method; as well as two types of classification schedules: hierarchical and faceted. I will discuss the advantages and disadvantages of each method and scheme, before elaborating on the method of deriving game elements as “facets” (see Vickery, 1960) of games from existing game classifications, through the extraction of differences that are employed to create divisions within them. After this, the sixteen analyzed classifications will be described in detail. Next, I will provide examples of classifications that cover the broadest range of identified elements, while keeping the amount of classifications to a minimum, followed by a discussion and clustering of the identified differences into the final set of facets.[39]

The earliest classification in the current sample is Culin’s (1907) extensive account of games of native North Americans. Jünger (1959) and Caillois (1961) developed classifications of games five decades later. Both are by-products of a broader focus on games and play and their relation to culture.

[39] The terms ‘elements’ and ‘facets’ will be considered synonymous. They refer to two different perspectives, where ‘element’ indicates an ontological perspective of the derived difference as a part of formal game systems, and ‘facet’ refers to the function of such elements within the classification schedule. These facets will be further classified in Chapter 5.

Interestingly, both examinations suffer from the lack of distinction between the two terms ('games' and 'play'), arguably due to the same lack of distinction in French and German. Around the same time, Murray (1951) published his work *A History of Board-Games Other Than Chess*, which, as the name suggests, is a collection of games, similar to Culin's work, but covers board games from five continents. The last of what will later be considered pre-digital classifications are Bell's (1969) *Board and Table Games From Many Civilizations* and Avedon and Sutton-Smith's (1979) *The Study Of Games*.[40] The analysis of *The Study Of Games* will focus on Avedon and Sutton-Smith's synthesis of six theories of games in the introduction to the chapter '*The Structure of Games'*, resulting in "four basic types of games" (Avedon & Sutton-Smith, 1979, p. 405). I will consider Parlett's (2000) collection of card games as the first of the post-digital classifications. In the early 2000s, publications on game classification surged, potentially triggered by the foundation of game studies. Within ten years, six explicitly classificatory works were published (Aarseth *et al*., 2003; Elverdam & Aarseth, 2007; Hinske *et al*., 2007; Klabbers, 2003; Mueller *et al*., 2008; Polizzotto *et al*., 2007), complemented by Pias' (2004) work. Aarseth *et al*.'s (2003) typology of game dimensions, which was later expanded upon by Elverdam and Aarseth (2007). Klabbers (2003) developed a classification for games and simulations, and Pias created a pragmatic classification for his doctoral dissertation, based on the input that games require. However, game classifications were not limited to the area of games and simulations as psychologists developed a number of game classifications. During a study on drinking game-related consequences for college students, Polizotto *et al*. (2007) created a basic classification for drinking games. This topic was later elaborated on by LaBrie *et al*. (2013), who identified five different classes of drinking games, based on Borsari's earlier six categories (2004). These latter categories are

[40] The classifications were clustered loosely in the categories of pre- and post-digital classification. These categories have admittedly vague boundaries, but are useful for some observations about the change of game classifications over time (see Sections 4.1.3 and 4.3.8).

omitted here due to their similarity to LaBrie's more recent ones. This leads us to the most recent game classification included in this analysis by Raftopoulos *et al*. (2015), who created a more specialized classification aimed at better understanding the gamification in enterprises. Section 4.2 "*The Classifications*" will be purely descriptive and may be skipped by readers familiar with the material. It was included as it will be useful for following the examples, as the classifications are at hand if needed by the reader during the last part of this chapter.

However, first I will give an overview over theory concerned with the process of classification.

4.1 Classification Theory

"I wished to show that library classification is not the toy of unrealistic dreamers in libraries, but has relevance to the larger world of ideas and actions. [...] I hope that my audience are with me in believing classification to be a valuable tool, and not a plaything for theorists. Yet theory there must be, for how can we sharpen a tool if we cannot tell the blade from the handle?"

(Palmer, 1971, p. 14)

.

In order to accurately analyze and discuss game classification, I will provide an overview of library classification and related fields. The purpose of this is twofold. First, it will provide deeper insights into methods for the development of classifications, which will be beneficial for the development of the Unifying Game Ontology. Second, it will identify types of classifications and their advantages and disadvantages, which will be especially useful for the analysis of game classifications in Section 4.3 and the UGO's construction (Chapter 5). In fact, library classification has dealt with such topics for over a century. The discussion will focus on theories of library classification, such as their methods and general arguments about classification(s), as particular library classifications should not be applied to games without further evaluation of the methods themselves and the specificities of particular classification schemes are not of further importance.[41]

It should be stated that, as with many fields and theories, the achievements of library classification cannot and should not be applied directly to games or their elements. After all, library classification is not concerned with the classification of things, but with writing or knowledge about things (Palmer, 1971, pp. 12, 18). However, it will prove more beneficial than drawing from fields that classify material things, such as geology or biology. As this dissertation does not aim for the classification of games as material objects, but for the elements of their underlying formal systems, I am not concerned with actual objects, but these formal components instead. Considering the space of games, player structure, or their outcome as objects would be a great mistake and render the whole project obsolete. Furthermore, Farradane (1961) has argued that the classification of things is, in fact, impossible. He understands classification as "[…] an intellectual operation upon mental entities or concepts" (1961, p. 121), concluding that "[w]e cannot classify 'things' themselves, but only our concepts representative of the 'things'" (ibid.). Thus, it appears that theory related to the classification of knowledge appears to be more applicable than that which is aimed at the classification of material things.

In order to begin the discussion of library studies theory, it is necessary to clarify certain terms. First, Aristotle's "Five Predicables" are useful terms for classification (see Sayers (1944, p. 37)). While discussing types of 'sameness', Aristotle describes four predicables for how a statement about something (a "predicate") relates to its subject. Originally, he distinguishes between *four* predicables:

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[41] With the former argument I invoke Aarseth's description of 'Ludology' as a reaction of unreflected application of theories from other fields to games (2014a).

the *definition*, *property*, *genus* and *accident* (bk. 1, part 8). If a predicate is convertible with the subject (i.e. “if A is B then B is A”), it is either its definition or one of its properties. If the predicate signifies the subject’s essence, it is its definition, and if not, it is a property. If the predicate is not convertible with the subject, one has to consider whether it is part of the subject’s definition or not. If it is, it is a genus or differentia of the subject, of which definitions consist. A genus is a subordinate kind of the subject and the differentia a criterion, which distinguishes between the genera. If it is not a part of its definition, it is an accident. An accident is a property that might apply to the subject, but can, in nature, also apply to many other things. Thus, it is not *necessarily* connected with the subject, or its essence.

The statement ‘EyeToy is a gesture recognition tool for the PlayStation 2’ are predicates about EyeToy (Sony Computer Entertainment, 2003). As EyeToy was the only gesture recognition tool for the PlayStation 2, the predicate is convertible with its subject: EyeToy is the tool and the tool is EyeToy. However, the statements ‘EyeToy is a gesture recognition tool’ and ‘EyeToy is a tool for the PlayStation 2’ are not convertible with the subject, as, for example, the PlayStation Move (Sony Computer Entertainment, 2010) was another tool for the PlayStation 2, and Kinect (Microsoft, 2010) is another gesture recognition tool. Thus, the individual parts of our first statement describe the genus (gesture recognition tool) and differentia (for the PlayStation 2) of EyeToy, which together form its definition.

These four predicables are usually referred to as ‘Aristotle’s *five* predicables’ (e.g. Sayers, 1944, p. 37): *Species* (or definition), *Genus*, *Difference*, *Property* and *Accident*. The reason for this is that Aristotle’s genus implies the ‘differentiae’. These, however, are currently considered two different predicables. After all, the genus refers to a set of subjects, whereas the differentiae describe a specific type of attribute – those which are essential to different genera, but not the subject in general, and are thus the criteria to distinguish between genera.

It is important to note that Sayers describes the terms differently. According to him, the s*pecies* is a subset of the *genus*. These s*pecies* are divided by the d*ifference*, which is some quality added to the *genus*. A *property* is considered a quality that is applicable to the whole *genus,* but is not essential to it (i.e. part of its definition); and *accidents* are properties that "have no *necessary* connexion with any member of a class" (Sayers, 1944, p. 38; original emphasis).

If we disregard the complications with the concept of games and their classification for the sake of the argument,[42] card games, for example, is a *genus* that can be further divided into *species*. One's genus' species can, of course, be another specie's genus. A d*ifference* is a criterion for the distinction between species, such as the number of cards necessary for a particular game. This is where game classifications tend to fail to deliver a satisfactory distinction. The idiosyncratic problem with card games (and games in general) is that there are too many *qualities* that can make a *difference* between *species* (cf. Wittgenstein, 1958). Many game classifications employ differences such as the types of objects played with (e.g. Bell, 1969; Culin, 1907; Murray, 1952), or the game's potential for immersion (e.g. Hinske *et al*., 2007), whereas I am more interested in the underlying formal system of games. As discussed earlier (Section 4.1), informal differences outside the formal game system will be considered *accidents* due to the focus of this project. In Poker, for example, it is unimportant whether you play with cards. What matters is that the material serves the purpose that the usual cards serve, i.e. that they provide a certain amount of randomness and relation between cards, which produces probabilities necessary for the game system to function. These probabilities can be achieved through many materials

[42] On first glance, games appear to be a particularly poor set of objects for the explanation of these terms. After all, who decides what the species to the genus game are? Are they the species mentioned here? Or are they related to the number of players required for the game? What about games with different themes or spatial layouts? Sayer's (1944, p. 38) example is animals (genus), which divide into lions, elephants, dogs, and so forth (species). Upon further examination, this second, intuitively more accurate, example is just as problematic: Why is the species to the genus not mammals and non-mammals? Why not land, sea and air animals? Why are lions not cats? In fact, the superordinate category, here, should be *Felidae*. However, in a way, each classification and genus-species relation is, to a certain extent, subjective, and Sayer's example only appears more accurate as this topic has been more accepted than that of 'game species'.

and objects. For example, we could use stones with different colors and cuts on them, or humans dressed in suits, dresses, bathing suits and yoga-pants carrying different amounts of items. Thus, game classifications often appear arbitrary in nature and inapplicable in a general sense.

The terms *genus* and *species* were directly translated into *division* and *subdivision* by Philipps (1963, p. 12). Following his terminology, a *subdivision* is the result of adding a *difference* to a *division*. Hence, games are a division, of which ball games and card games are possible subdivisions. The *differences* here are the ball and card, forming a *characteristic*, which is 'object necessary for play'.

Furthermore, the written word 'game' is a *term* (Phillips, 1961, p. 12; in reference to Bliss, 1940), and the written arrangement of the *terms*' *subdivisions* is – following their terminology – the *schedule*.

Philipps also describes the more technical terms *summum genus* (the most top-level class), *infima species* (the set of classes with which the divisions end), and *subaltern genera* (all the classes in between). Sayers described a similar scheduled hierarchy: *class* (top level), *division* (first subordinate level), *subdivision* (second subordinate level), *section* (fourth subordinate level). The problem with these terms is that it binds us to a four-level division. If the classificationist were to employ more than four differences onto a term, they would have to describe one of the original subordinate levels as a new top level for each subsequent evolving schedule. This leads me to the terms *extension* and *intension* (see Phillips, 1961, pp. 14–15; Sayers, 1944, pp. 41–44).[43]

Extension describes a term's range of covered objects, and *intension* describes a term's respective qualities. A term with great extension includes many objects. A useful example is the term 'game'. Its qualities are capable of distinguishing it from other entities and activities, yet 'games' still include a variety of objects and activities, such as card games, video games, children's games, drinking

[43] Phillips uses the terms synonymously with connotation (intention) and denotation (extension) (1963, p. 15).

games, and even, for some, human mating habits (e.g. Strauss, 2011). *Conker's Bad Fur Day* (Rare, 2001), on the other hand, covers only one specific game, for one specific console. Thus, its extension is very small, but it has a large amount of qualities distinguishing it from other games, resulting in great intension.

As the amount of subdivisions for the classification of game elements is not foreseeable, in this project I will use only the terms *division* and *subdivision* for any given level, instead of using a different term for each specific level underneath a division. This means that each subdivision is a division for another subdivision, until no further subdivision was found or possible. In this case, the last class will be termed *infima class*. One class's subdivision results in *sub-classes* that are specific to their class of origin. If there is more than one *term* inside a division or subdivision, these terms are considered *classes*, which are distinguished by *differences* – which form *characteristics* – added to it. These differences can be attributes, concepts or structures, making one class or term distinct from another. The concepts of *properties* and *accidents* will be adopted from Aristotle's five predicables. Thus, a property is a term's attribute, which is necessarily connected to the term, or part of its 'essence', whereas an accident is an attribute of the term that is not necessarily connected to it.

4.1.1 Types of Classifications

In the earlier years of library studies, the predominant, or possibly only, type of classification was an arrangement of topics in *hierarchies*. From top to bottom, hierarchies start with overall main classes, which are then further and further divided into subclasses of sciences and subjects. An example of a hierarchical classification in library studies is the Dewey Decimal Classification (e.g. Dewey, 1921). However, hierarchical classifications have been criticized for being not flexible enough (e.g. Vickery, 1960, p. 7). The examples given so far have all followed the structure of a hierarchical classification:

the *genus – species* relationship, card games as a subdivision of games, etc. Ranganathan developed a solution to the problems of hierarchical classifications called “Colon Classification” (1939). The Colon Classification is a faceted classification system. Faceted classifications examine the subject for its different “homogenous subject fields” (Vickery, 1960, p. 9) which are subsequently ascribed with ‘facets’ (ibid.). Within these facets, further subdivisions can occur, which may take the form of hierarchical classifications.

Subject fields in games could include the mechanical system, sign system and materiality (cf. Chapter 3 in reference to Aarseth & Calleja, 2015). Inside of these we could place facets such as space, time or goals (mechanical system); objects or devices (material); and objects, device or software (materiality). These facets are further filled with terms (one dimension, two dimensions, three dimensions, etc.). Inside the facets, the terms can be organized hierarchically again. The facet ‘device’, for example, could be filled with PlayStation and each individual unit (PlayStation 1, 2, etc.), and their individual versions could be organized hierarchically underneath this term. Thus, the idea behind the faceted classifications is to not describe subjects in their genus – species relationships, but by adding the facets to the subjects. In game studies, a deliberately faceted approach was used by Lee *et al*. (2014) to classify game genres (which should not be confused with the classification of games).

In library classification, a common distinction is made between *general* and *special* classifications (especially Sayers (1943a, p. 22), but also Farradane (1961, p. 127), Phillips (1963, p. 10) and Vickery (1960, p. 7)). General classifications are developed to encompass all of human knowledge, while special classifications are only concerned with specific subjects, such as chemistry, optics, or law (Sayers, 1943, p. 22). This results in general classifications being composed of many special classifications (ibid.). The amalgamation of special classifications into a general one is contested, and deemed impossible by some authors (Farradane, 1961). According to Farradane, one of the fallacies of hierarchical classifications is that subdivisions are based on differing criteria. Each division of objects should be distinguished on the basis of the same criterion, to ensure a horizontal consistency of the classification. If one takes special classifications and simply merges them into one bigger classification, two mistakes are prone to occur: (1) the levels of the merged classifications may not align, and criteria for division may differ in one specific subdivision; (2) a term may appear in more than one subdivision of the merged-classification, as it may be part of several special classifications. Such mistakes (also called “cross classification” (e.g. Farradane, 1961, p. 124)) must be avoided in a good classification. Due to (2), Farradane argues that only the “exclusively ‘special’ core of each component *may* be usable” (ibid.). For other more peripheral objects, he suggests creating separate schedules, in order to avoid the aforementioned problems.

The distinction between *general* and *special* classifications can be transferred into game studies as the distinction between a general classification of games and classifications of specific parts of games. General classifications (ontologies) of games include, for example, Elverdam & Aarseth’s game classification (2007) and Zagal *et al.*’s “Game Ontology Project” (2005). Special classifications include Mueller *et al.*’s classification of exertion games (2008), Aarseth’s classification of quests (2005), or the typology for navigation in games (Debus, 2016). In librarians’ terms, my Unifying Game Ontology delivers a first set special classifications for games, constructed through critical analysis and synthesis and grouped under carefully identified main classes.

Classification schedules can be based on different kinds of criteria of the classified object. Sayers describes a dichotomy of *natural* and *artificial* classifications (1944, pp. 56–57). A *natural* classification relies on properties inherent to the classified object, while *artificial* classifications rely on external attributes, which are *accidents*, and not necessarily connected to the classified object. If I were to order (classify) a group of pens on our desk, their date of acquisition or last use are accidents, and a classification based on these attributes would be considered an artificial classification. Their size and color, on the other hand, are criteria for a natural classification, as they are inherent properties of the pens. In the case of ontologies, the classificationist must carefully examine the criteria for division, avoiding the creation of an artificial classification. This might be useful for special purposes, as most classifications are, but would not satisfactorily answer the questions that are paramount to ontological enquiries, such as 'What is there?' and 'What are its most general features?' (Hofweber, 2014).

The Unifying Game Ontology will constitute a faceted classification of game elements. As the UGO's goal is to synthesize existing ontological works into one model, choosing a faceted classification has several advantages.

First, as Farradane (1961, p. 124) pointed out, combining special classifications into one schedule without further analysis and changes leads to incoherent division. This is mainly a problem within hierarchical classification schedules that divide subjects into trees. In these trees, one level of division comes *necessarily* before its levels of subdivision, which is why the direct adoption of special classifications is usually not possible. A faceted classification scheme offers the possibility of adding new facets that represent a different perspective on the subject field, without the rearrangement and alteration of the complete classification scheme.

Second, according to Vickery, classic "enumerative tree-of-knowledge classification is being superseded" (1960, p. 8), as contemporary subjects are compound subjects and "[…] can only be accurately designated by subject headings which combine two or more terms" (ibid.). In other words, a hierarchical classification of knowledge is insufficient, as the same subject areas are of interest to many fields with different perspectives. This is a development within the area of game studies as well, due to the diverse backgrounds of researchers and multifaceted nature of the game concept (see Aarseth, 2001b; Melcer *et al.*, 2015; see also Chapter 2). It appears necessary to develop a system that researchers can use according to their own interests and perspectives. A faceted classification scheme provides this through the employment of different facets that cover each element and perspective, but that do not have to be applied holistically.

4.1.2 Identification of Game Elements

The purpose of the following analysis of game classification is described by Vickery: “The essence of facet analysis is the sorting of terms in a given field of knowledge into homogenous, mutually exclusive facets, each derived from the parent universe by a single characteristic of division” (1960, p. 12). To identify these facets of the parent universe ‘games’ is the goal of this analysis. Thus, what are frequently called ‘game elements’ in this project are, in fact, the highest-level facets of games.

My aim is to examine existing game classifications in order to identify the commonly used criteria for classification. My premise is that each classification relies on a certain set of criteria, and that these criteria are elements of games. If they are not, they will be dropped from my classification as arbitrary classification criteria, or non-elements. Briefly returning to the example of ordering pens, I could order them by color, size, or filling capacity. I could also sort them by date acquired, last time used or an aesthetic value judgment. The latter criteria are arbitrary attributes of the objects and would not be included, whereas the former criteria are intrinsic elements of the pens and would be included. Ergo, the criteria for classification are elements of the classified object.

A good classification is based on differences that are inherent to the subject of classification (Sayers, 1944, pp. 56–57). In other words, good classifications are natural classifications, which are not based on accidents, but inherent properties of the subject or object. While this implies a certain level of essentialism, for the current project it means that only those differences that are part of the formal game system, as described in Chapter 3, will be considered.

For now, I will assume that every game classification is a natural classification. It follows that the differences employed by the classifications are inherent properties of games in general, not arbitrarily chosen properties external to games. To identify game elements, this chapter adheres to the argument of employed differences as essential properties of games to a certain extent.

By combining these two arguments – *characteristics* as inherent properties of games, and games being similar on the basis of family resemblances – I can conclude that game classifications can be based on inherent properties of games, and if I were to examine and list all of them, I could make a list of areas of family resemblances (cf. Wittgenstein, 1958), or *game elements*. However, it is obvious that not all game classifications are automatically natural classifications relating to this project's particular focus, just as it is obvious that not all games necessarily contain these elements, as we observed through Wittgenstein's family resemblances (1958). It is therefore necessary to examine the derived elements of games on two levels. First, properties that are external to games in any sense must be removed. Second, only those elements that fall into the specific scope of this project should be further considered. As the second limitation is the narrower one (to cover only a subset of those phenomena that are considered games), it will be sufficient to apply only this one.

In conclusion, good classifications are based on differences – inherent properties of the objects – and the abstraction of these differences produces a list of inherent elements, which I consider the areas in which family resemblances function. I refer to these characteristics as game elements. Before delving into this abstraction, I will give a brief overview of the examined game classifications. This serves two purposes: it will introduce the existing literature to readers who are less familiar with game studies or game ontology. Second, it will serve as a reference if any specific abstraction is in question. The following sub-section is purely descriptive and, if the reader wishes, can be skipped entirely without detriment to the understanding of the Unifying Game Ontology project.

Finally, it must be stated that my approach brings one limitation with it. It is highly unlikely that the existing literature on game classifications covers all elements of games. The sample might be biased towards our cultural perception of what a game is, possibly resulting in a homogenous or limited set of elements, instead of one consisting of all the nuances present in games. However, this only means that my classification must be considered a “typontology” (Karhulahti, 2015a, p. 6), designed and intended to be extended with further research. In this case, future research could explore those elements of games that were not covered by existing literature. The Unifying Game Ontology will serve as a clear starting point to identify such new elements.

I have described existing literature on classifications and its implications for the current project. I have shown that the adoption of a faceted classification scheme is beneficial as it enables easier synthesis and the addition of special classifications with particular foci. Similarly, by adopting a faceted classification scheme one can focus on only those facets that are of interest to a given project.

4.1.3 Types of Game Classifications

Classifications of games can be categorized as either pre-digital or post-digital. Not every game classification in history falls directly into one or the other, but the groups help to identify and discuss particular differences between the classifications over time. An alternative way to distinguish game classifications could be to cluster them according to the games used for their creation, or analog versus digital game classifications. This would pose the problem that most authors do not explicitly state such a basis for their classifications. The categories of pre- and post-digital games are not connected to specific years, as the evolution from analog to digital was a fluid process over the course of several decades. In this study, game classification literature from after the 1980s will be considered post-digital. This enables some observations regarding these loosely defined groups after the following analysis.

There are generally two types of game classifications: games arranged in corpora, and classification systems. The first type includes ad-hoc classifications made for the purpose of organizing a set of games into some structure, such as classifications made with the structure of a book in mind (e.g. Culin, 1907; H. J. R. Murray, 1951). People's *Steam* library categories are corpora of games arranged in a classification made for a practical purpose. Similarly, the organization of board games by hobbyists, who discuss and upload pictures of the games on their shelves online (so called "Shelfies" (Rogerson, Gibbs, & Smith, 2017)), use this ad-hoc classification system.

The second type includes classifications that are deliberately constructed for the classification of games. These usually aim at a classification of games in general, not a particular set of games. They might, however, aim at the classification of a particular type of game, such as videogames. The difference between the first and second type is that the second type is not aimed at any particular set of games; instead, the classification system itself is the final product. Examples of such systems are Elverdam and Aarseth's (2007) or Klabbers' (2003) classification systems. The advantage of such systems for the present study is that they explicitly state and describe the criteria for classification in each of the categories. In other words, the *differences* employed are clearly laid out.

While the first type of classification as corpora always describes what characteristics and differences the classification is based upon, they may be implicit and need to be identified, explicated and formalized. Murray's category of *war games*, for example, is a term that does not deliver any direct criteria. However, he further describes why and how these games are similar: "These games are normally played by two persons who, as Groos remarked, appear as leaders of opposing forces and originators of strategic operations" (H. J. R. Murray, 1951, p. 53). In this case, as with many others, the analysis is not a matter of identifying the elements, but rather of disentangling them: war games are distinguished from other games by a *competitive player relationship* (opposing forces) between *two players* (two persons), who are *controlling entities or objects* (leaders and originators of strategic operations) within the game. This will be done during the analysis of game classification, as discussed in the previous section. Prior to the analysis, however, I will first describe the classifications.

4.2 The Classifications

According to Mueller *et al*. (2008), we lack the tools needed to understand and analyze existing 'exertion games', preventing a theoretical foundation to guide future designs. To fill this gap, the authors developed a taxonomy of exertion games.[44] Their hierarchically represented taxonomy is made up of four levels.

Mueller *et al*. distinguish exertion games from other games, defining them as games that are connected to the fatiguing movement of muscles and the skeleton, which is connected through an input mechanism that is "exhausting and [requires] intense physical effort" (Mueller *et al*., 2008 in reference to Mueller, Agamanolis, & Picard, 2003). Also, the goal of exertion games is only reachable through "gross motor competency" (Mueller *et al*., 2008). Overall, their definition can be colloquially understood as a game that involves the physical tasks of sports but uses some technological mediator.

The following levels differ based on several components. The first is 'competitiveness', or whether or not the player has an opponent in the game. The second includes parallel situations, where players compete indirectly (such as doing push-ups), and non-parallel situations, where players must

[44] The terms taxonomy, typology and classification are used synonymously in present studies. Instead of discussing and comparing each use of the terms according to the previously developed framework that drew from library studies, in this chapter the terms will simply be used as in the original studies.

overcome their opponents directly. The third is the nature of the competition, such as direct combat or an attempt to control an object.

Through a review of literature on drinking games, Borsari (2004) identified six categories in which drinking games fall: *Motor skill* games, in which the players perform a physical task (e.g. tossing a coin in a cup); *Verbal skill* games, in which players perform a verbal task (e.g. performing jawbreakers); *Gambling* games, which are based on chance and use dice or cards; *Media* games, in which participants drink to a certain cue in a media product (e.g. the 'But um' game in *How I Met Your Mother* (Bays & Thomas, 2005 - 2014);[45] *Team* games, in which two or more teams compete against each other (e.g. Beer Pong); and *Consumption* games, which do not consist of many rules and are mostly intended to get people drunk quickly (e.g. chugging beers against each other).

LaBrie *et al*. (2013) developed five new categories of drinking games inspired by Borsari (2004). Their aim was to expand on the analyses of drinking game behavior and their potentially dangerous outcomes. In a large-scale study with 3,421 participants, they identified and confirmed 100 drinking game descriptions, and grouped them into these five categories:

(1) Targeted and Skill Games: This game type has a single loser (of 3 or more, no teams) who has to drink or a winner who sets to pick who drinks. These games usually involve some sort of skill or strategy to avoid personal drinking or target certain players to make them drink.
(2) Communal Games: This game type has no official winner or losers. Everyone participates simultaneously following an agreed upon set of rules that dictate how much and when they will drink. All players drink in response to an agreed upon action, phrase, event, etc.
(3) Chance Games: This game type involves no (or very little) skill or strategy and each person drinks in turn. Often these games involve the rolling of dice, guessing or playing card values, or randomly drawing cards to see what action you or others must complete.

[45] In episode 13 of season 5 the main characters play a game in which they have to drink every time the host of a TV show says 'but um'.

(4) Extreme Consumption Games: This type of game involves extreme isolated chugging episodes. Typically one or more standard drinks. Rules (if there are any) are simple and rarely progress beyond drinking a lot, drinking fast, or finishing your drink.

(5) Even Competition Games: This game type is defined by one versus one or team versus team competition where the losing side must drink as punishment. The winner(s) do not have to drink.

(LaBrie *et al*., 2013, p. 2135)

Through interviews with students, Polizzotto *et al*. (2007) developed a classification of drinking games based on two dimensions: *Competitive* versus *non-competitive* games, and *skill-based* versus *chance-based* games.

Aarseth *et al*. (2003) sought to establish a classification for games that occur in some sort of virtual environment. In their top-level division they identify the five classes space, time, player structure, control and rules. Except for player structure, all of the classes have three sub-classes, which are further divided into two or three types.

They consider space as a “key meta-category of games” (2003, p. 49). This division has three sub-classes. The *perspective* can be omnipresent, in which players can see and examine the whole map, area or vagrant, which requires the players to explore the map incrementally, as the perspective is tied to the avatar. Here, Aarseth *et al*. also mention the more common use of first-person, third-person and isomorphic perspectives. They also state the *topography* can be either geometrical, allowing the players continuous movement through the gameworld, or topological, which offers only discrete areas to be located in and moved through. The third sub-class distinguishes the *environment* as either dynamic, which allows the players to manipulate and change the environment during the act of play, or static, in which case the environment is unchangeable and remains the same.

According to Aarseth *et al*., a (video-) game time's *pace* can be turn-based, in which the play occurs in discrete chunks of time and players may take turns, or real-time, in which the players act continuously and simultaneously. They further classify the game time's *representation* as either mimetic or arbitrary. In mimetic game time the game imitates the flow of time as it might occur in the real world, whereas arbitrary game time is disconnected from any 'real' occurrence or perception of time. For example, buildings and heavy weaponry may be built in seconds. Finally, a game's *teleology* can be finite or infinite. Simply put, this sub-domain examines whether the game has a clearly defined ending or not.

The *control* class distinguishes between *mutability*, *savability*, and *determinism*. *Mutability* refers to the possibility of (positively) changing the player-character's state in the game. This can either be non-existent (*static*), *temporary* (powerups) or *permanent* (experience-leveling). *Savability* refers to the option of saving the game state. This can, again, be non-existent (*non-saving*), but, if existent, can depend on certain places or occurrences (*conditional*), or be available to the player at free will (*unlimited*). *Determinism* refers to whether a given situation in the game will always result in the same outcome, through application of the same input, or whether there are elements in the game that are randomized or outside of the player's control.

The "most central element of games" (Aarseth *et al*., 2003, p. 53) - rules - has three sub-classes, classified as *topological rules*, *time-based rules*, and *objective-based rules*. Topological rules refer to rules that are only present in a specific location within the gameworld. Time-based rules describe whether the mere passing of time has influence on the achievement of an objective. A game contains objective-based rules if its progression is tied to a specific condition, such as killing an opponent, delivering an item or conquering a region.

Aarseth *et al*.'s *player structure*, with the subcategories *single player*, *two player*, *multiplayer*, *single team*, *two team*, and *multiteam*, enables us to describe the relationship between players, as well as an approximate number of them (a multiteam game should have at least three players).

As Elverdam and Aarseth's (2007) typology is built upon the earlier work of Aarseth *et al*. (2003), the following summary will focus mainly on their additions and alterations.

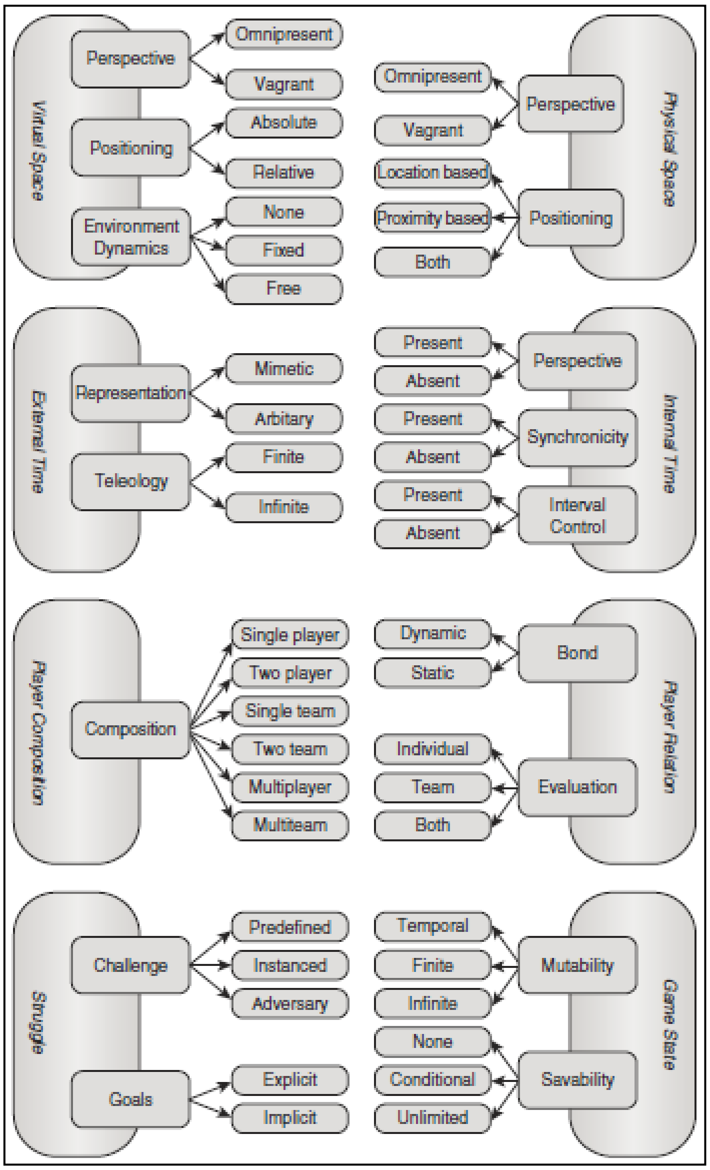

Figure 4: Elverdam and Aarseth's Typology (2007, p. 21).

The new typology split space into the metacategories *physical* and *virtual space*. Although some terms are different, the virtual space remains largely the same as in the previous typology. The greatest difference is that instead of describing the topography in a sub-class, Elverdam and Aarseth changed their perspective to how a player might describe their position in a game, in either an *absolute* (e.g. numerical) or a *relative position* to other entities or objects in the game. In physical space the dimension *perspective* remains the same, while the positioning changes. The positioning in physical space can be either *proximity based* (which was called 'relative' in virtual space), or *location based* (for example, where it is required to stay in a certain field), or *both*.

Similar to space, the game time was split into the *internal* game time and the *external* game time. The external time describes the game's relation to real time and contains the previous categories of *representation* and *teleology*. The internal time is divided into the presence or absence of *haste*, *synchronicity*, and *interval control*. *Haste* describes whether the mere passing of real time influences the game state (similar to the earlier time-based rules). The presence of *synchronicity* was expressed previously in *pace* as "real-time" (Aarseth *et al*., 2003) and describes whether players are able to act simultaneously, and *interval control* describes whether players proceed to the next game interval by choice (*present*), or automatically (*absent*).

The metacategory *player composition* remains largely unchanged, and simply describes the composition of players and teams in six categories. What Elverdam and Aarseth (2007) added is the metacategory *player relation*. In the facet *bond*, the player composition can either change (*dynamic*) or remain the same (*static*) during play. At the end of the game, these player compositions are then *evaluated* either individually, as a team or both, where the evaluation is based on team as well as individual scores.

The metacategory *struggle* is divided into two facets: *challenge* and *goals*. A game can, according to Elverdam and Aarseth, have challenges, which are exactly the same during each playthrough (*identical*), built into a space of possibilities but only randomized to a certain degree (*instances*), or come from the interaction of autonomous agents (*agent*), making the challenges less to nearly un-predictable. *Goals* are described as either relative to the performance of other players (*relative*) or prescribed by a particular game state that is the same every time (*absolute*).

Finally, Elverdam and Aarseth include the categories of *mutability* and *savability* in their *game state* metacategory. Mutability, again, describes the temporal nature of state-changing effects and can be temporal, finite or infinite. *Savability* was also adopted into the new typology, describing the opportunities to save the game as either *unlimited*, *conditional* or non-existent (*none*).

The German cultural essayist Jünger (1959) defined three overall categories of games: Chance (*Zufall*),[46] Dexterity (*GeschicklichkeitI*), and Imitation and 'Pre-mitation' (*Ahmung*). Interestingly, Jünger argues that a subdivision of chance games into classes based on tools, toys or materiality is impossible, as it would simply result in an enumeration of an infinite list of things (1959, p. 20). According to him, subdivisions of chance games should distinguish between those that require some additional skill or dexterity, and those that are purely chance based. Games of dexterity can be of physical (*körperlich*) or mental (*geistig*) dexterity. A word of clarification is needed for games of imitation and pre-mitation. 'Imitation' is the translation of the German word 'Nachahmung', which is the act of using someone or something as a model for one's own behavior. 'Pre-mitation' is a makeshift translation for the word 'Vorahmung', which Jünger refers to as the act of playing something that in the future will not be considered play anymore, such as household chores or shopping. Another difference he outlines between the two games is immediacy: Is the person using their own body to imitate or pre-mitate something, or are they imitating or pre-mitating something or someone *with something*, such as a doll? He further discusses several versions of these classes, such as puppet play, theatric play (*Schauspiel*), dance, music, or German sayings such as to show off (*sich aufspielen*)[47].

Caillois's (1961) distinction between *ludus* and *paidia*, as well as between *Agon*, *Mimicry*, *Alea* and *Ilinx*, is aimed towards play, rather than games. I include it here for exactly this reason, in order to infuse the Unifying Game Ontology with a perspective on the closely related topic of play. Briefly,

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[46] The term *Zufall* could also be translated to 'luck'. However, as I will discuss in Section 5.8, luck can be understood as a concept referring to a perceived structure in the wins and losses of a particular person or a force that determines them. Here, Jünger does not refer to this concept, but chance or randomness instead.

[47] As mentioned previously, the German word for play is *Spiel*. This is why the German version of 'showing (oneself) off' is related to this topic: (sich) auf*spielen*.

ludus describes structured play, whereas paidia describes free form (or children's) play. Agon, Mimicry, Alea and Ilinx function on a different axis and describe competitive play, imitation, chance and vertigo, respectively.

Avedon and Sutton-Smith arrive at "four basic types of games" (Avedon & Sutton-Smith, 1979, p. 404). According to him, these basic types are "games of arbitrary power", "games of luck", "games of skill" and "games of strategy". He also states that strategy is not a game element per se, but is rather something external that players bring to the game.[48]

Card games were ordered in two overall classes by Parlett (2000). He mentions that "[…] cards are used for two types of activity: gambling games of chance, in which (basically) you bet on the identity of a card or cards seen only from the back; and games of varying degrees of skill in which you manipulate them in such a way as to win cards from your opponents, or form them into matched sets, or pursue whatever other objective human ingenuity may device" (2000, p. XIII). However, his main distinction is made between card games that rely on trick taking and those that do not. Trick taking games are then further divided by their different objectives: Those which are won by taking as many tricks as possible, or by bidding, and those which are won by obtaining point scoring cards, which are contained in tricks. There are more types of non-trick taking games than trick taking games, as this class has eight sub-classes, as opposed to the aforementioned two:

- Card-taking games, in which players gain cards
- Adding up games, in which players aim at or avoid certain totals
- Shedding games, in which players try to dispose of their cards as fast as possible
- Collection games, in which players try to collect sets of matched cards
- Ordering games, in which players must order a shuffled deck

[48] This is similar to particular versions of the concept of 'metagames' (see Debus, 2017).

- Vying games, in which players vie about which player holds or finishes with the strongest hand
- Banking games, which include gambling games, but only those that can be conveniently played at home
- Original card games, which are a selection of Parlett's own inventions of card games

One of the most extensive classifications of games was developed by Murray in his book *A History of Board Games Other Than Chess* (1951). This classification, similar to Parlett's (2000), grew out of the necessity to arrange a set of games (board games) in a structure that would make then more easily accessible in the form of a book. His position is that board games resemble early activities and occupations of man (1951, p. 5). His five classes are *games of alignment and configuration*, *war games*, *hunt games*, *race games* and *mancala games*. The subdivisions of these are idiosyncratic to each class. Games of alignment and configuration are divided into the sub-classes *three-in-a-row games*, *five-in-a-row games* and *games of configuration*, by the difference of their objective. War games have four major subclasses, *battle games* (which are further divided by types of capture and moves that are employed), *struggle for territory*, *blockade games*, and *clearance games*. Hunt games are divided by their boards into *alquerque*, *enlarged Alquerque*, *older forms of Fox and Geese*, *modern games of Fox and Geese*, *leopard games* (triangular boards), and *tiger games*. Race games' subdivisions are *games of the old world*, *games of the new world*, and *the Arabic astronomical game*. Mancala games are, similar to the difference in boards, divided by the number of rows into two, three and four row mancala games. There is more to be explored within in Murray's classification, such as the differences between battle games, but this description should suffice in order to understand the classes, subclasses and employed differences.

Culin (1907) finds differences within native North American games especially in their materials, arguably rooted in environmental influences. He first differentiates between games of chance and games of skill or dexterity. The subclasses of games of chance are guessing games and games in which objects are thrown to determine an outcome. This distinction, he argues, is based on whether the hazard in the game stems from an object (second class) or the players themselves (first class), where it is the players' fault if they fail, for example, to guess the correct amount of objects in someone's hand. The *object games* are then divided into subclasses by their method of counting (score is either kept with objects, passing from hand to hand, or on an external counting board). Guessing games are, at first, divided into subclasses by gameplay. In *stick games*, arrows or sticks are divided and the opponent has to guess where a specific stick is. The subdivision of stick games divides the objects in use (arrow shafts or flat discs). In *hand games*, the objective is to identify an unmarked object from a pair of two identical ones (bones, bundles of grass, etc.). The *four stick game* requires players to identify the relative position of sets of two within four objects. In the "hidden ball game" small objects (balls) are hidden under wooden cups or moccasins (subclasses). The games of dexterity are divided into archery, sliding javelin or darts, shooting at a moving target, ball games and racing games.

Raftopoulos *et al*. (2015) developed a taxonomy of company gamification. Due to the scope of this section, the description will focus on the parts of the classification that would commonly be considered game related, leaving out the "market elements" and most of the "technology elements" of the model. The interesting class in the technology elements is "games and simulations", which are further subdivided into *mobile*, *game platforms* and *web*. The metacategory *design elements* aims at what would commonly be referred to as the 'game system', and is thus of the most interest for the present endeavor. Its subdivisions *core gameplay* and *key mechanics* have the following subdivisions:

Core Gameplay:

1. Collection
2. Prediction
3. Survival
4. Puzzle/Problem-solving
5. Social/Role-play
6. Building
7. Territory acquisition
8. Racing
9. Trading
10. Destruction
11. Spatial navigation
12. Chasing or evading

Key Mechanics:

1. Status, success, recognition
2. Points
3. Social (friend, connect, chat)
4. Experiences
5. Missions & quests
6. Currency, rewards
7. Achievements
8. Leaderboards
9. Progression
10. Narrative

Hinske *et al*. (2007) examine pervasive games and what they are made of. To do so, they introduce a classification of different versions of reality and their structural relation to game elements. Their aim is to be able to examine how different kinds of reality (physical, mixed, virtual) can realize experiences of game elements (physical, mental/intellectual, social, immersion). So, these first three terms are types of realities, while the latter four are game elements or dimensions.

Drawing from game studies and semiotic theory (of gaming) Klabbers (2003) developed a taxonomy of games and simulations on a three-by-three grid. The grid is based on identified “building blocks” of games (actors, rules, and resources) and semiotic theory (syntax, semiotics, and pragmatics). Through this combination, he is able to describe, locate and discuss a multitude of game aspects, including, but not limited to, players and their roles and types of steering; game positions, their evaluation and allocation and the team of facilitators (referees); and the set of pieces, their meaning as resources and instructional material.

Bell (1969), in need of some structure to organize his book about board games, arrived at six chapters with zero to six sub-chapters. Most of the subdivisions are based on the used item or the board game's topology. The subdivision of *race games* consists of five classes: *cross and circle race games*, *spiral race games*, *square board race games*, *peg scoring boards*, and the *backgammon group*. Similarly, *war games* consist of six classes: The *Alquerque group*, *chess group*, *draughts*, *TAFL group* (asymmetrical games), *Latrunculorum group* (war games with the custodian method of capturing)[49], and *running-fighting games*. Another class with six sub-classes are *positional games*, which are subdivided into *morris games*, *three-in-a-row games*, *five-in-a-row games*, *replacement games*, *territorial possession* and *patience games*. Mancala games are divided by their number of rows into *two* and *four rank* mancala games. Bell describes four types of dice within the class of dice games: *two-sided dice*, *six-sided dice*, *special dice* and *Chinese dice*.[50] Domino games have no further subdivision.

Pias' book *Computer Spiel Welten* (2004) includes a division of games (or, rather, chapters) which is specifically "not a game classification", but aims at "Gegenstandsgruppen oder Äusserungsmengen" (Pias, 2004, p. 4; in reference to Foucault). In other words, he tries to cluster certain kinds of games in a way that they correspond to similar phenomena outside of games. With this approach, he adapts widely accepted game genres of *action*, *adventure* and *strategy*. According to Pias, these genres are not divided by inherent attributes or elements, but by the input that the game requires from the player. Action games require time critical input ('press button at the right time'), adventure

[49] The games usually consist of two phases: In the first phase the pieces are set up, and in the second they fight for supremacy (R. C. Bell, 1969, p. 82), typically through removal of opponent pieces.
[50] Chinese dice have six sides, with partially special coloring. The numbers are arranged in a way that numbers on opposite sides add up to seven.

games are based on the decision sensitive navigation and decision making of the player, and strategy games are sensitive towards the configuration they require from the player.

4.3 Exemplary Analysis of Game Classification

After developing the framework for analysis through library studies and the description of the examined game classifications, this section will exemplarily apply the framework to some of the described classifications. The sample is based on the broadest possible range of abstracted characteristics, while minimizing the classifications to a necessary amount. The analysis was conducted on all classifications; however, the following description shall suffice, as my goal is not a quantification of employed differences. Consequently, it is not important how each individual element was abstracted in each instance, only that and how it was identified once across the classifications.

The purpose of this analysis is not to demonstrate how previous classifications have failed. After all, most of the classifications were built for a specific purpose, with a certain goal in mind, and surrounded by social and cultural particularities different from current ones. Many had the task of conveniently ordering games within a book structure (e.g. Culin, 1907; Murray, 1952; Parlett, 2000); others were more interested in games, play, culture and their interwoven relationships (e.g. Avedon & Sutton-Smith, 1979; Caillois, 1961; Jünger, 1959). Additionally, the development of digital games has had a significant impact on our understanding of games in general. Classifications constructed before the emergence of digital games are unlikely to cover more complex, abstract or encompassing concepts as current ones. For example, classifications of board games might easily omit the distinction between physical and virtual space, as they are the same in classical board games. A distinction between the physically inhabited space and the more conceptual arrangement of it (virtually) is obvious to us in the digital age but was less apparent in the past. While each individual approach could be criticized for its shortcomings, my goal is to provide an overview and abstraction of the differences that were deemed interesting by previous studies, not criticize individual works. Ultimately, the aim of this chapter is to identify these employed differences that are considered game elements (cf. Section 4.1.2).

4.3.1 Murray: A history of Board Games Other Than Chess

The first game classification I will analyze is Murray's classification of board games (1951). The five top classes are *games of alinement and configuration*, *war games*, *hunt games*, *race games* and *mancala games*. Considering these five top classes as the classification's first division, no particular characteristic can be identified as the basis for the division. Instead, the categories are differentiated by several sets of attributes, different for each type of game and not consistent across the division. Games of *alinement and configuration* are a class identified by **mechanics** and **goals**,[51] whereas war games refer to an external theme, or what the game is supposed to represent. Just as *hunt* and *race* games, which resemble "early occupations of man" (1951, p. 5). Of course, these resemblances are based on a conflated interpretation of the game's rules, history and sign system. Thus, no single characteristic can be identified to distinguish one from the other based on their labels. The classes rely more on Murray's interpretative work than on the games' intrinsic properties. *Mancala games* refer to a very specific kind of (counting) game and are defined by one game's resemblance to a prototypical Mancala game. This means that while the first four categories are distinguished by some set of attributes or elements – rules, theme, history, etc. – *mancala games* are distinguished merely by their resemblance to one very specific game. To exemplify this resemblance with a prototypical game, I could create the group of *poker games*.

[51] The identified game elements will be emphasized in bold to enable a more convenient overview.

Some of Murray's classes' definitions also point towards inherent properties of the game systems they are clustering. In *race games*, for example, "[t]eams of equal size race one another along a given track, and the first player to complete the course with his team wins. Moves are controlled by the throws of dice or other implements of chance [...]" (1951, p. 5). Murray's term *race game* is again a cultural interpretation of the game's rules, and ultimately useless for the abstraction of differences. More important is the need to examine the definition of each class for their defining characteristics. In the case of *race games*, these are 'teams of equal size' (**players**, **player relation**), 'first player to complete wins' (**winning condition**),[52] and 'moves are controlled by chance' (**chance**).

Alinement and configuration encompass games in which ordering objects in a certain manner is the main goal. This group is identified by either the main task or **mechanic** (ordering, configuring), or the **goal** – or victory condition – of the game (reach a certain configuration). The subdivision of these games contains three classes: *Three-in-a-row* games, *five-in-a-row* games, and *games of configuration*. Here the goal of the game gains more depth, as the length of rows (three or five) describes the necessary adjacent pieces to achieve victory. According to Murray, the goal of games of configuration is to occupy the space that the opponent's pieces occupied at the start of the game. The abstracted characteristic of this subdivision is the game's specific **goal**.

War games are subdivided by their **goal** or **winning condition**. War games encompass *battle games*, which require the player to immobilize the opponent's men, *struggle for territory* games, which require the player to obtain control over a certain area, *blockade games*, in which the players need to immobilize the opponent's pieces without the mechanic of *capturing*, and *clearance games* in which the players aim for a large number of captures. Murray further subdivides battle games by type of

[52] For now, the terms 'goal' and 'winning/victory condition' will be used as one game element. However, while these terms are closely related and have been used interchangeably (Debus, Zagal, & Cardona-Rivera, n.d.; see also Section 5.7) they will be distinguished in Section 5.7.

capture (a mechanic to remove or capture tokens) and the way tokens can move on the board (a navigational act (cf. Debus, 2016)). These two characteristics are then the **goal** of the game (the first four-fold division) and two kinds of **mechanics** (its subdivision). Murray also adds two more classes in the first division of the classification: *war games* played with lots or dice, and those of which we have no certain knowledge. We can easily dismiss the latter, as knowing about a game is not one of its intrinsic properties. The former refers to a group of games distinguished by the inclusion of chance by adding lots or dice. This subdivision is based on the difference **chance**; Murray does not further distinguish between games played with lots and those with dice. In this case, I add **chance** to the list of differences, but not objects.

Hunt games are games "[…] played by two persons, one with many pieces and the other with not more than four pieces" (Murray, 1952, p. 98), meaning they are distinct from other games by their asymmetrical **player relation**. The division is based on the games' boards, such as the *Alquerque board*, the *enlarged Alquerque board*, or *leopard games*, the latter of which are played on triangular boards. Murray also mixes a holistic view of games such as *fox and geese*, as well as *tiger games*, which are arranged by the number of tokens (tigers).

It is important to note that the number of tigers refers to a difference in objects dissimilar to the difference of games played with sticks and those played with discs (Culin, 1907). One differentiates based on the number of objects used for play (Murray, 1952), the other on the particulars used (Culin, 1907, p. 227). Only Murray's difference is a valid part of the underlying formal system as the particular's material properties are irrelevant. Culin's distinction, on the other hand, is based on the particular materialization of the formal system's 'object position'. In his guessing games (Culin, 1907, p. 227), it is irrelevant whether one has to guess the number of discs or sticks. These items have no properties that are relevant for the underlying formal system.

The classification of **objects** remains, even though it describes material objects, because the formal game system needs to specify object positions with which players can interact. This means that the particular materializations of objects will be disregarded, but their formal existence with certain properties acknowledged. In other words, some formal systems describe object positions that fulfill certain functions and carry particular properties but can be materialized in different ways. Similarly, boards must be excluded from the current list as they constitute particular materializations of the game-specific. Instead, the classification of boards will be considered through their formal function: the arrangement of **space**. Thus, *Hunt games* contain differences of **space**, **objects** and **player relation**.

The class of *race games* has three subclasses. Two of these refer to the area in which the game was invented and played; the third refers to a specific set of games: *The Arabic astronomical game*. The differences here are of a clearly game extrinsic nature. The place where a game was created is not part of the game system or material, as any of them could have been invented in Russia, China, Israel, or even on the moon. For the game to function as a system, this feature does not make a difference. It is a coincidental feature of the game, an accident. The *Arabic astronomical game* refers to a class that is distinct from the others by identification of variations of a very specific game (e.g. the earlier example of a group of *poker games*). This class is of little further use, as it describes one kind of race games (which were already defined by player relation, goal and chance). From the subdivision of *race games*, I can thus not deduct any further difference for the present purpose.

The final top-level class describes *mancala games*. This label refers to a holistic view of a type of games based on their resemblance to one particular version of them. While mancala games are counting games, mancala is played on specific boards, with specific rules. The subdivision is based on the layout of the mancala boards, counting the rows of holes used for play. This subdivision adds **space**, due to the formal function of the boards, to the list of differences.

Taking into account the top-level classes, subdivisions and the removal of accidents in Murray's classification, I identifed six general characteristics used to create the classification: **Mechanics**, **outcome/goal/winning condition**, **(number of) players**, **player relation**, **chance** and **space**.

4.3.2 David Parlett: The Pengiun Encyclopedia of Card Games

Parlett's (2000) classification of card games is less extensive than Murray's. Parlett states that it distinguishes the games "according to their various methods of play" (2000, p. XVII). His first division is based on the characteristic of a mechanic: games that revolve around trick taking (winning discrete periods of play, such as rounds or turns; the winner is the 'taker' of the trick), and those that do not. This adds **mechanics** to the abstraction of game elements.

The subdivision of *trick taking games* distinguishes between *plain trick games* and *point trick games*. In the former, players try to win as many tricks as possible or bid, and in the latter they win by points, which are obtained by winning tricks. This describes a method of evaluation, which ultimately relates to the victory condition of the game: do you win by number of tricks or points? Thus, the abstracted characteristic here is **goals**.

He further distinguishes *non trick taking games* into eight categories: *card taking games* ('gain cards through non trick taking'), *adding up games* ('make or avoid certain totals'), *shedding games* ('dispose of your cards as soon as possible'), *collecting games* ('collect sets of matching cards'), *ordering games* ('order the shuffled deck'), *vying games* ('vie about who holds or finishes (with) the strongest hand'), *banking games* ('gambling games', limited to those which are playable at home), and *original card games* (Parlett's own creations). All of these subdivisions (except for *banking games* and *original card games*) are based on the characteristic of the game's **goal**. Goals are closely related to mechanics (Debus *et al*., n.d.). So, 'players vie about who holds or finishes (with) the strongest hand' can be interpreted as the act of vying itself (**mechanic**), and also as the goal of the game: the one who made the correct guess wins.

Banking games are described as "[…] a form of gambling in which one or more punters simultaneously play a two-handed game against a banker" (Parlett, 2000, p. 591). He describes that the punters' task is limited to deciding how much they want to lose, and the banker is usually at an advantage. Implicitly, Parlett employs the difference of **chance**, describing these games as gambling games. Furthermore, he explicitly utilizes the characteristics of **time** (simultaneously), and **player relation** (banker has advantage). As seen before, this 'class' of games is defined by several characteristics, which individually can appear in other games as well. In the abstraction of characteristics, I can add to the list **chance**, **time**, and **player relation**.

The final class of games, *original card games*, refers to the games that Parlett himself invented. The inventor of a game, however, is not an inherent characteristic of the game. Charlie Chaplin or I could just as well have invented these games. For its function as a system this feature does not make a difference and it must be considered an accident.

The characteristics that Parlett employs are: **goal**, **mechanic**, **chance**, **time**, and **player relation.** Aside from the category of his own, "original card games", Parlett's classification is not based on accidents.

4.3.3 Claus Pias: Computer Spiel Welten

Pias (2004) observes that the genres 'action', 'adventure' and 'strategy' require different inputs from the player, and structures his book accordingly. So, a possible additional element could be *type of input*. While this observation is interesting enough to be part of the analysis of game classifications, the element will be disregarded as an accident. The input a game requires is not an inherent element of the formal game system, but a consequence of different elements in the game. For example, the reason that action games require time sensitive input is that other entities in the game act at the same time as the player (e.g. Elverdam and Aarseth's "haste" and "challenge" dimensions (2007)) and potentially threaten the player's being in the gameworld.

A game such as *StarCraft II: Legacy of the Void* (Blizzard Entertainment, 2015), may be classified as a strategy game, following Pias' classification. However, in the electronic sport scene, professional players show finger dexterity on levels that enable them to execute 300 to 600 actions per minute. These actions are necessary for organizing their bases simultaneously and for micromanaging units on the battlefield. This micromanagement – rescuing near-to-death units with movements or escape abilities; healing units and using counter-abilities in short time frames – especially requires time sensitive input. In the end, *type of input* refers to an affordance the game has through other existing elements, such as time intervals and player relation, and the classification of games according to these criteria is unclear.

For this reason, it should not be considered an element in itself, but a result of a combination of other elements, and will be disregarded in the Unifying Game Ontology. Pias' approach to clustering games is interesting and unique, but for the abstraction of game elements through employed differences, his division is of no further use.

4.3.4 Hinske *et al.*: Classifying Pervasive Games

Hinske *et al*.'s (2007) first three-fold distinction (physical, mixed and virtual) can quickly be disregarded as a classification of realities, not game elements. More important for the present study is their four-fold classification of games as *physical*, *mental/intellectual*, *social*, and *immersion*.

Classifying games according to physical and mental tasks is rather common (e.g. Avedon & Sutton-Smith, 1979; LaBrie *et al*., 2013; Polizzotto *et al*., 2007). However, similar to Pias' observation about the input required from the game, the characteristic of whether a game poses a physical or mental task lies not in the game as a system but evolves from it. For example, it can be argued that Basketball is a physical game due to the struggle between two teams for points and the necessity to obtain the ball. The game occurs in real time, meaning that both teams act at the same time. On the other hand, in Connect Four, players take turns, giving them time to think about their moves, and mental capability becomes the dominant requirement to play. If the rules of Connect Four were changed so that both players acted simultaneously and placement of several tokens at a time was possible, it could be considered a physical game, in which the strategy to use tokens as quickly as possible leads to victory.

A similar argument applies to their dimensions *social* and *immersion*, or the potential of a game to be used in a social context, as well as its potential to serve as a tool for immersion. These possibilities arise from the game, but are not inherent parts of the system. Ermi and Mäyrä (2005), for example, "[…] approach immersion as one of the key components of the gameplay *experience* and analyze its different aspects" (Ermi & Mäyrä, 2005; emphasis added). To consider the "sensation of being surrounded by a completely other reality" (J. H. Murray, 1997, p. 98) a component of the *experience of play* is comprehensible. However, this experience is not part of the game as a formal system but a result of its properties within the player as the operator.

Thus, all four criteria for classifying games in Hinske *et al*.'s model are considered accidents and will be dropped from the final set of characteristics employed as game elements.

4.3.5 Jünger: Die Spiele

Jünger's categorization is based on that, which is before the game, or where it has its origin (1959, pp. 13–14). He identifies three such origins: chance, dexterity and mimicry. The difference between chance and dexterity has been discussed: The requirement of dexterity is not based in the game system as a singular element, but results from the combination of elements, such as the lack of chance or particular combinations of mechanics and objects.

The category of mimetic games is more interesting, as this element for classification emerged from literature that examined *play* rather than games (Caillois, 1961; Jünger, 1959), and that was originally published in languages that distinguished less between the concepts of play and games. None of the more 'game' related classifications employed such a difference. The Merriam-Webster dictionary defines mimesis as "the action, practice, or art of mimicking". It is the act of representing something else, with, for example, one's own body. As this project is focused on the mechanical systems of games and their elements, representation was understood as a layer that can be added on top of these systems to produce meaning, give cues and lead the way for the player.[53] The mechanical system itself, though, is incapable of representing anything in itself (Aarseth, 2015; Möring, 2013, pp. 219–232). For a mechanical system to produce meaning it will always need a representational layer to point towards what is to be represented (ibid.).[54] Hence, as there can be no mimesis based on a mechanical system itself, the category is unimportant for the Unifying Game Ontology.

[53] This could lead us to a broader discussion of procedural rhetoric, as postulated by Bogost (2007), or Treanor and Mateas (e.g. 2009, 2013).

[54] As this chapter is focused on the analysis of game classifications, I omit a bigger argument revolving around 'procedural rhetoric'. Proceduralists essentially argue that processes (mechanics) are capable of conveying meaning, (e.g. Bogost, 2007; Treanor & Mateas, 2013). The counter arguments are based on the inherently free nature of play and meaning making (Sicart, 2011), the necessity of mechanics to be represented through a semiotic layer before interaction and interpretation is possible (Möring, 2013, p. 231) and the inherently abstract nature of mechanics (Aarseth, 2015).

4.3.6 Raftopoulos *et al.*: How Enterprises Play

This classification provides a better understanding of how enterprises incorporate gamification into their structures. Many of Raftopoulos *et al.*'s dimensions can easily be dismissed, as they classify the purpose, audience, type of enterprise or product modifications. I am interested in the "games and simulations" dimension within the class "technology elements", as well as the "core gameplay" and "key mechanics" classes within the "design elements" category (Raftopoulos *et al.*, 2015, pp. 8–12). Within the metacategory "technology elements", the authors describe the subdivision of "games and simulation", stating

> "[…] organizations that self-reported gamification projects included games, serious games, simulations, and playful experiences – technologies that have been excluded from formal definitions of gamification (Deterding, Dixon, Khaled, & Nacke, 2011; Huotari & Hamari, 2012). A close inspection of the games labelled as gamification indicates that at one time they may have been called advergaming, edugaming or training games, which are technically in the domain of serious games"
>
> (Raftopoulos *et al.*, 2015, p. 10)

While initially relying on literature demarcating games, serious games, simulations and gamification, their final category of "games and simulation" includes all of these phenomena. This means that distinguishing games and simulations from "enterprise", "product modification" and "playful experiences" based on a single difference is not possible. One of their sources, for example, examines definitions of games and finds eight criteria for gameness, on two different levels of abstraction and split in systemic and experiential conditions (Huotari & Hamari, 2012, p. 18). As Raftopoulos *et al.*

only state that their taxonomy was "inspired" by previous literature, it is unclear which of these (and other) factors they used for delineation.

I will discuss the subdivision of games and simulations into "mobile", "game platforms" and "web", in a graphic (Raftopoulos et al., 2015, p. 9).[55] This indicates a possible subdivision of games by the device on which they are run. However, devices are merely the material tools on which game systems can be individuated, and will be disregarded similar to the material aspects of objects and boards earlier. The authors' classification of design elements into "core gameplay" and "key mechanics", while certainly under-defined, may be useful in the later classification of **mechanics.**

4.3.7 Elverdam & Aarseth: Game Classification and Game Design

The typology by Elverdam and Aarseth (2007) expands on an earlier version by Aarseth *et al*. (2003). It falls under the category of explicit systems for classification, opposed to the 'classification of corpora', which means their criteria for classification are openly described. In the following paragraphs, I will briefly describe the reasons for the inclusion or exclusion of particular employed differences.

First, all of the authors' eight metacategories are included on some level in the later classification. Some of them will be subsumed under the same label, such as 'physical space' and 'virtual space' under 'space'. Both categories are distinguished from the other metacategories as they describe space. 'Virtual' and 'physical' are additional properties that distinguish the two categories from each other. However, this distinction is technically employing a possible difference for a subdivision of the space element on the first level. The metacategories describing internal and external time, and player composition and relation will be subsumed in a similar manner. Generally speaking,

[55] I emphasize this here as the authors do not further explicate this division.

the subdivisions within the metacategories are not differences for game elements, but facets of them. In other words, if considered part of the formal system, the subdivisions within Elverdam and Aarseth's typology will be considered facets of game elements in the later classification, not elements as such.

I will begin with the metacategories of virtual and physical space, separated from the others by **space**. The distinction between virtual and physical was already dismissed as a classification of realities, not game elements (see Chapter 4.3.4 '*Hinske et al.*'). Moreover, in the particular case of Elverdam and Aarseth's typology, the distinction is unnecessary from a game element perspective, as both *should* contain the same subdivisions, as their only difference is the additional subdivision of virtual space by '*Environment Dynamics*', or the possibility to alter game space. This subdivision must also be included in a classification of physical space (if using their system), as some physical games require the alteration of real space as well (e.g. Curling). Hence, virtual and physical space are identical for the underlying formal system and their classification should only be considered in terms of material aspects of games.

Both spatial metacategories contain the sub-domains 'perspective' and 'positioning'. Perspective describes the players' view onto the game space and whether they are able to see the whole game area at once (*omnipresent*) or must move and explore the area (*vagrant*). The only difference between virtual and physical space is that in virtual space an avatar is moved around, while the players move themselves in physical space. From a formal game system perspective, it makes no difference whether the players move themselves or their representation in the gameworld. Their physical bodies have the same role in the physical world as their avatars in the virtual world. The difference employed in perspective ultimately refers to a property of the player, not the formal game system. As such, the system organizes space in a particular way and puts player-positions into it; how the system is represented and viewed by the player is a representational, not ludic, property. Thusly, the dimension of positioning employs the difference **space** only.

Whether something within the game space is alterable or not can be considered a property of the formal system, and the distinction between *free*, *fixed* and *no* dynamics will be taken into further consideration in the later classification of game elements. As environment dynamics is a sub-dimension in the original typology, as well as a subdivision of either space, the gameworld or certain mechanics, it will not be placed on the element level but remain for sub-levels.

The next two metacategories are external and internal time, where **time** separates them from the other six metacategories. 'External time' describes how the game's time connects to time outside of the game. The dimension 'representation' describes whether time is represented in such a way that it resembles the passing of time in our physical world (mimetic) or not (arbitrary). Thus, this distinction can be dismissed, as it is clearly a representational property and not a formal systemic one. Teleology describes whether the game ends at a specified time or goes on indefinitely. In other words, it describes whether the game has a temporal end condition or not. This distinction will also be considered a subdivision.

Internal time contains the dimensions *haste*, *synchronicity* and *interval control*. All of these dimensions and their subdivisions will be included in a subdivision of the later classification. They separate game systems with and without time-based rules and separate the regulation of simultaneous and non-simultaneous actions.

The two player metacategories describe the operator's position, making **player** and **player relation** their distinguishing factor. *Player composition* lists six different constellations of players: *single player*, *single team*, *two player*, *two team*, *multiplayer* and *multiteam.* The *player relation* metacategory has two dimensions, *bond* and *evaluation*, respectively describing whether the relation between players can change, and how they are evaluated in the end. As player position was considered an aspect of the formal system, which describes the operator's roles, all of these dimensions will be considered in subdivisions of an element in the later typology. The dimension *bond* differentiates between dynamic and static relationships among players. The possibility of change of types of elements is not a property particular to the dimension of player relation and will thus be discussed in a dimension that will later be called 'unattached facets' (Section 5.2), as well as through the mechanic 'change of element' (Section 5.3.3).

The metacategory *struggle* discusses two related yet different dimensions of games. Elverdam and Aarseth describe the dimension *challenge* as whether and to what extent the event of a given playthrough will be similar to a previous playthrough. The *challenge* dimension will be disregarded here, as these challenges are, like previous dimensions, compound elements that result from the particular arrangement of other, more formal elements. For example, 'Agent-created' challenges require a particular player composition and relation, 'identical' challenges are simply a lack of indeterminism, and 'instances' of challenges are created through the addition of randomness. The difference between 'absolute' and 'relative' goals will be included in the element of **goals**.

Finally, Elverdam and Aarseth use *game state* as their last metacategory. It contains three types of mutability of games states by agents and three types of savability. The three types of mutability are *temporal*, *finite* and *infinite* changes to a given state. These are, once again, not elements in themselves, but types of other elements. The authors use eating pills in Pac-Man as an example for a temporal mutation. This means that mutability is applicable to many other things as well, such as the change in the dimension of environment dynamics. Mutability will thus be included in more broadly applicable concepts, the 'unattached facets'. **Savability** describes the possibility to save and retrieve a given game state, and will be considered part of the formal system of games.

In the end, Elverdam and Aarseth's typology has added four differences, and with them the elements **space**, **time**, **player(s)**, **savability** and **goals**. Several sub-differences were identified that will be used to classify the identified elements further (i.e. player relation and composition, mutability, virtuality and physicality, temporal end conditions, types of challenges).

4.3.8 Results of the Analysis

The goal of this chapter is to identify a set of elements that formal game systems are made of. As shown earlier, classifications employ differences on subjects that are inherent to the subject (if it is a good classification), and we can abstract such elements from existing game classifications (Section 4.1.2). This set of elements will later serve as a basis for the Unifying Game Ontology. It represents the characteristics that scholars considered important enough to use for the creation of a game classification.

The analysis of the seventeen classifications resulted in a list of sixteen potential differences:

1. Mechanics
2. Outcome/victory condition/goal
3. Players
4. Player relation
5. Chance
6. Kind of task
7. Objects
8. Boards
9. Mimetic
10. Space/Presentation
11. Time
12. Device
13. Immersion
14. Social
15. Savability
16. Type of input

Table 1 shows the distinguishing elements, as well as the authors that used them for the purpose of classification. To provide an overview, the disregarded, accidental characteristics are included in this chart, marked red. This visualization enables us to make some observations about game classifications.

Differences / Authors	Mechanics	Outcome/Goal/ Victory condition	Players	Player Relation	Chance	Kind of task	Objects	Boards	Mimetic	Space	Time	Device	Immersion	Social	Savability	Type of input
Culin (1907)	■				■		■									
Murray (1951)	■	■	■	■	■		■	■		■						
Jünger (1959)					■	■			■							
Caillois (1961)				■	■				■							
Avedon & Sutton-Smith (1971)				■	■	■										
Bell (1979)	■				■		■	■								
Parlett (2000)	■	■		■	■						■					
Pias (2000)																■
Aarseth *et al*. (2003)				■	■					■	■					
Klabbers (2003)		■	■	■			■			■				■		
Borsari (2004)	■			■	■	■										
Elverdam & Aarseth (2007)		■	■	■						■	■				■	
Polizotto *et al*. (2007)				■	■											
Hinske *et al*. (2007)						■				■			■	■		
Mueller *et al*. (2008)		■	■	■												
LaBrie *et al*. (2013)		■		■	■	■					■					
Raftopoulos *et al*. (2015)	■									■		■				

Table 1: Game Classifications by Employed Differences and Authors.

'Pre-digital classifications' revolve around a set of nine game elements, whereas the diversity of elements increases around the year 2000. This particular year is, of course, not a clear cut-off for the 'singularity of game elements'; it is simply an arbitrary date connected to the first publication in this list that mentions an element that has not before been employed. There are two reasons for this increase of characteristics, which are both connected to the development of digital games and their influence on our understanding of games. On the one hand, the emergence of additional differences supports the hypothesis that digital games have made our understanding of games more nuanced, resulting in the distinction between pre- and post-digital game literature. On the other hand, we can also consider that digital games might simply be different from non-digital games. As later classifications examined and clustered these more complicated artifacts, they naturally employed more and more diverse differences. This still indicates a more detailed understanding of what games are and what they consist of in our current time. However, while the answer to this question remains for future research, it is interesting to observe the difference in diversity of employed differences over the decades.

The previously mentioned difference between hierarchical and faceted classifications can also be applied to game classifications:

	Hierarchical	Faceted	Mixed
Culin (1975 [1901])	✓		
Murray (1951)	✓		
Jünger (1959)	✓		
Caillois (1961)	✓		
Avedon & Sutton-Smith (1971)	✓		
Bell (1979)	✓		
Parlett (2000)	✓		
Pias (2000)	✓		
Aarseth *et al.* (2003)			✓
Klabbers (2003)		✓	
Borsari (2004)	✓		
Elverdam & Aarseth (2007)			✓
Polizotto *et al.* (2007)		✓	
Hinske *et al.* (2007)	✓		
Mueller *et al.* (2008)			✓
LaBrie *et al.* (2013)	✓		
Raftopoulos *et al.* (2015)			✓

Table 2: Types of Classifications Applied to Game Classifications.

A mixed classification is a faceted classification that further distinguishes between items inside the facets in a hierarchical manner. In library studies, this was mentioned as a common feature of faceted classifications (Vickery, 1960, p. 9). However, as there are classifications that only employ facets and others that further classify them hierarchically, this distinction was maintained for greater accuracy. A classification with, for example, only three categories of games is considered a (flat) hierarchical classification (e.g. Pias' threefold distinction (2004)). A more in-depth discussion could explore how each author's specific intention, as well as background, plays into the classification's nature as hierarchical or faceted. If Pias, for example, did not aim at absolute categories, but three aspects of games in the form of their inputs, his classification might be considered faceted as well, and its application achievable by checking which kinds of the three inputs are present in a given game.

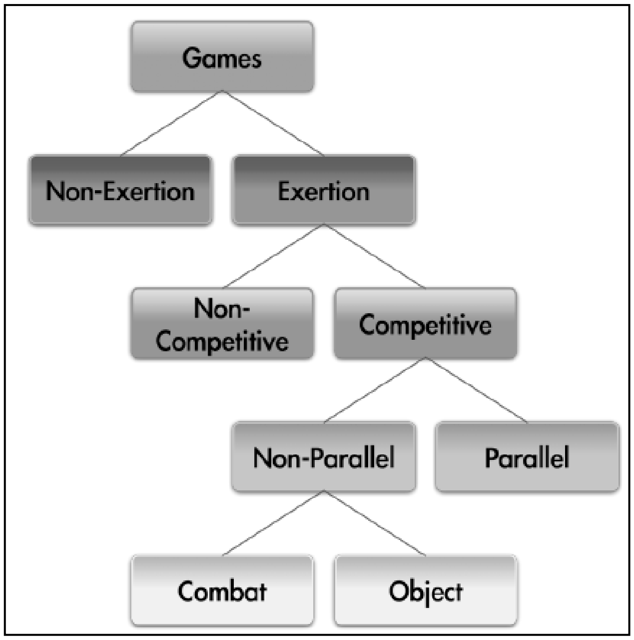

Figure 5: Mueller et al.*'s typology of Exertion Games (2008, p. 264).*

Some classifications appear to be hierarchical through their presentation by the authors, but are, in fact, faceted classifications. To determine whether a classification is hierarchical or not, it is important to examine whether a class–sub-class relationship is *necessary* in that particular order or not. In Mueller *et al.*'s (2008) classification of exertion games, for example, the first two divisions do not have necessary parent-child relationships. An exertion game can be competitive or not, just as much as a competitive game can be an exertion game or not. While the order of divisions is strongly suggested by their objects of study (exertion games), it is ultimately arbitrary. This means that these are two different *facets* of games, which could be called the 'competition' and 'exertion' facets. Mueller *et al.*'s classification is ultimately mixed, as the lower division are necessary children of competitive games. In other words, a non-competitive non-parallel game is impossible.

Interestingly, aside from flat hierarchies, most authors using hierarchical classification are concerned with the classification of specific corpora of games, not the development of a classification system as such. To put it differently, around the year 2000 the dominance of hierarchical classifications disappears. The hierarchical classifications often have a pragmatic motivation, such as Parlett's (2000) who needed to organize games in a way that made sense in book format. It appears that faceted classifications are developed later, supporting the hypothesis that digital games have largely influenced our understanding of games in general. However, another explanation is that scholars may have also become aware that games are not easily ordered into black and white terms according to a set of inherent properties. After all, the faceted classifications aim at classifying (one kind of) games in general, not a particular set of games. So, the present faceted classifications are methods for classifying games, which the present analysis has to extract from the earlier – hierarchical – classifications of corpora. The reverse case of a corpus of games organized in a faceted classification is not present in the current examination.

4.3.9 Refining the List of Elements

Here I will reiterate some of the discussion from the analysis of game classifications. My goal is to reduce the number of game elements by merging similar elements that can be classified together or identify elements that can be adapted into subdivisions of other elements.

For pragmatic reasons, the first step towards this goal has already been made: the clustering of *goals*, *winning condition* and *outcome* as a single dimension of goals. The concepts of goals, end conditions and winning conditions are closely related (Debus *et al*., n.d.; Zagal, Debus, *et al*., n.d.; see Section 5.7.2). It was also stated that the material aspect of elements is negligible due to the particular focus of this project. This means that classifications of boards will only be considered through how they organize space within the formal game system. Similarly, objects will not be considered as material items, but thorugh their function as objects within the game system that fulfill a particular purpose. These object positions will be clustered together with the player element under the element *entities*.

The term 'chance' will be replaced with 'randomness'. However, here the two terms are considered synonyms and the replacement is merely due to the fact that those studies that go into the most detail examining randomness use 'randomness' instead of 'chance'.

Finally, *savability* was mentioned only in Elverdam and Aarseth's typology (2007), describing the possibility of saving some state of the game for later retrieval and revisit by the player. In light of the current re-emergence of rogue-like games and games with a 'new game plus',[56] this element will be adapted into the Unifying Game Ontology but moved to a sub-class of time as the element that can be understood through the occurrence of events.

After refining the list of game elements employed in the classifications, we arrive at a list of six elements or element clusters: **Mechanics**, **goals**, **entities**, **randomness**, **space**, and **time**.

[56] These are games that enable the player to finish the game's story once and start over with the same character, items and stats, but on a higher level of difficulty.

Chapter 5:
The Unifying Game Ontology

The following sections constitute the synthesis of existing game element classifications. Each identified element is described in its own section. These sections start with a review of literature related to the given element. The reviews will be structured by topic, with literature that argues for similar positions clustered together, rather than following a strict chronology. By clustering similar ideas together, it is possible to argue more efficiently for their inclusion in the present project. With few exceptions, the reviews move from literature of smaller relevance towards literature that is most relevant to the present project. For example, the review of literature about space in games begins with literature that conflates different perspectives – such as representational elements and the notions of game space and gameworld – and ends with particular classifications of space in games as understood in the present project, as these will be the basis for the subsequent classification of how games organize space.

The sections following the reviews will explicate the present classification's facets. While the structure of a dissertation necessitates a linear organization of these facets, this linearity does not necessarily represent a hierarchy with the first to appear being equivalent to a higher level in a hierarchy. In fact, the current classification scheme attempts to avoid hierarchies wherever possible, and each section should be considered a facet representative of a different perspective on a particular element unless indicated otherwise. Some game element sections start with 'universals', which are identified distinctions that apply to all individual types within the element. Some of the developed facets require further discussion if, for example, particular combinations of items within the facet are not possible. These discussions, if necessary, will constitute the final part of each element's section. Lastly, Chapter 5.9 (pp. 291) contains a summary of each facet, as well as visual overviews, which were included in the summary, for the most convenient access to only the classification, without the additional evaluations and discussions.

First, however, it is necessary to discuss the methodology used for constructing the present faceted classification.

5.1 How to Construct a Classification

"In its general make up, a scheme of library classification will have to come out whole as an egg from the intuition of a classificationst of the creative variety. The intellectual classificationist can only polish it up with the aid of theory germane to it."

(Ranganathan, 1961, p. 80)

According to Farradane (1961) there are generally three different ways of creating a classification. The philosophical method constructs main classes of knowledge which are then further distinguished into smaller classes. The scientific method initially groups things "by similarities of properties, and thus building larger group concepts by stages" (Farradane, 1961, p. 120). Thus, the scientific method moves from individual items to larger groups through the discovery of similarities, while the philosophical method begins with the largest possible groups of things and moves towards individual items through the discovery of differences. Sayers considers the division of general terms into smaller subdivisions, until arriving at an indivisible unit, as the method of classification (1943b, p. 37). The Unifying Game Ontology (UGO) will follow the third method, which will be described below, after a discussion of these first two methods, as well as more general problems that must be avoided during the classification process.

We can compare these two approaches, respectively, to the deductive and inductive approaches in the social sciences, or top-down and bottom-up approaches. More importantly, similar approaches were connected to the difference between typologies and taxonomies: "The basic difference, then, is that a typology is conceptual while a taxonomy is empirical" (Bailey, 1994, p. 6). Bailey's distinction aims not only at the presence or absence of empirical cases, but also at the (lack of) application of quantification or statistical analysis in the case of typologies. Thus, typologies are purely "verbal and qualitative" (ibid.). While Bailey also describes the general features and uses of types of classifications – such as taxonomies usually being hierarchical and used in natural sciences; and typologies used in social sciences – the direct connection between empirical and conceptual approaches, to taxonomies and typologies respectively, shall be noted. To be clear, typology and taxonomy can both refer to the result, as well as the method (Bailey, 1994, p. 6). Within this dichotomy, the UGO falls into the typological, conceptual pole, as it describes different dimensions of game elements and their subdivisions, which can be holistically or partially applied to a given element in question (cf. Bailey, 1994, p. 4). While the resulting classification and its differences will be exemplified with empirical cases, this does not turn the classification into a quantitative classification (i.e. taxonomy), as Bailey points out that "[e]ven when empirical cases are identified for such [qualitative] typologies, this can often be accomplished without quantification" (Bailey, 1994, p. 6; MSD).

Important for every classification system is that the terms for classes must be univocal (Sayers, 1929, p. 35). A term that has different meanings at different places in the classification is not only useless, but detrimental. One example is the term 'goal' in a classification of game objectives. Considering that winning conditions are subsets of objectives, introducing a particular winning condition, such as 'scoring more goals than the opponent' in Soccer, covers a different intention,[57] than what is to be classified. The object of interest, 'goals,' are objectives in games – which is why a difference between goal and objective was made earlier in this paragraph – while the goals to be scored refer to a physical object, or a concept of scoring, which is likely etymologically connected to the material object in Soccer. In this example, 'goal' is a multivocal term with at least three meanings: the material object, kicking the ball into the net (i.e. 'scoring'), and winning over the opposing team. One possible advantage of a faceted classification is that it can clarify such multivocalities by offering distinct facets that illuminate individual meanings through the addition of multivocal terms to applicable facets (cf. Farradane, 1961, p. 128).

Classification should be conducted in "gradual steps" (Sayers, 1929, p. 43) and use a "consistent factor of division" (idem., p. 44). If a classification is not conducted in gradual steps, it risks leaving out one or more logical divisions. If one were to classify vessels for storage of liquids, a non-gradual classification schedule would be: vessels → glass bottles. The gradual classification schedule would include the more general class 'bottles' first: vessels → bottles → glass bottles. Naturally, the higher-level classes have greater extension and the lower-level classes have greater intention (cf. Sayers, 1944, p. 42). While the gradual steps refer to the vertical consistency of classifications, using a consistent factor of division is necessary for its horizontal consistency. Following the vessels example, one must decide on the factor for division between bottles. For now, 'material' was chosen as the factor, resulting in bottles made of different materials: the aforementioned glass, as well as plastic, aluminum, and clay bottles. Using inconsistent factors of division would lead us to a classification such as: glass bottles, plastic bottles, high-shoulder bottles, indestructible bottles.

[57] As discussed earlier Phillips (1963, p. 15) uses the terms intension and connotation synonymously. They refer to the qualities attached to a term, as opposed to the range of things covered by it, which are its extension.

Both of the latter classes can, theoretically, be part of the former two classes. Thus, the division is not mutually exclusive and orthogonal to the original objective. This mistake is called a "*Cross-Division* (or sometimes, *Cross-Classification*)" (Sayers, 1929, p. 45: original emphasis).

The UGO follows the synthetic, faceted method described by, for example, Farradane (1961) and Vickery (1960). The identification of the "homogenous subject fields" (Vickery, 1960, p. 14), within which facets are to be identified, of games was the particular focus of this dissertation on the underlying formal system. Of course, subject fields refer to areas within knowledge, whereas elements describe parts of games, which raises the question of their comparability. However, the focus was achieved through literature that describes the constitutive elements of (video)games, which can also be considered homogenous fields of knowledge about games. In that sense, the idea of "homogenous subject fields" (ibid.) is similarly applicable. The identification of facets, which "[…] can be achieved only by a detailed examination of the literature of the field to be classified" (Vickery, 1960, p. 20) was achieved in Chapter 4, through the analysis of existing game classifications. The present chapter classifies these facets further, by analyzing existing special and general classifications within game studies.[58] While doing so, it must be kept in mind that the mere fusion of special classification schemes is insufficient and leads to unintentional cross-classification (Farradane, 1961, p. 124). This means that each classification must be examined for differences and divisions that might occur within other facets. Furthermore, the careful construction of concepts that do not bear multivocality is of utmost importance (cf. Farradane, 1961, p. 128).

As discussed above, one advantage of typologies is the possibility of partial application. The disadvantage is that it might render certain combinations of facets, or items with facets, obsolete. The

[58] A special classification scheme is "[…] limited in scope to a single subject" (Sayers, 1943, p. 22) and a general classification "[…] is one that embraces all knowledge" (ibid.) (see Section 4.1).

classification of randomness, for example, will distinguish between digital and analog randomness in one facet, and ontological (true) and epistemological (pseudo-) randomness in another facet. Due to the particular definitions of these types, 'ontological digital randomness' is impossible, as digital randomness is always only epistemological. Thus, a hierarchy that only adds the individual type of epistemological randomness to digital randomness would emerge. However, it could be possible that a particular application is only interested in whether a given case of randomness is epistemological or ontological, not in its digital or analog nature. Thus, the decision to employ non-hierarchical facets was made with the pragmatics of later applications in mind.

In summary, the following classification will create a qualitative typology with empirical cases as examples, without aiming for quantification. The facets of each element will not be ordered hierarchically, for pragmatic reasons of application as well as future additions and alterations of the classification itself.

5.2 Unattached Facets

During the synthesis of existing classifications, "only the exclusively 'special' core of each component *may* be usable; the rest is better placed in other schedules so that multiple location and unintentional cross-classification are avoided […]" (Farradane, 1961, p. 124; original emphasis). Using only these cores will leave parts of original special classifications uncovered by the UGO. While some will be disregarded as elements that lie outside the scope of the present classification, others describe types of elements that are applicable across facets. We might call these more broadly applicable types 'universals', derived from the ontological distinction of universals and particulars. Universals are useful to discuss "[…] how universal cognition of singular things is possible" (Klima, 2017). However, as the present chapter lies within the area of classification, the use of Farradane's term "unattached facets" (1961, p. 130) is more appropriate.

As discussed, certain special classifications employ differences on their particular subjects that, while certainly applicable in those cases, can also be applied to other elements. This means that they are not inherent subdivisions of the particular element examined by the special classification, but applicable across facets of other elements as well. Generally speaking, the content of unattached facets describes *how* facets are, not *what* they are. Not all unattached facets will apply to all other facets of elements. The present list will only include the unattached facets that were identified during the development of the UGO and include only cross references to those facets they were identified with.

The present section will gather and describe these unattached facets. The identification of unattached facets did not occur chronologically parallel to the structure of the classification. Instead, it occurred during the creation of the classification of elements. Discussing the unattached facets first is beneficial as some of them will be explicitly mentioned within other elements, due to prominent employment within those areas.

Some of the identified unattached facets are also clearly not of ontological nature, nor within the declared main focus of the classification of formal elements of game systems. However, it is more beneficial to mention and discuss these instances here, rather than identifying, disregarding, and leaving them for future additions of the UGO.

5.2.1 Explicitness

In the area within game studies concerning goals, a recurring distinction is made between *explicit* and *implicit* goals, win states, etc. Costikyan, for example, observes that there are games with "explicit win states" (Costikyan, 2002, p. 12), while others are lacking in those (ibid.). Järvinen notes that –

according to psychology, as opposed to real life – "games emphasize conscious and explicit goals" (Järvinen, 2008, p. 34).

It is interesting to note that Elverdam and Aarseth changed their categories of "absolute" and "relative" goals from an earlier version in which they were termed "explicit" and "implicit" (Elverdam & Aarseth, 2007).[59] I believe this change was made for a very good reason: both of the two terms work on two different levels. Considering the game as a system, it either has an explicit goal that will be reached with a given game state, or it does not. Following this argument, looking at an implicit goal from a systemic view does not make sense. One could instead argue that the term 'implicit' refers to goals that are not readily available to the players or more difficult to detect by them. I arrived at the epistemic level of goals, questioning whether a player knows about a given goal or not, and how easy it is to identify a given goal. Unfortunately, this perspective renders the terms nearly useless.

If one considers this epistemic meaning of explicit and implicit, a given goal's assignment to one of the categories is relative to a person's cognitive capabilities and pre-knowledge of games or genres. For example, someone unfamiliar with the 'survival' genre might wonder what the goal of the game *Day Z* (Bohemia Interactive, 2013) is, if instantly put into the position of playing.[60] The interface does not indicate any necessary collection of items. Furthermore, the spatial layout of the game does not force the player into any one direction, as for example in *Super Mario Bros.* (Nintendo, 1985). Thus, there are no visual or mechanical cues for the player. Despite the game lacking explicitly rewarding states (one could call them 'goals'), however, players are punished for not surviving by losing their progress and ultimately players will learn what to do (cf. Leino, 2013, p. 11), which is only

[59] This is based on the different version of visual overviews within the paper and in the appendix. The appendix appears to be an older version, in which the goals are distinguished into "explicit" and "implicit".
[60] For this argument the process of starting the game must be skipped, as the newest version (1.04) of *DayZ* indicates statistics such as "Time survived" and "Players killed" in menu screen.

to survive in *Day Z*. Initially, however, the 'goal' of *DayZ* is most certainly not explicit to the player. A different person with the knowledge of the 'survival' genre, however, will immediately know what to do. Furthermore, while a person with general knowledge about videogames might be able to identify the goal of survival games after a few runs, this might be impossible for someone who must figure out the affordances, controls, and visual cues of videogames first. As stated above, the terms explicit and implicit are difficult to apply. However, they are still described here in case a particular application of the UGO is interested in this dimension of elements in games. Considering the game as a system, only the term explicitness makes sense to the degree that it describes whether a particular element exists in the system or not.

The concepts of (epistemic) explicitness and implicitness can also be applied to other facets of game elements. These will be pointed out during the later sections. For now, imagine a game, such as *Age of Wonders III* (Triumph Studios, 2014), which separates its maps into hexagonal, discrete spaces. If these spaces were not delineated with explicit lines, the game space might appear as a non-discrete space to the player, as the movement of the units is continuous. Thus, the visible lines between hexagons could be understood as that which renders the space in *Age of Wonders III* (epistemically) discrete. This shows that, while being connected to the player's epistemology, 'explicit' and 'implicit' can also be understood on the level of the game's representation: an element is explicit if visually, auditorily, or textually communicated, and is implicit if the player has to identify it without such direct commands. This is the first example of the earlier discussed advantage of faceted classifications: moving the terms from one subject field (formal system) to another (representational layer) enables a discussion of differing meanings of the same term.

Lastly, the idea behind explicit and implicit game elements could also be described with the terms 'unhidden' and 'hidden' respectively. With these terms, it would be easier to describe the particular epistemic nature of, for example, information or solutions. In 'hidden object' games, such as *June's Journey* (Wooga, 2017), the players must select objects on the screen that are pointed out with written words. Here, the objects are 'unhidden', as they are directly visible for the player at any time. They are only 'hidden' as the player has to search for them, a process commonly connected to hidden objects (and people). In other words, the term 'hidden' is used in *June's Journey* not because of a property of the objects, but because of a process that is commonly associated with the term. As opposed to this example, in the case of *Cluedo* (Pratt, 1949), the players must go through several iterations of gameplay to identify the actually hidden information of who committed the crime.

5.2.2 Fixedness

In their metacategory *Player Relation*, Elverdam and Aarseth distinguish the dimension *Bond* in "dynamic" and "static" (2007, pp. 12–13). This, according to the authors, "[…] describes whether the relation between players can change during play (dynamic) or not (static)" (idem., p.12). Thus, Bond describes whether the nature of a particular element is able to be altered during play, or if the game always prescribes it the same.

This distinction should not be limited to the relation of players, but that it is in fact capable of describing other elements as well. Within their model, one could argue that the perspectives of omnipresent and vagrant could also be considered static in most games but dynamic in others. For example, the modification *Natural Selection* (Unknown Worlds Entertainment, 2002) is generally played in a first-person vagrant perspective, but players can also switch into a commander role, which has an omnipresent overview over the map.

Narrative single player games often require the player to pursue multiple objectives in succession, within one level or playthrough. Smith distinguishes between ultimate and proximate goals, where "ultimate goals are end conditions while proximate goals are steps towards that end" (2006, p. 67). Thus, gathering X number of stars in *Mario 64* (Nintendo, 1996) is a proximate goal to the ultimate goal of defeating the last Bowser. In the board game *Posthuman 2* (Mighty Box Games, 2019, forthcoming), players must place particular tokens on particular types of land to reach mission objectives. Different objectives require different orders of this process, but players are always required to fulfill mission objective one before mission objective two. In this case, reaching objective one is a proximate goal to reaching objective two, without any of them constituting the ultimate goal of the game, which is winning by the accumulation of points. As the end condition cannot be reached without fulfilling the proximate goals, games can be considered to have multiple (or dynamic) proximate goals.

One could object that reaching each individual proximate goal constitutes different 'games' or 'parts of the game'. If this objection is accepted, however, one must abandon the idea of dynamic game elements altogether, as the same argument applies to the original dimension of player relations: each part with a different player relation constitutes a new part of the game. This would mean that when two players form an alliance in a multiplayer match of, for example, *StarCraft II* (Blizzard Entertainment, 2010), it would constitute a 'different part of the game'. As I am opposed to this, I consider the fixedness-facet to be unattached and applicable to multiple game elements.

5.2.3 Continuity

The distinction between *continuous* and *discrete* elements has been made, particularly in the areas of space (Aarseth, Smedstad, & Sunnanå, 2003), navigation or movement (Debus, 2016; Günzel, 2008, p. 174), and mechanics more generally (Adams & Dormans, 2012).

The difference employed is whether incremental steps between a start and an end are present or not. I have used this to distinguish between movement and relocation (Debus, 2016, pp. 34–37). Günzel describes the essential difference between Aarseth *et al.*'s (2003, pp. 49–50) two types of space – "topological" and "geometrical" (ibid.) – as "[…] the difference between continuous movement and discrete movement" (Günzel, 2008, p. 174). Discrete movement can be understood in the way quantum leaps of electrons occur between orbits without actually passing the space in between these orbits: the electrons are either on orbit one or two, but never in-between. This 'either one thing or the other' is the essence of discreteness. Continuity, then, as the opposite of discrete, has all available locations between the orbits. In other words, the transition between two states occurs via incremental states in-between.

This distinction brings a mostly epistemological problem with it. In many cases, a process is phenomenologically continuous but ontologically discrete. In the case of videogames, for example, the computational system always attributes a definite position to the game elements during motion. While these motions appear to be fluid or continuous to the player, they are ultimately occurring between miniscule discrete locations within the computation.

Thus, the distinction between discrete and continuous elements must be considered carefully in each instance. If it refers to the explicit creation of discrete locations as on a Chess board, the description as discrete is justified from the system view. Broadly considering all mechanics as continuous or discrete, however, is a mistake.[61] In other cases (such as time and space) the discrete and continuous nature of the elements plays such an important role that they will be discussed separately.

[61] This refers to Adams and Dorman's types of mechanics (2012, pp. 9–12), which will be discussed in the Section.*Types of Mechanics* (5.3.2).

5.3 Mechanics in Games

This section will discuss the nature and types of mechanics in games. I will start with a review of the discussion surrounding definitions of game mechanics to gain a deeper understanding of what it is that has to be examined. After this, some approaches towards different particular instances of mechanics will be discussed, resulting in a more careful examination of Järvinen's "library of game mechanics" (2008, pp. 385–394). Other approaches were dismissed due to their conflation of different perspectives. Järvinen's list of mechanics will be used as a basis for the classification of game mechanics in the present UGO. To arrive at the desired formal list of mechanics, it is necessary to use some methods on Järvinen's list, including formalization, deconstruction of compounds, and the identification of special cases. After this process I will explicate each individual formal mechanic in an individual section.

5.3.1 Definitions of Mechanics

For practitioners, the earlier discussed observation that mechanics are purely formal (Section 3.6.) is important, as the design of a game of any materiality can borrow mechanics from games of other materiality. Especially in the current economy, the ability to create a game of the same 'IP' is important for designers, marketers, and companies.[62] For example, the successful videogame *StarCraft* (Blizzard Entertainment, 1998) was adapted into the board game *StarCraft: The Board Game* (Konieczka & Peterson, 2007) in this way. Similarly, game 'clones' are a common practice across companies. 'Cloning' describes, among other things, the creation of a mechanically similar game with minor alterations to its systems and, usually, major re-skinning. In this manner, the currently popular *Fortnite*

[62] 'IP' means 'intellectual property' and is actually a juridical term that describes a non-material property of a juridical person, usually resulting from creative work. However, it became to adopt the meaning of a particular series of products, owned by a company, that are related through, for example, a common, fictional universe. In that regard, *Star Wars* is an IP that covers movies, books, games, toys and many other things.

(Epic Games, 2017) is considered a clone of *Player Unknown's Battleground* (PUBG Corporation, 2017) (see Sheridan, 2017), the latter of which arguably started the current success of battle royal games. However, the question arises of what mechanics in games are other than purely formal.

As Järvinen points out, the term "[…] 'mechanics' or 'mechanism' is often mentioned in passing but not rigorously defined" (Järvinen, 2008, p. 251; in reference to Adams, 2001; Crawford, 1982, pp. 10, 26, 27; Hansson, 2002; Hardin, 2001; Johnson, 2001; Klevjer, 2002; Larsen, 1999; Mackay, 2017, pp. 37–60; Parlett, 1999, p. 9; Rollings & Adams, 2003; Rollings & Morris, 2000). Järvinen continues to discuss these authors' use of the term, pointing out that they either simply pre-suppose its meaning or define it too broadly to be useful (2008, pp. 251–252). In the following I aim to develop a formal understanding of game mechanics that can serve as the basis for later classification.

Broadly speaking, one could argue that mechanics are the functions that change any given state or value in a game. Hunicke *et al*. describe mechanics similarly as "[…] the various actions, behaviors and control mechanisms afforded to the player within a game context" (2004, n.p.). Other definitions range from mechanics as methods that enable agents to interact with the game state (Sicart, 2008), to lists including "narrative", "progression", and "achievements" (Raftopoulos *et al*., 2015), to a two-fold understanding of mechanics as tools of performance and exploration for the players, as well as to tools of restriction for game designers (Järvinen, 2008, p. 254). Extensional definitions, such as Raftopolous *et al*.'s list of mechanics, are not useful for the present purpose of understanding the underlying formal system for two reasons. In their examination of gamification in enterprises they include, for example, "status, success, recognition" and "narrative" under the label of "key game mechanics" (2015, p. 8). While narrative is an element of ludonarrative software under which some games fall, its general consideration as a game mechanic must be negated. If narrative was considered a game mechanic this would mean that movies and novels also contain game mechanics. Second, to be useful for the understanding of underlying mechanical systems of games it would be necessary to convert the extensional definition into an intentional one. Discussing the nature of a mechanical system while constantly considering all items in the set of the extensional definition is not pragmatic, especially when considering that some elements of their list already fall outside of other, more established intensional definitions of mechanics in game studies (e.g. Hunicke *et al*., 2004; Järvinen, 2008; Sicart, 2008). These definitions will be discussed now, and a brief discussion of some items on these lists of mechanics will appear at the end of this section.

Järvinen defines game mechanics as "[…] a functional game feature that describes one possible or preferred or encouraged means with which the player can interact with game elements as she is trying to influence the game state at hand towards attainment of a goal" (2008, p. 255). He considers mechanics the intersections between the player and the game state, as prescribed by the game itself. They enable the player to interact with the game state, but also limit them to a specific set of actions. They are simultaneously possibilities and restrictions to the player, as they are the designer's way of forcing the player to do what they intend them to do (cf. Järvinen, 2008, p. 254). In other words, players cannot do as they please in a game, but only what they have been made capable of doing. The only way to avoid these limitations is to not play the game. With the former aspect of game mechanics as the possibility to interact with the game state and explore the game, Järvinen covers two other definitions: Cook's definition of mechanics as a "rule based system/simulations that facilitate and encourage a user to explore and learn the properties of their possibility space through the use of feedback mechanisms" (2006), as well as Lundgren and Björk's understanding of mechanics as "[…] one, and only one, possible kind of interaction that takes place during the game" (2003, p. 48). One aspect that sets Lundgren and Björk's definition apart is that it does not mention the player, which leads to Sicart's definition of mechanics.

Sicart builds especially on Järvinen's definition. He defines mechanics as "methods invoked by agents, designed for interaction with the game state" (Sicart, 2008, n.p.). The emphasis of 'agents' instead of 'players' is useful, as agents also cover non-player characters and other entities in the game (ibid.). In other words, mechanics are available not only to players but to all entities of the game. In addition to moving away from the "anthropocentrism of previous approaches" (ibid.), Sicart argues that his definition, as opposed to Järvinen's, bears the advantage of omitting any goal directedness within the understanding of mechanics themselves (ibid.). Through this it is possible to describe mechanics in games without explicit goals, such as *SimCity* (Maxis, 1989) (ibid.). As an example of mechanics Sicart uses the cover abilities in *Grand Theft Auto IV* (Rockstar North, 2008) and *Gears of War* (Epic Games, 2006). It should be noted that mechanics are not necessarily tied to one particular entity representing the player in the gameworld. This means that an ability that can be executed by or directed toward several units in, for example, a strategy game, is also a mechanic.

Lastly, Arjoranta defines processes, drawing from Bogost (2007), as "[…] a script or a collection of rules for how something is done, be it a mechanical engine, a social organization or a digital game" (Arjoranta, 2015, p. 47). For the moment it should be accepted that mechanics are one sort of process, as indicated by the quote. Arjoranta continues to state that "[t]hese processes are defined by the game rules or, sometimes, by external factors like physical laws, social agreements or cultural assumptions" (ibid.). The important observation here is that processes (and with them mechanics) do not have to be explicitly described through rules or constitute particular mechanical parts of a machine. Mechanics might, in some cases, simply be defined by real life physics – for instance, when a ball drops in a particular way after being thrown by the pitcher in Baseball – as well as material conditions of a particular item.

I will adapt Sicart's definition of mechanics as "methods invoked by agents, designed for interaction with the game state" (2008). Mechanics also serve as a tool for the designers to restrict the player's actions. Furthermore, game mechanics are not bound to the player or player-controlled entity, but also available to other agents in the game. Finally, they can be implemented through other means than prescriptive rules, such as physical laws or materiality. With this, I arrive at a brief discussion of particular items in the aforementioned lists of mechanics and how they conflate several mechanics on the one hand and include informal aspects that lie outside the game system on the other hand.

Both, Lundgren and Björk (2003) and Järvinen (2008) work with lists of game elements. The former refer to a list of forty game mechanics in the online forum 'Boardgamegeeks', while Järvinen assembled his own "'library of game mechanics'" (2008, p. 250). Lundgren and Björk's example from that list are "[…] bidding, negotiation, story-telling, roll and move, and role-playing" (2003, p. 48). The example of 'negotiation' shows that lists of mechanics oftentimes simply enumerate informal occurrences of more formal mechanics, as 'negotiation' is merely communication with a particular goal. Communication in itself is an exchange of information, and as information in the present project is considered an object in the game system, negotiation is the exchange of an object with a particular intention in mind. Thus, negotiation is an 'informal compound mechanic'. It is compound because it describes the use of two different exchanges (communication and goods) and it is informal because it includes the players' intention to mutually use this exchange mechanic for goods. Another mechanic that is distinguished by an informal purpose is Järvinen's "Attacking / Defending" mechanic (2008, p. 386). He defines it as "[a]ttacking opponent component(s) or defending one's own from them" (ibid.). Here, again, attacking and defending are amalgams of formal mechanics such as 'removing something (from someone)' and the semantic connotation as an act of combat. The formal mechanic that is attempted during an attack is that of removing health points (in a first person shooter) or units and buildings (in a strategy game) from your opponent. Thus, an 'attack' is constituted by movement of game elements (avatar or units) and the use of an ability that removes elements (mechanic) directed at the opponent. To put it polemically: the attempted removal of a brick in Jenga would never be considered an 'attack'.[63] The later classification will use these lists as sources for the formalization of mechanics by abstracting away the discussed informal aspects. This enables broader applicability of the classification to, and comparability of, such informal descriptions with particular semantics. However, after discussing implicit extensional definitions as lists of mechanics, what is still lacking is an intentional definition of game mechanics.

5.3.2 Types of Mechanics

After clarifying and discussing some definitions of game mechanics, this section will summarize literature on different types of mechanics.

Sicart describes core mechanics as mechanics that are repeatedly executed to achieve an end state of the game, or a state that is desired by the player in cases of games without end state (2008). In first-person shooter games this would be, for example, the shooting mechanic. In *Counter Strike* (Valve Corporation 2000 -) players have to eliminate their opponents to achieve victory in a match. In *Half Life 2* (Valve Corporation 2004) the player is required to overcome most of his opponents by shooting to progress in the game's narrative.[64]

Acknowledging the problem of core mechanics in complex games such as *Grand Theft Auto IV* (Rockstar North, 2008), he further distinguishes between primary and secondary core mechanics

[63] Jenga is played with a tower built by levels of three rectangular bricks. Each level is offset to the previous level while maintaining a square shape of the tower. Players then take turns removing bricks from within the tower and placing them on top of it. The player during whose action causes the tower to collapse loses the game.
[64] I acknowledge practices such as 'pacifist runs', in which players want to finish the game without shooting. This, however, should be considered an exception rather than the norm.

(Sicart, 2008). Primary mechanics, following Sicart, are mechanics that are ready at hand and explained early in the game. These are also frequently and necessarily executed throughout the game to achieve the desired (end) state. Secondary core mechanics are therefore not ready at hand, likely to be introduced later in the game, and only optionally used to achieve the desired (end) state.

Adams and Dormans distinguish between discrete and continuous mechanics (Adams & Dormans, 2012, pp. 9–12). Continuous mechanics describe those possible interactions that occur in very small, gradual steps, such as the moving of an object in a contemporary three-dimensional video game. Discrete mechanics are described in whole numbers and can most easily be thought of in an 'either/or' manner. Adams and Dormans' example for discrete mechanics is that "[i]n a game you usually cannot pick up half a power-up" (2012, p. 9). Adams and Dormans further describe how earlier arcade games' mechanics were less continuous than contemporary video games' (ibid.). However, they argue on several different levels and the distinction is problematic, as it uses an undefinable threshold between the two poles. That the movement in arcade games was less continuous is merely a matter of the game's visual representations. Formally speaking, the movement in contemporary video games also occurs between discrete locations. Furthermore, their example of picking up a power-up conflates the mechanic 'picking up' with the object 'power-up'. The mechanic enables the player to pick something up, but the fact that the power-up is not separable is a quality of that object, not the mechanic.

While the distinction between contiuity and discreteness itself may be correct, it should be noted that the broad claim of its applicability to all mechanics is questionable. Due to the unclear distinction between discrete and continuous mechanics it will be disregarded in most parts of the following classification. However, in some special cases the distinction can be argued for, which will be pointed out.

Aside from this twofold distinction, Adams and Dormans also "[…] listed five types of mechanics" (2012, p. 9). Drawing on Adams' earlier work (2009), these five types are labeled "physics", "economy", "progression", "tactical maneuvering", and "social interaction" (Adams & Dormans, 2012, p. 8). Some of these categories suffer from the often informal perspective of design-oriented research. "Social interaction" (idem., p.7), for example, describes the exchange of gifts between players, and the reward thereof. The problem these categories bear is that they conflate the nature of the mechanics with the intention with which they are executed.

In the browser game *Ogame* (Gameforge, 2002), for example, players can transport resources to other players' planets. This in itself is merely the mechanic of delivering resources to another player's planet. In attempting to apply Adams and Dormans' types, the delivery of these resources can be ascribed to multiple classes in the typology. It can be necessary to relocate the resources to avoid the pillaging of the resources through an opponent's attack (tactical maneuvering); it can be a gift to a new player (social interaction); it can be an exchange of resources within the frame of a trade (internal economy); and it can be a gift to a stronger player in hope for future protection (social interaction, tactical maneuvering, and internal economy). To briefly elaborate on the last scenario, as the delivery of resources has no immediate or negotiated counter-value, it can be considered a gift. However, the moment the stronger player helps in a combative situation, the same mechanic could be considered a trade: resources for military power. Finally, the player's intention to receive future protection can also be considered a tactical maneuver: by tactically placing resources on neighboring planets, they invisibly increase their combat power. These 'types' of mechanics are frames in which particular mechanics can be executed, identified through the intention and outcome of a particular mechanic's execution.

One comprehensive model on different mechanics in games is Zagal *et al.*'s *Game Ontology Project* (e.g. Fernández-Vara *et al.*, 2005; Zagal, Brown, *et al.*, n.d.; Zagal & Mateas, 2007; Zagal, Mateas, Fernández-Vara, Hochhalter, & Lichti, 2007). It must be noted that Zagal *et al.* do not explicitly mention the term 'mechanic'. However, their top-level element 'Entity Manipulation' "[…] consists of altering the attributes or abilities of any entity in the game world" (Zagal, Brown, *et al.*, n.d.: Entity Manipulation). If we understand attributes and available abilities at a particular point in time as a given game state, the parallel to the earlier discussed definition of mechanics becomes clear. While the authors might have chosen that particular label with the exact intention of avoiding the term mechanics, for the present classification their ontology will be examined and adapted into the classification of game mechanics due to the above stated similarity. Their eleven top-level categories within 'entity manipulation' are:

- Compound Action
- To Collide
- To Create
- To Move
- To Own
- To Remove
- To Rotate
- To Select
- To Manipulate Time
- To Manipulate Gravity
- To Customize

Generally speaking, this part of their top-level elements suffers partially from the same informalism as the earlier lists of mechanics by Lundgren and Björk (2003), and Järvinen (2008). As a sub-category of "to move", the authors list the example "to evade". They state that "[e]ntities can move for the purpose of avoiding contact with another entity" (Zagal, Brown, *et al.*, n.d.: To Evade). Similar to the problem of negotiation being communication with a particular purpose, the further mentioning of evasion as a mechanic (or form of manipulation) adds an informal aspect to the class. The inclusion of "purpose" is problematic and leads again to the question of intention. If a player uses the move mechanic in *Space Invaders* (Taito, 1978), they may or may not have done so with the purpose of evading a bullet. Maybe they accidentally pressed a key, or they did not see the bullet. Such informal additions will be avoided in the later classification, remaining on the more formal level of 'moving'.[65] However, this ultimately leads to the problem that mechanics can only ever be understood within the frame of another game element.

As per definition, on a purely formal level, every mechanic is merely the interaction with, or alteration of, some value in the underlying formal system. On a second level, one could distinguish between alterations that increase and decrease values. The removal of hit points is a decrease of hit points; any movement on a map can be described with the increase and decrease of location values; resources can be increased or decreased. Formally speaking, the mechanics described here are only increases and decreases of values.

Ultimately, we can think of several formal levels of mechanics in games. On the most informal level, we could place descriptions such as 'catch ball' or 'capture the flag'. In fact, both these descriptions are already working on two formal levels, as they are able to describe a rather particular instance of a mechanic: grabbing a flag in the Warsong Gulch in *World of Warcraft* (Blizzard Entertainment, 2004); catching the ball in Baseball. They can also describe the more formal idea of grabbing a flag and catching a ball in any given game. On a more formal level, one can consider these two mechanics the same. For this, it is important that both descriptions include a mechanic (grab, catch) as well as an object (flag, ball). In both cases executing the mechanic means to obtain a particular object in the game. If we formalize the situations further, we can describe each as mere value

[65] 'Moving' will in fact be a sub-category of the mechanic 'navigation', which encompasses 'relocation' as well.

changes in the system that indicate which entity another entity is possessed by: first, the flag 'belongs to team A' ('owned by: 1') then it 'belongs to player avatar' ('owned by: 2').

Thus, to be able to distinguish between these changes the following classification will describe mechanics within what could be called the middle ground of this discussion, where catching a ball and obtaining a flag are the same formal process of obtaining an object within the game system. For this, it is necessary to examine certain frames within which the mechanics work, and targets that they are executed towards. For example, the alteration of the location values of an entity within the frames of time and space will be understood as navigation; the change of the 'existing value' of an entity will be understood as the removal of an entity (player, agent, or object); and the decrease of the 'amount value' of a resource will be understood as the removal of individual units of that resource. While also deformalizing the classification to a certain extent, the difference from Zagal *et al*.'s description of evasion is that the frames and targets of mechanics as described here will remain within the formal game system itself – rather than pointing towards intention or purpose, which lie within the player's cognitive realm.

Lastly, the following list of mechanics will attempt to avoid ambiguity as much as possible. However, it must be remembered that any list of mechanics which uses language is constrained by the semiotic connotation and possibilities of interpretations such language brings with it. The mechanic of 'navigation' could for example be connected to the process of orientation and route planning, which goes far beyond its intention in the current project as the purest form and common denominator of movement and relocation: reaching point B from point A.

5.3.3 Classifying Game Mechanics

I will now develop the UGO's classification of mechanics in games. As discussed above, this classification aims for the highest level of abstraction, although the inclusion of certain frames and targets within the game system need to be taken into consideration to distinguish beyond the increase and decrease of values. I will start with the identification of facets within the mechanics element. To do so, I will examine Järvinen's list of forty mechanics (Järvinen, 2008, pp. 385–394). The goal of this examination is to remove any references to out-of-game components (such as 'purpose'), as well as cluster mechanics that are formally the same and only differ on more informal levels. This is not to say that Järvinen's list of mechanics is wrong, only that it includes differences that are not part of the underlying formal system. He also specifically points out particular mechanic-submechanic relationships; for example, he defines 'sprinting and slowing' as a submechanic of 'moving' and 'acceleration and deceleration' as a submechanic of 'manoeuvring'. Järvinen's list of mechanics was chosen as the basis for the formal categorization of game mechanics for two main reasons. First, as opposed to, for example, Lundgren and Björk's categorization which is based on a list from boardgamegeeks.com, it constitutes a much more formal list of mechanics. Second it constitutes one of the most extensive lists, as opposed to smaller typologies such as Sicart's (2008).

To elaborate briefly on other models' inaccuracies, Björk and Holopainen's (2005) action patterns conflate formal, structural, and representational aspects, as well as particular instances and properties of actions, into individual patterns. To mention only a few, "interruptible actions" (idem., p. 168) describe whether an action can be interrupted or not, not a particular action; "ability losses" (idem., p. 175) is ultimately only the removal of something and distinguished on the representational nature of the removed object (an ability); "asymmetric abilities" (idem., p. 157) describes the structural component of actions' relations. Zagal *et al.*'s top-level element "entity manipulation" in the Game Ontology Project is the classification that competes in accuracy and formal nature with Järvinen's. However, Järvinen's list was chosen over the Game Ontology Project, as it constitutes a complete and finished system. The Game Ontology Project is an ongoing endeavor, with entries that are "suggested", but not accepted. This means that, potentially, the acceptance of a suggestion or a change in the system might affect other entries. Furthermore, these suggestions would have to be considered rather carefully, due to their tentative nature.

Table 3 shows the mapping of Järvinen's "library of game mechanics" (2008, pp. 385–394) onto the more formal versions within the UGO. Some of his mechanics appear in multiple locations, due to his descriptions covering multiple formal mechanics. I will briefly discuss five main changes that were made to arrive at my final list of seven types of mechanics in the indicated order: identification of special (sub-) cases of mechanics, formalization, deconstruction of compound mechanics, dismissal as the mechanic falls outside of the definition of mechanics, and finally the clustering in a new facet. The first two will be discussed using one example, followed by an individual discussion of the remaining alterations.

Changing of possession (receiving/sending/exchange)	Bidding	Expressing
	Buying / Selling	Information-seeking
	Catching	Taking
	Conquering	Trading
	Conversing	Storytelling
	Enclosing	
Navigation (spatial, temporal, abstract)	Accelerating / Decelerating	Manoeuvring
	Allocating	Motion
	Aiming & Shooting	Moving
	Arranging	Performing
	Browsing	Placing
	Catching	Point-to-point movement
	Enclosing	Sprinting / Slowing
	Herding	Substituting
	Jumping	Voting
Removal	Attacking / Defending	Discarding
Creation	Building	Placing
	Composing	Storytelling
	Enclosing	
Choosing	Choosing	Submitting
	Sequencing	
Change of element	Contracting	Upgrading / Downgrading
	Transforming	
Activation	New Mechanic	

Table 3: Järvinen's "Library of Mechanics" (2008, pp. 385-394) and the UGO.

Järvinen describes certain mechanics as submechanics of others, such as “point-to-point movement” as a submechanic of “moving” (Järvinen, 2008, p. 392) and “powering” as a submechanic of “attacking / defending” (ibid.). Here, I will focus on the earlier mentioned mechanics of “accelerating / decelerating” as submechanics of “manoeuvring” (idem., 385) and “sprinting / slowing” as submechanics of “moving” (idem., p. 392).

Järvinen defines “sprinting / slowing” as a mechanics where “[t]he players are allowed change [sic] their speed of movement in order to gain best possible result” (2008, p. 392) and “acceleration /

deceleration" as a mechanic where "[t]he players are allowed to change the speed of the game element (often component-of-self) they are manoeuvring" (idem., p. 385). The only difference between these two definitions is that the latter additionally includes the "component-of-self", which he defined earlier as "components possessed by oneself and controlled by oneself" (idem., p. 63). Here, Järvinen makes a distinction between those elements that are controlled by a player within a game and the player themselves, as he also points out that characters can be components-of-self if controlled by the player (idem., p. 64), and that "[i]n physical games such as sports, often the player is there to present herself" (ibid.). Thus, while making a distinction between those elements that are controlled by the player in, for example, video games, he points out the same distinction in physical games, but collapses the position of the player and the component-of-self into one. It is this fusion that creates the two different types of mechanics, which should in fact be the same: manoeuvring and moving. Considering only the mechanic and the underlying formal system, it is irrelevant if the navigating – to use a term alien to his distinctions – entity is the player or an element controlled by the player. Both cases are an act of navigation, movement, or manoeuvring, depending on which term one prefers. The most obvious difference between these two mechanics is their use in non-digital (sprinting and slowing, moving) and digital (acceleration and deceleration, manoeuvring) games. To formalize these mechanics, the reference to the executing element must be removed, enabling us to collapse "manoeuvring" and "moving" (Järvinen, 2008, pp. 390, 391) into one mechanic, 'navigating', and equating "acceleration / deceleration" and "sprinting / slowing" (Järvinen, 2008, pp. 385, 392) as the same special cases of navigation. Other examples of mechanics that were identified as special cases are "arranging", "jumping", "substituting", "taking", and "trading" (Järvinen, 2008, pp. 385, 390, 393, 394); cases of formalization include "attacking / defending", "conversing", and "herding" (idem., pp. 385, 388, 389).

The deconstruction of compound mechanics aims at breaking down mechanics described by Järvinen into their smaller elements. The idea of compound mechanics directly refers to Zagal *et al.*'s "compound actions" (Zagal, Brown, *et al.*, n.d.: Compount Action). One of these compound actions will also serve as a direct example of how some of Järvinen's mechanics are constituted by several more granular mechanics. His "aiming & shooting" mechanic is defined as "[t]aking an aim towards a target and trying to hit it with a a [sic] component (ball, dart, ammunition, etc.)" (Järvinen, 2008, p. 385). Interestingly, Zagal *et al.* specifically declare "shooting" one of their "compound actions", as "[w]hen an entity (the shooter) shoots, it performs multiple actions. The primary action is that the shooter releases a projectile object. The projectile object moves along a trajectory. This trajectory is often determined by the shooters [sic] targeting" (Zagal, Brown, *et al.*, n.d.: To Shoot). Following Zagal *et al.*'s breakdown of shooting, Järvinen's "aiming & shooting" was translated into the navigation (movement) of aiming and the movement of an object. Oftentimes shooting is connected to the mechanic of removing an entity or resource (lifepoints), but these two have to be considered two different mechanics, for if they were not, pulling the trigger would automatically cause the removal of the entity. As this is often not the case, the mechanic of removal is connected to the traveling object. Other mechanics from the library that are compound mechanics are "catching", "enclosing", "information-seeking", and "storytelling".

"Controlling", "operating", and "powering" were dismissed as falling outside of the definition of mechanics. "Controlling" and "operating" are borderline cases, as parts of their definitions fall outside the definition of mechanics, while other parts depend on the particular mechanic that is executed with the objects. Both constitute the execution of a mechanic while having a particular component selected or under control. "Controlling" is defined as "[k]eeping possession of a component and/or handling/controlling it" (Järvinen, 2008, p. 388) and "operating as "[t]aking an action where an object belonging to the game system (a component, environment) is operated" (idem., p.391). Firstly, "keeping possession" is clearly outside of the definition of mechanics as "methods invoked by agents, designed for interaction with the game state" (Sicart, 2008). Instead of interaction with the game state, this part of the definition merely describes the upholding of a game state, which occurs without any action. To simplify, the player takes possession of an object and does something with it (executing a mechanic), which changes the game state. In other words, "controlling" refers to using an object over a longer period of time, whereas "operating" could be understood as a single time activation. Describing controlling this way is in fact an attempted shortcut, to cluster a longer process into a single term. On a very granular level one can understand both instances in the same way. When dribbling, the player takes possession of the ball and executes a movement mechanic with it, delivering it to another location. In that moment, they lose possession of the ball to the game system (or physics) until regaining possession and executing the mechanic again. Considering only one instance of this longer process of dribbling, it resembles the formal structure of a die roll exactly: taking possession, executing mechanic, losing possession. This leads to another difference present within this distinction.

The used object in the case of "operating" has a function in itself: the die generates a random value. Controlling, on the other hand, refers to the handling of a ball, such as dribbling in Handball, where the ball has no further purpose than being an object.[66] This additional function, however, is a representational property of the material object. Thus, this distinction is based on an added property of the used object, rather than a property of the mechanic itself. Allow me to elaborate on this.

[66] This ties into a broader discussion about materiality of games and exchangeability of elements. Briefly put, these two examples explain why in some games it is possible to exchange an object with nearly any other object (e.g. replacing the soccer ball with cans), while in other games the possibility range is much smaller. The used objects must fulfill a particular function within the game system and the range of objects than can be used for that function are more limited when it comes to random number generators, than objects with the function of only 'existing'.

As discussed, one roll of a die and one ‘dribble’ of a ball are not different from a purely mechanical point of view. The movement of the die additionally triggers a randomize function, due to the material and representational properties that we add to the object: rolling a die without numbers on it would be as meaningless as throwing a ball towards the ground. To turn this around, in a system that specifies a certain numerical outcome depending on what part of the ball hits the ground, a similar randomize function would be triggered by throwing the ball.

To summarize the discussion of “controlling” and “operating”, both are partially neglected, as ‘upholding a game state’ falls outside of the definition of mechanics. The “controlling” mechanic can furthermore be separated into smaller units, rendering them equal with the operating mechanic, and the only difference that would remain is based on properties of the used objects, not the mechanic itself.

“Powering” is when “[p]layers are allowed to use maximum physical power to gain the best result” (idem., p.392). The definition of this mechanic puts an emphasis on games in which the “attacking / defending” mechanic is predominant (ibid.). As Järvinen refers to physical sports such as boxing, the use of “attack / defend” should, again, be replaced by navigation (movement) of body parts and the attempted removal of the opponent from the game. Of course, using strength changes the degree of impact and severity of this move, but the executed mechanic remains movement. Furthermore, a similar mechanic would have to be introduced for outsmarting people, or using dexterity. These three player properties may be considered an alteration of mechanics, similar to the already discussed acceleration and deceleration. However, to me it appears that these three properties only describe how a mechanic is executed *better* on the basis of properties of the informal player.

Before concluding the refinement of Järvinen’s list of mechanics for the UGO, a brief discussion of the mechanic ‘change of element’ is necessary to delineate its particular focus. As discussed above, mechanics are, on the most formal level, always a change of some value. Thus, one could assume that all mechanics fall under the category 'change of element'. However, the difference between this mechanic and the others is that it changes the nature of another formal element of the game itself, not only an attached value. Navigation, for example, changes the location values of an element; removal and creation chenge the complete or partial existence of an element; change of possession changes the element another element belongs to, etc. The 'change of element' mechanic does not change such values of entities within the system (location, possession, etc.) but must be understood as changing an element's inherent properties. This means, for example, that it changes the player relation from 'cooperative' to 'competitive' (covering Järvinen's "contracting" and "transforming"), or the individual properties and function of an entity (covering Järvinen's "upgrading / downgrading").

With these refinements, I arrive at a list of seven basic mechanics in games:

1. Changing of possession occurs when an element (entity, a particular space, etc.) is exchanged between two entities, or one entity and the game system. This change can be further split into receiving an element or sending an element. Another special case within this mechanic is 'exchanging'. Exchanging refers only to the very specific mechanic of a mutual change of possession. For example, in *PokémonGo* (Niantic, 2016) trading Pokémon can only occur iff both players are exchanging a Pokémon. In other words, it is not possible to gift a Pokémon to someone without receiving something in exchange. Only this particular instance is considered an exchange. A verbal agreement and subsequent mutual sending of resources, such as in *Ogame* (Gameforge, 2002) is considered two mechanics (two times sending), as it can be cancelled or executed unilaterally.

2. Activation describes the mere initiation of another mechanical system, function, or item. The pressing of a button in the real world can be described as navigation, but it must be considered more formally. Using a digital die is the activation of a function that generates a random number. In a digital environment, pressing a button is the activation of the system behind the button. In role-playing games, equipping an item to the avatar activates the item.
3. Navigation is a broad category that refers to the general movement, relocation, or allocation of elements. It covers spatial and temporal navigation of the avatar, as well as more abstract movement of resources, such as currency or votes to other abstract locations (a bidding or voting situation) for evaluation. Due to the broad nature of this category, it will be discussed in more detail, including the introduction of further subdivisions.
4. Removal describes the elimination of an element from the game. The mechanic refers only to the particular case in which an entity is permanently removed from the game. Before the introduction of respawning in *Fortnite* (Epic Games, 2017), removing an opponent's life points to zero (partial or incremental removal of a resource) ultimately removed them from the game completely. Opposed to this are situations, such as in Ludo, where tokens are simply moved from one location in the game to one where they are functionless until re-introduction. This latter case must be described in terms of navigation.
5. Creation describes bringing elements into existence that were not present before. When a player's life points in *Fortnite* are partially removed, they can use an item to create new

life points. The assembly of parts to create a new whole is also considered creation, such as crafting or building.

6. Choosing enables and requires the player to decide on a game element for evaluation of the game system. The most common example is selecting an element from a range of options, such as in riddles or hidden-object games (e.g. *June's Journey* (Wooga, 2017)). Similarly, *Reigns* (Nerial, 2016) offers two options to a player who is required to choose one of them.
7. Change of element alters the nature of a game element itself. It can change the properties of an element completely, potentially changing its location within the Unifying Game Ontology. This can change the relationship between players, as well as mechanics available to particular tokens in a game.

In the following, the mechanics will be discussed, including the description of subdivisions. I will start by describing the universal *mutability*, before describing particular types of mechanics and their possible subdivisions. These will start with the broadest category of navigation mechanics.

Universal: Duration of Change

As mechanics were defined as methods invoked by agents to change the game state (cf. Sicart, 2008), a first general facet can be described through the difference of the duration of a given change. The three classes are adopted from Elverdam and Aarseth's *mutability* dimension (2007, p. 15): *finite*, *temporal* and *infinite*. Their term 'mutability' was not adopted, in order to prevent juxtaposition with the 'change of element' mechanic.

A finite duration of change describes alterations to elements that will cease with the conclusion of a game instance. In a match of *Heroes of the Storm* (Blizzard Entertainment, 2015) players gain experience and level their heroes to a maximum level of twenty. These levels change the state of the hero-entity, but will be void after the conclusion of the match.[67] During an instance of Beer Pong, players remove or re-arrange (navigate) the opponent's cups. Just as in the example of *Heroes of the Storm*, the location and removal of the cups only persist during one instance of Beer Pong, and with the conclusion of the instance the alteration of the particular element concludes as well.

Temporal changes to game states do not persist either. The difference from finite changes is that temporal changes cease within one instance of a game. The creation of portals by Wraith in *Apex Legends* (Respawn Entertainment, 2019) also alters the game space, as it directly links two previously disconnected locations. As the durations of these portals are exactly sixty seconds, the change to the game space is temporal in nature. Another temporal change to the game space that is only incidentally connected to time are the portals in *Portal 2* (Valve Corporation, 2011). In principle, these portals are infinite. However, practically a player uses several portals within one instance of the game, as well as within levels. Each new placement of a portal removes a previously placed portal, making these alterations of the game space temporal as well.

Infinite changes persist over the period of several instances of a game. This is the case in role-playing games where characters gain abilities and levels that carry over to future sessions of the game as well. However, this category bears a problem within the particular scope of the present project. The persistence of changes usually occurs in two cases – either the change affects a property that lies

[67] There are other leveling systems in *Heroes of the Storm* that include the leveling of particular heroes across matches. However, this example refers to the levels within only one instantiation of the game.

outside an orthogame's formal system,[68] or different instances of a game must be considered the same instantiation, which means that changes would be finite. I will discuss these two cases separately.

In some games, players obtain changes to their characters within one match (or instantiation of the orthogame). In the multiplayer mode of *Titanfall 2* (Respawn Entertainment, 2016), players can level up weapons to give them access to new and additional mods for those weapons. These mods include bigger magazine sizes, new scopes, or better handling of the weapon. Once a weapon is leveled up within one match, the player can choose these new mods and they will be added after the next respawn. As the level of weapons is tracked outside of the orthogame, in the overall menu of *Titanfall 2* the weapons, their level, and the mods that come with it can be considered a meta-entity that is only drawn upon during each individual orthogame instance.

Another example of infinite changes to the game state are massively multiplayer online role playing games, as well as their predecessors, pen-and-paper role-playing games. Here, the player's entity gathers levels and skills that carry over between multiple instances. This, however, is not technically an infinite change of an element, but connected to the infinite teleology of the overall game. While instances of the game (e.g. one afternoon of playing *Dungeons and Dragons* (Gygax & Arneson, 1974)) might conclude, the overall campaign does not. Thus, in these cases all instances of a group must be considered one instantiation with interruptions. Following this, one must differentiate between the massively multiplayer online role playing games and their analog predecessors, as changes to player entities in, for example, *World of Warcraft* (Blizzard Entertainment, 2004), are only infinite to the point of server shutdown. The changes to a character in a pen-and-paper role-playing game are then similarly connected to the existence of the character sheet.

[68] The term 'orthogame' describes a loosely defined 'core' within a holistic game artifact (see Carter, 2015; also Section 3.6).

Ultimately, the existence or non-existence of infinite changes ties into the discussion of a game's finite or infinite teleology (see Section 5.5.1) and cannot be solved. Some examples refer to entities that should be considered as outside of the orthogame, while others refer to the infinite teleology of a game, instead of the infiniteness of a change. In other words, infinite changes are finite changes within games of infinite teleology.

Navigation

Navigation remained on a high formal level during the refinement of Järvinen's mechanics, leading to its coverage of a broad range of actions. The reason for this is that navigation can be considered from the level of an object being 'here' first and then 'there', to a very informal level of the particular motion of a physical body between two locations in space. In the following, I will further divide this broad notion of navigation to make it more practically applicable.

There are multiple perspectives on the topic of navigation in games. One can discuss the phenomenological implications of navigating game space (e.g. Flynn, 2000, 2008), examine the impact of amount of movement in games (Isbister, Rao, Schwekendiek, Hayward, & Lidasan, 2011), or use it as a specification of space as navigable (e.g. Wolf, 2011). The study of formal aspects of navigation of videogames is limited to my earlier work (Debus, 2015, 2016), which builds on Gazzard's work on paths in games (Gazzard, 2009a, 2009c). This is interesting, as – in many cases – navigation can be considered the configurational mechanic in games. Configuration has been pointed out as the "dominant user function" in games (Eskelinen, 2001, n.p.). In ludonarrative single-player games, it is the player's navigation that connects spatial and narrative dots and arranges them in idiosyncratic temporal ways. In multiplayer games it is also navigation that enables players to play with and place themselves in relation to other players. The following classification will build upon my earlier typology of navigational acts in videogames (Debus, 2016), but alter and adapt it in the necessary ways to fit the present project. To summarize the earlier typology of navigational acts, it is distinguished on five levels (Debus, 2016, pp. 33–40):

1. Nature of environment (topological or geometrical)
2. Environment (space or time)
3. Presence-of-Path (movement or relocation)
4. Modi of Movement (Modus of Movement or subdivision by availability)
5. Level of Predictability (definite, predictable, and arbitrary start or end locations)

To adapt this typology into the present work, the first level will be neglected, as the difference between topological and geometrical environment is described as the difference between discrete and continuous elements and included in the present typology as an unattached facet. In the following, the individual levels will be discussed and adapted.

Environment Facet: Space, Time, Abstract

The environment level (space or time) of the typology of navigational acts (Debus, 2016) will be used as the first facet for the present typology. The navigation mechanic changes the location values of particular elements, within the environment of a certain nature. This division will employ these elements as differences and consist of three facets: *space*, *time*, and *abstract*. Spatial navigation refers to those navigational acts that occur within the space facet of the formal game system. Temporal navigation refers similarly to those navigational acts that occur in the time facet. Generally speaking, temporal navigation refers to the traversal of events of a particular time frame. The frame of time is important here, as the mere passing of time in real life does not necessarily bring new events in the game with it. If, for example, all actions in a turn of *Age of Wonders III* (Triumph Studios, 2014) are conducted, but the players do not start the next turn, no additional events in the game occur and the time can be considered stopped. A temporal navigation in *Age of Wonders III* would then be to advance to the next turn. In other games, for instance *Braid* (Number One, 2009) or racing games such as *Colin McRae: Dirt 2* (Codemasters, 2009), it is possible to move back in time by reversing the occurred events (cf. Debus, 2016).

The last class, 'abstract', is the reason that the navigation element covers such a broad range of informal mechanics. With this facet, game elements are considered to occupy a location in an abstract space of the game system that can be changed without any noticeable change in the interface or game object. It is important to not attach too much meaning to the term 'abstract space'. It is an inaccurate but necessary metaphor assisting in the explanation of the problem at hand. It is also possible to describe substitution players as a property of the teams, only existing as such property attached to the team in the entity element and removed from and moved to that exact property. As there are potentially other ways to describe this 'inventory' or 'stock' of elements not in play, the navigation category 'abstract' covers navigational acts to and from this abstractness of the formal game system. Ultimately, navigation in the abstract facet occurs when elements are moved within the system or brought into or out of one of the other facets.

In the franchise mode of *Madden NFL 20* (EA Tiburon, 2019), players can choose a team and reenact a season of the National Football League, taking the positions of managers, coaches, and players. During the season, it is possible that one of the players becomes injured in a match. If the injury is too severe to let him play, it is possible to move him to the 'injured reserve'. As the active roster is limited to 53 players, the injured reserve is a tool to keep players on the team without losing slots of the active roster. Moving players in and out of the injured reserve is an act of abstract navigation. It is not the removal of players, as they are not removed from the game system completely, they are only 'stored' in a different area. It is also not a creation of players within the active rosters, as the entities existed beforehand in the aforementioned 'different area'. Furthermore, it is not an exchange, as the possession of the players does not change. Thus, this abstract move is considered a navigational act.

Presence-of-Path Facet: Movement and Relocation

In the original typology, this level distinguishes between movement and relocation. It is argued that the difference between moving somewhere and relocating somewhere is not the passing of time, but the "transition between two locations through a path of adjacent locations in between them" (Debus, 2016, p. 35). The exclusion of time from the definition of movement in this distinction is important, as it is also possible that relocation occurs not instantaneously, but over a period of time (idem., p. 34-35). This distinction will be adopted unchanged into the UGO.

The presence-of-path facet is applicable to all three environment classes. In terms of space and time, a given application must determine whether the start and end locations of the mechanic are adjacent or not. Within the abstract class it is more difficult to imagine that a given navigational act would constitute a relocation. In the case of navigation between abstract environments, it would be complicated to argue which locations are adjacent, as they can be described in many different ways (see above). Thus, it appears that the combination of relocation and abstract navigation is unlikely.

Finally, it must be stated that the application of this distinction must be conducted more carefully than it might appear on first sight. As discussed in the unattached facet of continuity: in many cases a process appears continuous but is in fact discrete. However, the distinction remains useful in cases where the underlying formal system explicitly provides discrete spaces to move. Here, it is easily argued whether locations between spaces were physically passed or not. In other cases, an application of the presence-of-path facet must keep in mind that it commits to a partially phenomenological view, as "[…] every computer *Game World* is, in fact, discrete, as the positions and environment are expressed in digital format" (Björk & Holopainen, 2005, p. 56; original emphasis).

Availability Facet: Permanent, Limited, Single

The fourth level of the original typology will only be adopted partially into the present typology. The reason for this is that one particular aspect of "tunneling" (Debus, 2016, p. 36) must be moved to another facet of the UGO. This level of the original typology further distinguishes relocations and tunnels by their availability to the player.[69] First, movement and relocation were distinguished by the presence of a path. Now, they are further distinguished between tunneling and relocation. Tunneling was defined as "[…] the act of continuously moving through altered game space" (idem., p. 36). The idea behind this distinction is that there are special ways of navigation in (especially video) games that enable the player to alter the game's space or time by creating a shortcut (which must not be considered movement in the original sense, as this only uses the available space). However, due to the introduction of the mechanics 'change of element', the special case of tunneling must be moved there from the original typology of navigational acts. The change of element mechanic enables players to alter a game element from its original state, which tunneling essentially is. If, however, only individual parts of the gameworld are removed, the process must be considered two individual mechanics: the removal of parts of the gameworld, and normal spatial navigation.

[69] It also covers the "modus of movement" (Debus, 2016, p. 37), which covers the particular ways in which common movement occurs in, for example, the outside world. As these can only be referred to with common language (ibid.) and distinguished by informal means, this aspect of the original typology will be omitted here.

To return to the adaption of the classification, the availability level describes whether a given mechanic is available “permanently”, “limited”, or “single” (idem., pp. 37-39). It is important that such classification only refers to one particular instance of a mechanic. Just because a character in a game has the ability to teleport and can use it abundantly, with a cooldown in between uses, does not render it a ‘permanent’ mechanic. This threefold distinction only applies to one execution of the mechanic. The character Pikachu in *Super Smash Bros.* (Nintendo & HAL Laboratory, 1999) can use a teleportation move that enables it to jump one to three times. This is a limited use mechanic. A permanent relocation is, for example, Wraith’s portals in *Apex Legends* (Respawn Entertainment, 2019). She creates a link between two locations which people can enter and be transported to the other side. While one might assume this is not teleportation due to the visual presentation of the entity moving between the two points, the characters do not materialize in between the portals and are thus not mechanically passing the path between the portals. Once established, the Wraith’s team can use the portals as many times they like, until disappearance, which is a second important aspect of this classification: the availability is not linked to time, but to numbers of uses. If the definition included time, one could always argue that ‘at some point the server shuts down’ or ‘the game state is lost’, which would mean that there is no permanent use navigation mechanics. Instead, permanent refers to the possibility of using the once executed mechanic infinitely until it disappears (ibid.). ‘Single’ use describes navigational mechanics that relocate the player only once, such as the ‘Blink’ ability of mages in *World of Warcraft* (Blizzard Entertainment, 2004).

Definition Facet: Definite, Range, Arbitrary

The fifth level of the original typology distinguishes navigational acts by the predictability of their start and end locations. ‘Predictability’ is not a good term as it strongly refers to the epistemic capabilities of the individual player.[70] As the present classification aims at a formal level of classification, it is beneficial to eliminate such connotations. Despite terminological problems, the original typology's underlying idea is still adaptable.

It distinguishes between "definite", "predictable", and "arbitrary" start and end locations (Debus, 2016, pp. 39–40). "Definite" refers to mechanics in which the start and end locations of the mechanic are always the same, decided on either by the player or the game system (idem., p. 40). The earlier mentioned portals of Wraith, for example, remain in the same position after initial setup. "Arbitrary" describes start and end locations of a navigational mechanic that are randomly chosen from all actually possible end locations (ibid.). Actually possible end locations are those that the mechanic is capable of reaching. In other words, excluded from the arbitrary nature of start and end locations are locations that are not available to the mechanic under any circumstances. A particular teleportation spell in *Magicka* (Arrowhead Game Studios, 2011) teleports the player to an arbitrary location on the screen. While such navigational mechanics might not be too common due to the lack of control by the player, this example shows that they exist. The category "predictable" will be replaced with "range", due to the earlier mentioned reference to epistemic problems. However, the underlying distinction remains the same: instead of definite start and end locations, or completely arbitrary start and end locations, the navigational mechanic is limited to a certain range of options within the actually possible end locations. Due to this limitation, the category was earlier called "predictable", as it enables the players to know approximately where the navigational act will occur.

[70] For a more detailed discussion about the problems with predictability, see Section 5.8.1 in the randomness element of games (Section 5.8).

Change of Possession

Change of possession was defined as the exchange of an element between two entities, or an entity and the game system. As indicated above, change of possession can be further divided by the difference in role of a particular entity. During a change of possession one entity must *send* the element, while another entity (or the system) must *receive* the element. Examples of this are sending gifts in *Pokémon Go* (Niantic, 2016), or passing the ball to another player in Soccer. It is important to note that the distinction does not include a prior negotiation or the voluntary or involuntary nature of the exchange. Sending resources in *Ogame* (Gameforge, 2002) requires neither agreement, nor negotiation. Players merely load resources on ships and send them to a location. In a similar manner, the passing of a ball in Soccer does not always include prior exchange of information, which is why some passes might not reach the intended person, who acted differently than the sender of the ball expected. In these cases the receiver obtains the element involuntarily, but the inverse case where the sender involuntarily releases the object occurs as well. In American Football it is allowed at any time during play to remove the ball from the opponent team's ball carrier and bring it under possession. In this case, the sender released the ball involuntarily. The addition of prior negotiation or agreement to the definition would render the mechanics informal due to the inclusion of properties outside the formal system. Furthermore, it is important that sending and receiving do not always occur jointly between two entities. Sending the ball or the resources first transfers the objects into the possession of the game system, before another entity receives them. In some special cases these transfers between two entities are simultaneous and the game system is not involved. However, collapsing sending and receiving into a direct interaction between two entities would be a mistake. These two classes are accompanied by a third class in this subdivision: *exchanging*.

Exchanging was added as the particular version of exchange that is necessarily mutual. As discussed above, it is of utmost importance that the mutuality is part of the mechanic itself and not a result of negotiation. As soon as it is *possible* to conclude the exchange unilaterally, the underlying mechanic is that of receiving and sending, not exchanging. An example from a digital game was already discussed earlier with *Pokémon Go* (Niantic, 2016). However, the sub-class of exchanging also occurs in non-digital games, such as *Settlers of Catan* (Teuber, 1994), where players can exchange resources with the game system to a particular rate, on specific locations on the map. This exchange cannot be executed if the player does not deliver the resources demanded by the game system, for example two wools for a resource of the player's choice. Lastly, exchange mechanics are not limited to the exchange of resources of equal nature. It is entirely possible, for example, to exchange a resource (e.g. currency) for the execution of another mechanic: in Monopoly the players exchange money for the execution of a creation mechanic (building hotels).

Activation

Activation was added to the list of formalized mechanics, as the original list was incapable of describing the mere activation of an element with its own function. In non-digital games, the pressing of a button could be explained by the movement of the hand and subsequent activation of the mechanism behind the button. However, doing so would ultimately include the material properties into the classification of mechanics. If these material properties are removed, an argument based on movement is no longer possible.

For example, activating a character's abilities in pen-and-paper games, such as *Dungeons and Dragons* (Gygax & Arneson, 1974), occurs not through the movement of body parts, but through a verbal command. This example, of course, also includes material aspects such as our bodies. However, the comparison aims at the underlying formal process that occurs while either pressing the button or using, for example, a shield spell in *Dungeons and Dragons*, which are formally the same in that a particular function of an element in the system is activated. Activation also covers the use of different items in games. In digital games with role-playing elements it is common to have different items in an inventory that can be equipped to the avatar. To equip something also falls under the category of activation of its effects, which often alter the avatar's properties and therefore influence the game state. To be able to describe these processes formally, it was necessary to introduce the additional mechanic activation.

Removal

Removal was described as the elimination of an element from the game completely. This is important, as ending on the same field as an opponent token in Ludo does not result in the removal of that token, but only in its movement to another space in which it cannot be used until its re-instantiation into the main game field. Another example in which this difference matters is American Football. As opposed to many official Soccer leagues, in American Football it is possible to substitute a player out and later in again. Similar to the situation in Ludo, the player is only moved from the main playing field into a more abstract location where available players are kept. Thus, substituting in American Football is the movement of a player entity from the playing field into that abstract area. Of course, the players also move on and off the physical field, but this is irrelevant for the formal system, which only exchanges one player for the other. There is also a remove mechanic in the game that can only be executed by the referees: ejection. An ejection penalizes a player and its team for major misconduct (such as willfully targeting other players with the intent to hurt). In such a case, the player is ejected from the game, which means they cannot return to playing and must actually leave the location of play completely (not just the actual field). Thus, the ejection is a type of removal of an entity from the game enforced by the referees as representatives of the game system.

Creation

The creation mechanic refers to bringing an element into existence that was not present before. Creation can refer to very obvious instances in which a particular building must be built, such as in a quest in *Lego World* (Traveller's Tales, 2017), an example that I will come back to. Creation does not have to refer to material entities such as objects or agents. It can also refer to the creation of immaterial things such as stories. In the game *Gloom* (Baker, 2004), for example, players must create stories that refer to particular occurrences indicated on cards. Furthermore, participants of Truth or Dare might be asked to create a performance. While the creation is executed through movement, the performance will be evaluated by the game system (the other players) as a whole.

If one was to further subdivide creation, it is possible to argue that creation can either occur *incremental* or *complete*. This distinction is similar to Adams and Dormans' types of continuous and discrete mechanics (2012, pp. 9–12). The terms were changed to distance the present distinction from their broad application to all mechanics, as well as to avoid confusion with the unattached facet of continuity. To return to the earlier example of *Lego Worlds*, the quest to build a house necessitates the player to gather individual elements in a location piece by piece until the completion of a building that is evaluated by the game system. In strategy games, such as *StarCraft II* (Blizzard Entertainment, 2010 -), players can create buildings by merely selecting a building from a menu and placing it on an available location. After payment and a short period of time, the building will be completed holistically. This latter example points towards a problem with the distinction between *incremental* and *complete* creation, as the placement of the building does not, in fact, create the building instantly. The building time could be considered one part of the building process, which would render it incremental again (placement, building phase, creation).

Choosing

Choosing describes those mechanics in which players make a final decision on a particular element to be evaluated by the game system. Evaluation, here, does not necessitate a 'right' or 'wrong' answer; it may also refer to the mere evaluation of the outcome of a particular choice. Thus, the purpose might be to alter the game state according to the consequences of choosing a particular element, or the game system's requirement for the player to take a final decision.

An example of the choosing mechanic is *Reigns* (Nerial, 2016). In this game the player takes the role of a monarch controlling a country. The gameplay consists of advisors, lords, knights, and peasants approaching the ruler and confronting them with problems. The player must then choose between two options that will influence resources. If any of the resources are depleted, the player 'dies'. Similarly, in the quiz show *Who Wants to be a Millionaire?* (Briggs *et al*., 1999) the player is confronted with a question and four answers, one of which is the correct one. The player's task is to choose the correct answer.

Change of Element

Change of element describes mechanics that are capable of changing game elements themselves, not only their values. In the most pragmatic way, the mechanic can be understood as moving a particular element from one class within this UGO to another. As discussed in the navigation facet already, the alteration of game space for the purpose of navigation falls under this category as well. In *Portal 2*

(Valve Corporation, 2011) players create portals that connect previously disconnected locations in space, effectively altering the three-dimensional Euclidean game space itself.

One case of the change of element mechanic was moved from the typology of navigational mechanics and shall be discussed in more detail: tunneling. Tunneling describes the "[…] act of continuously moving through altered (game) space" (Debus, 2016, p. 36). It was moved to the change of element mechanic because the act of moving through altered game space and the act of altering the space itself must be considered separate; tunneling in the sense of digging a tunnel through the ground, as in *Age of Wonders III* (Triumph Studios, 2014), is not a change of element mechanic, but a removal of individual entities (parts of the ground) placed within the game space. Opposed to this, creating portals in *Portal 2* changes the underlying spatial structure itself, connecting locations that were originally apart.

Thus, one must differentiate between altering entities within the game space, which are oftentimes considered the 'gameworld', and space itself.[71] Breaking a window in *Half Life* (Valve Corporation, 1998), an example for fixed environment dynamics by Elverdam and Aarseth (2007, p. 9), is not a change of the game *space* but the *gameworld* (i.e. the objects placed within the game space). The problem at hand is that it can only be considered to be a change of the gameworld if the gameworld is constituted by all entities within it. In other words, the concept of 'gameworld' is a compound of many objects within the game. The removal of a window is the removal of one entity from this compound. I am opposed to the inclusion of the concept of 'gameworld' as an element due to its nature as a compound. Its inclusion would lead to cross-classification of individual mechanics:

[71] Sections 5.4.2, 5.4.5 and 5.4.7 discuss the necessary destinction between game space and gameworld more closely. Briefly put, gameworld is here understood as the objects (buildings, walls, mountains, trees) that are placed within the game space, which only constitutes the game's limitations and cardinality.

destroying a window would simultaneously be a removal of an individual entity, as well as the change of an element.

The existence of a change-of-element mechanic in the game system raises a problem with the unattached facet fixedness. As that facet describes whether a given game element is static throughout the whole game or if it can change, the change of element mechanic renders this facet obsolete, as no change can occur if there is no mechanic for it. However, the practical application of the classification in mind, both facets were included; a particular application might not consider the mechanics element, but still be interested in the fixedness of another element. In such a case, the applicant would not be able to describe a change of an element without the unattached facet fixedness.

Discussion

The creation of this formal list of mechanics raised some observations that shall be discussed here as endnotes before the classification continues with game space. The first observation is that what was considered as mechanics here can be seen as working on (at least) two different levels: those mechanics that are responsible and necessary for the game procedures to take place, and those mechanics that refer to the progression of the system as a whole, which we might call 'meta-mechanics'. These meta-mechanics include advancing turns or rounds (temporal navigation), and two special cases within activation and choosing.

The special case within choosing *could be* (but was not) considered 'selecting'. It occurred to me that before effecting the game state in any way, players often have to pick a particular element to execute a mechanic with it. In Chess, players must pick a token to move, just as in *StarCraft II* (Blizzard Entertainment, 2010) players are required to select units and buildings to give them orders. Selecting a given entity for further mechanic execution, however, does not alter the game state further than 'X is currently selected'. It would be possible to simply accept this as a valid addition to the game state. This would also mean that all mechanics in, for example, strategy games, must be considered secondary to the selection mechanic, as nothing can be executed before the selection of an entity. To avoid this layering of first and second order mechanics, the selection of a particular entity was moved from the list of mechanics to this potential category of meta-mechanics. The special case of 'activation' was moved for the same reasons: it is possible to argue that before any mechanic is executed, a particular ability must be activated first. In the example of pen-and-paper role-playing games, activation of abilities occurs through verbal commands: 'I use my fireball spell to shoot at the orc'. Shooting at the orc would be considered the attempt to remove hitpoints. For this, however, the fireball spell must be activated first. The similarity to the special case of selecting should be obvious: including it into the list of mechanics would render all mechanics of particular games secondary mechanics to the activation mechanic. These two meta-mechanics work as necessary pre-mechanics to other mechanics. Another meta-mechanic can be considered the advancement of temporal chunks.

In the classification of navigational mechanics, moving from one turn to another is a (discrete) temporal navigation. However, one could also argue that the advancement of turns and rounds work, again, on a different level than mechanics such as removal, creation, changing possession, etc. As no other mechanics can be executed until the turn is ended and a new one begins, this temporal navigation enables further changes to the game state and does not change the values of entities within the game itself. In other words, before any other mechanic can be executed, the turn must end. Through this necessity, the advancement of turns is equal to the other two meta-mechanics.

Lastly, in Section 5.4.4 *Classifications of Visual Space* (pp. 205) the perspectival mechanic of scrolling (cf. Egenfeldt-Nielsen, Smith, & Tosca, 2013, p. 119) will be mentioned. It refers to "[…] the gradual unveiling of game space" (ibid.) and could also be understood as a meta-mechanic which does not affect the lower level game state, but the visual presentation to the operator. Another meta-mechanic that will be described later is savability (pp. 236). It was not included in the mechanics element and moved from Elverdam and Aarseth's (2007) 'game state' dimension to the temporal element in the present classification for the reason that it does not *change* the game state. Instead, saving enables players to retrieve the game state at a later point.

5.4 Space in Games

Through the analysis of game classifications, space emerged as one crucial element of games. In the following, I will review literature related to space and games.[72] I will start with an introduction of space concepts outside of game studies. This introduction must and will be limited to some prominent positions, as the discussion surrounding the term 'space' are countless. Following this, I will provide an overview of studies that examined space in games in a more general sense, including concepts such as the gameworld and the player's experience and positioning within it. I will then continue to discuss the differences of the relationships between physical games and space, and digital games and space. I finally conclude with the observation that, from a structural/ludological perspective, a classification of game space can be universally applicable, despite the ontological differences of 'real' and 'digital' spaces.

The goal of this section is to build upon established concepts of space and notions related to it. Most importantly, it is necessary to obtain this overview of existing notions to be able to delineate two things. First, my particular understanding of the term space and with it what my later classification of 'space in games' will actually produce: a classification of how games structure space, which contains

[72] This builds on Debus (2015, pp. 9–11).

other sub-spaces and is measurable through means, such as units, but has no anthropological meaning or history attached to it. Second, it delivers notions to delineate other concepts, such as ‘place’ or ‘location’, which will be used in the later classification to describe particular sub-spaces in games.

5.4.1 Space Outside of Games

The literature on space outside of game studies is vast and I will not be able to cover it in its entirety here. Instead, I will highlight a few discussions surrounding space in general to explicate my understanding of space, which will be the basis for the following reviews and classification.

Marc Augé, in his discussion of how our contemporary society, as “supermodernity” (e.g. Augé, 1995, p. 93), increasingly produces “non-places”, discusses four concepts that are interesting for the present endeavor: space, area, place, and non-place. Places and non-places, following Augé, function as opposites. While places create “the organically social” (Augé, 1995, p. 94), “[…] non-places create solitary contractuality” (ibid.). Places are anthropological sites with attached history, experiences, events, and procedures; they create identity through individual characteristics. In our contemporary society, however, these characteristic sites are increasingly replaced through textual references to real places or the creation of a universal identity. Augé points out how the route along a highway in modern day France is plastered with references to interesting sites that are nearby the road, which the traveler will never actually experience. The *reference* to a place replaces the experience of the place itself. Supermarkets, on the other hand, obtain non-placeness through the creation of similitude (Augé, 1995, pp. 100–103). Through standardized procedures and technology, people interact only with technology, instead of with other people. The supermarket has become a non-place in which every customer is equal, similar to travelers in airports (other non-places): “The passenger through non-places retrieves his identity only at Customs, at the tollbooth, at the check-out counter.

Meanwhile, he obeys the same code as others, receives the same messages, responds to the same entreaties" (1995, p. 103). Thus, Augé's opposition of (anthropological) places and non-places: "Anthropological place' is formed by individual identities, through complicities of language, local references, the unformulated rules of living know-how; non-place creates the shared identity of passengers, customers or Sunday drivers" (p. 101). Simply put, he connects places with identity, and non-places with anonymity (ibid.).

Space, then, is an abstract notion for Augé. He uses space "[…] in much the same way to an area, a distance between two things or points (a two-metre 'space' is left between the posts of a fence) or to a temporal expanse ('in the space of a week')" (ibid., p.82). He elaborates on this by mentioning spaces of jurisdiction, advertisement, and airspace (amongst others). All of these are too vague or diverse in its elements; airspace and jurisdictional space are, for example, amalgams of national borders, international laws, and technologically possible observation methods, and, as Augé argues, "cannot be localized" (ibid., p. 83).

The description of space as an area in between two (or multipe) things also appears in Lefebvre's *Production of Space* (1991). He establishes a "conceptual triad" (idem., p. 33) consisting of "spatial practice" (ibid.), which describes space as lived particulars with idiosynchratic properties (i.e. behaviors, and traditions of inhabitants), "representations of space" (ibid.) as particular relations and order, and "representational spaces" (ibid.) as mostly representational symbolisms. The similarity to Augé's theory can be found in the "representations of space", which Aarseth described as "logical systems of relations" (2001a, p. 163). As with Augé, in Lefebvre's theory these systems only exist *through their relations* and not as something inside of which relations are established.

I will adopt the theory of space as existing before inhabitation, practice, or motion. A theory that was criticized by Lefebvre (1991, p. 169): "[h]aving assigned ontological status by speculative diktat to the most extreme degree of formal abstraction, classical philosophy (or metaphysical) thought posits a substantial space, a space 'in itself'". In fact, Augé and Lefebvre's post-structural understanding of space earned my sympathie. However, considering space as something that is created by entites and practices within it has led to the terminological and conceptual conflation of, for example, game space and gameworld, as the next sections will show. If the production of space through relation of entities is accepted, the fact that games organize space in different ways *before* anything exists within them is easily and quickly forgotten. In my opinion this has led to the careless conflation of the relation of things that exist within the game, and the ways that games organize space on a more abstract level. The fact that two buildings within the gameworld structure my navigational options and create a space in between them has come to be conflated with the more abstract ways that game limit space or separate it into discrete areas. I argue that, by taking a step back from the post-structuralist theories, and considering space as that *in which* is moved, instead of *that which is created by movement and relation*, enables more accurate conceptual distinctions between space that is created within the game, and space that is created by the game.

A theory that is useful for the later classification of organization of space by games are Deleuze and Guattari's distinction between smooth and striated space. Smooth space is that of nature, such as for example the desert, the steppe or the sea (Deleuze & Guattari, 1987, p. 479). Smooth spaces are "[…] haptic rather than optical perception" (ibid.). Striated spaces are our organizations of smooth spaces in lines and grids (ibid.). These two kinds of spaces are constantly translated into each other (idem., p. 474), and the authors describe their difference more formally with the example of lines and points. According to them, "[i]n striated space, lines or trajectories tend to be subordinate to points: one goes from one point to another. In the smooth, it is the opposite: the points are subordinate to the trajectory" (idem., p. 478). To exemplify this further, the authors use nomads and their non-directed journey. For the nomads, space is not traversed to arrive somewhere, but the journey (line) itself is the important aspect of space, rendering it smooth space. Opposed to this, in striated space the importance is on the points, the individual locations, the arriving at somewhere. To connect these points, space is organized in grid-like, or fabric-like structures (idem., pp. 440). In the later classification of games, this distinction will be useful to understand that some games organize space more rigidly, i.e. those that create discrete areas through grid-like structures (striated), and others use space simply as it is (smooth).

Concluding this section, space must be understood as that which is before things, players and behaviors. This enables a clear distinction between those things that create a 'lived space' within the game, and the structural organization of space by the game itself. Furthermore, these structural organization can have at least two different natures. One puts emphasis on individual points, whereas in the other the openness and continuous nature of and possibility to journey is more important.

5.4.2 Game Space as Gameworld

Space in video games is a prevalent topic in contemporary (video) game studies. Günzel, for example, identifies space as "[…] the one category that has come to be accepted as the central issue of game studies" (2008, p. 171). Similarly, Majsova mentions a "spatial turn in game studies" (2014, p. 107), Aarseth proclaims that "[t]he defining element in computer games is spatiality" (2001a, p. 154), and Murray states that "[t]he new digital environments are characterized by their power to represent navigable space" (1997, p. 79). Thus, the amount and variety of space related studies is unsurprising, whether one agrees with these observations or not. Aside from several monographs (e.g. Gazzard, 2013; Nitsche, 2008), a whole anthology is dedicated to spatiality in games: *Space Time Play* (Borries, Walz, & Böttger, 2007) covers topics from the formal architecture of games, to games that permeate our 'real' space (ubiquitous games), to games with a focus on dystopian and utopian themes. To cover all of the excellent essays assembled in the anthology would exceed the scope of this section. Some discuss the development of game spaces over time (e.g. Boron, 2007; Juul, 2007a), and Aarseth discusses the allegorical nature of game spaces, which represent real space in a condensed way to enable gameplay (2001a). Most importantly however, the essays show that the understanding of the term 'space' is connected to other terms such as 'world' (e.g. Jakobsson, 2007), 'environment' (e.g. Pearce, 2007), and 'urbanism' (e.g. Lobo, 2007; Montola, 2007). It appears that 'space' has come to mean different things and to be used in many contexts.

Taylor (2003), for example, examines what one could call 'breaking the fourth wall' and how videogames create a form of presence 'through the screen'.[73] Vella describes ruins in game spaces as maybe "the natural home of the embedded narrative" (2011, p. 3). While problems with the definition of "narrative" and "embedded narrative" might still persist (see Nelles, 1992), the term "embedded narrative" can be described as a narrative that is nested within another narrative, such as when Bilbo tells tales of past adventures inside the narrative of *The Lord of The Rings* (Tolkien, 1954). Following Jenkins (2004b, pp. 126–128), Vella describes the term "embedded narrative" as a story that is nested architecturally in the gameworld (2011, p. 2) and which bears "[…] the scars of events that happened there prior to the player's arrival" (ibid.). In this way, he argues, game spaces function as a "repository of traces of the past" (ibid.).

[73] The fourth wall is a concept first introduced in theatre studies (see for example E. Bell, 2008, p. 203). It describes an imaginary "fourth wall" between the audience and the actors, which is only transparent for the audience. However, in some cases directors play with the idea of the fourth wall by, for example, letting an actor address the audience directly, this is considered "breaking the fourth wall". Some video games employ the method as well, for example in *Conker's Bad Fur Day* (Rare, 2001) the protagonist Conker is in frequent dialogue with the player (and himself) about matters of controls.

While Vella's discussion focuses on constructs in the gameworld as implemented by the designers, Scully-Blaker (2014) examines a practice by players that potentially *deconstructs* game space: speedrunning. He defines speedrunning as "the practice of players or 'runners' attempting to 'travel' from a game's opening state at its first necessary button input to the game's conclusion at its last necessary button input in the smallest amount of time possible" (ibid.). To put it more colloquially, speedrunners try to finish games as fast possible. In his examination of this practice, Scully-Blaker distinguishes between two general kinds of speedrunning: *finesse* runs and *desconstructive* runs. In deconstructive runs, players exploit bugs and glitches in the game to progress faster, no matter if the means used were intended by the designer or not. Thus, a deconstructive run ignores the "ideal game object" (Aarseth, 2011, p. 65), which is a mental construct created by players about how the game "ought to be" (idem., p.66). In an early dungeon of *The Legend of Zelda: Ocarina of Time* (Nintendo EAD, 1998), the 'Deku Tree', players are able to skip a part of the dungeon. For this, a hostile plant has to knock back the player in a particular way, so they fall into an abyss, landing on a lower level. Constantly moving backwards, the player is able to fall into another abyss that is covered with a spider web. This spider web usually prevents the player from entering the next lower level, but if executed as described above, the player can fall through it without its removal. The option of completing the dungeon in this way is part of *The Legend of Zelda: Ocarina of Time* as a digital artifact. If it was not, it would not be possible. However, it is also comparable to walking through a wall and arguably not what the game "ought to be" (Aarseth, 2011, p. 66). Thus, the practice of deconstructive runs deconstructs not the actual game space, but the game space as constructed in the mental, "ideal game object" (idem., p. 65). Finesse runners, as opposed to deconstructive ones, aim to complete the game as fast as possible while adhering to the limitations of the ideal game object.

Adding to approaches that treat space as a bearer of narrative and a restriction of race-like metagame activities, Flynn combines an aesthetic approach to game spaces with a navigational perspective onto them. In her pioneering works, Flynn examines questions of the relationship between the player's positioning in the game space as a design decision (Flynn, 2000) and the importance of the player's navigation in the gameworld – not as a means of narrative-creation, but as the acquisition of a language that functions "[…] at the level of a central organizing device" (Flynn, 2003, n.p.). It is the navigation of digital spaces that enables us to put together the pieces offered by the gameworld. Finally, she also discusses the use and implications of (virtual) navigation for cultural heritage and how the loss of the original's "aura" (cf. Benjamin, 1968) can be thwarted via digital reproduction of historical monuments (Flynn, 2007).

Hayot and Wesp (2009) discuss Norrath, the world of the game *EverQuest* (Verant Interactive & 989 Studios, 1999), in terms of their space- and placeness. They use Tuan's (1977) distinction between spaces as "that which allows movement" (p. 6) and places as "wherever stable object catches our attention" (ibid.) to discuss the world of Norrath and how areas in it became places through inhabitation and practices of players. Consequently, certain areas in Norrath became trade hubs not because the premade world of Norrath suggests these areas for it, but because players started trading in areas that were convenient for travel (Hayot & Wesp, 2009). Similarly, seemingly irrelevant and nameless inns along roads received names (or rather numbers), not because they are in themselves points of interest for rest or purchases, but because they are points that enable players to communicate the location of dangerous griffins (ibid.). While these locations became places through the use of the players, it is clear that Norrath exists as a representation of our (or a) world, before it exists as an inhabited space with places, or as Hayot and Wesp put it as "anthropological-substrate" (ibid.). The representation of a world can suggest places, but ultimately it is the players' behavior that form the real cultural and economic hubs of the space, turning them into places. All of these studies refer to space in video games. However, it appears that the term space – in these cases as well as others – conflates several aspects of 'game space', namely its navigable characteristic, its 'placeness', and the gameworld.

Video games are places in our real world (see also Aarseth (2001a, p. 162), in reference to Leirfall (1997, p. 2); and Nitsche (2008, p. 193) in reference to Wertheim (2000, p. 229)). Using Tuan's terms of space and place, the world of Norrath is – observed from the physical world – a place. Similar to the areas inside of Norrath, which gained placeness through the practices of players that gave the areas purpose, Norrath becomes a place in the physical world through the purpose that players give it. Let this purpose be play, fun, or escapism; in all of these cases Norrath is a space filled with purpose and attributed with a name. Norrath and other video games enable us to "pause" (Tuan, 1977, p. 6) in a seemingly separate space. Fittingly, Tuan describes places as "[…] centers of felt value where biological needs, such as those for food, water, rest, and procreation, are satisfied" (Tuan, 1977, p. 4). These places in the real world are, however, also spaces that enable movement. Just as a church is a place inside of which we are able to move. However, studies referring to space in video games often refer to the games' aspects of placeness, their purpose, the function that gave them a name, or their meaning to the players, rather than the aspect of enabling navigation within a formal system. In the present project, however, I am specifically interested in the *spatial*, not the '*agoric*' characteristic of games.[74] Formally ontologically speaking, there is no difference between a place and the part of space with a name. Both will refer to the same ontic structure, which in turn often encloses space. The difference at hand is clearly a phenomenological one. Spaces become places through the experience of

[74] The word 'agoric' is derived from 'agora', which were public spaces in ancient Greece where various activities were held, including arts, athletics, trade and spiritualism. With the term 'agoric' I refer to the nature of a place as inhabited, practiced and purposeful, not to those practices in particular.

the agoric characteristics of a part of space by a person and the attribution of such characteristics to the material structures located in this part of space. Thus, in the classification of space as an element of games, studies regarding what *kinds* of navigable spaces games contain are of higher relevance than the previously discussed studies, which are concerned with human practice, experience, and the particular objects that such experiences are attached to.

It appears that the terms game space and gameworld are sometimes used interchangeably. It is, however, possible and necessary to distinguish between areas with attached meaning through practice (places), and the formal structure these are located in (space). Furthermore, it is necessary to distinguish between the structures that meaning is attached to (objects) and their function for the formal system. These structures include artificial objects such as weapons, tables, and buildings, as well as natural objects such as mountains, rivers, and forests, all of which are ultimately distinguished by semiotic labels. For the underlying formal system, however, there is no difference between a limitation by a wall, or a cliff. A first helpful distinction was made between space and place, where places are areas within a gameworld that were ascribed particular purpose through the actions of players. The gameworld must then be understood as the material or representational entities placed within the purely formal system that space is.

5.4.3 Games, Mazes and Stories

Two common metaphors for video game spaces are the labyrinth and maze (e.g. Fernández-Vara, 2007; Gazzard, 2013, p. 13).[75] It appears that the two terms tend to be used interchangeably, even though some interesting distinctions have been made in the past (Fernández-Vara, 2007, p. 74). Doob (1990),

[75] See also Aarseth (1997, pp. 5–9), who argues against the metaphorical application of such terms by narrative theorists due to the apparent marginalization and exclusion of literary works that are truly non-linear (idem., p. 8).

for example, distinguished between unicursal and multicursal structures of labyrinths (see also Aarseth, 1997, p. 6). A unicursal labyrinth offers only one path between start and end, whereas a multicursal labyrinth confronts the user with decisions, and thus offers multiple paths through the structure. A common video game example for a unicursal structure is *Half-Life* (Valve Corporation, 1998), in which the player takes the role of the Gordon Freeman, who has to progress through the linear corridors the game offers, while puzzle-solving and defeating enemies. A multicursal labyrinth can be found in the level overview of *Lylat Wars* (Nintendo EAD, 1997),[76] in which the player can chose different paths of levels to approach the antagonist Andros. What both structures have in common is their function to slow down the person attempting to pass through (Fernández-Vara, 2007, p. 74).

Aarseth (1997, p. 6) points out that these two structures correspond to the linear and maze type labyrinths, as described by Eco (1984, p. 80). Eco, however, also describes a third kind: the net (ibid.). In this structure "every point can be connected with every other point" (idem., p. 81). This definition, as correctly observed by Aarseth (1997, p. 6), corresponds to Deleuze and Guattari's (1987, p. 7) description of a rhizome: "any point of a rhizome can be connected to anything other, and must be."[77] This third category appears to be fundamentally different to the inaccessibility of the other two (Aarseth, 1997, p. 6). Thus, returning to the other two types (unicursal and multicursal), it appears to be useful to stay away from the terms 'labyrinth' and 'maze'. The problems with these terms are manifold. As already mentioned, they appear to be used interchangeably. Furthermore, Aarseth observes that "[t]he problem is not, finally, that literary critics use words like *labyrinth*, *game*, and *world* as

[76] The (non-Japanese) NTSC-version's name of the game was *Star Fox 64*.

[77] While Eco's definition of the net resembles the rhizome, it actually does not clearly capture the topological structure of a net. In a net, each point is connected to each other point *through other points*. Thus, a net is *not* a rhizome. Rauscher (2018, p. 18) similarly describes labyrinths of classical role playing games as rhizome-like. According to him, points in the labyrinths can (often times) be navigated to freely, after the player visited them once. While this comparison might fit *some* role playing games, such a generalized statement disregards the variety of navigational acts (cf. Debus, 2015, 2016) that video games offer. These labyrinths are only rhizome-like iff *every* point on the map can be reach from every other point. Any case of uni-directionality or single-use navigation (cf. Debus, 2016) negates the claim.

metaphors in their analyses of unicursal works but that this rhetoric seems to have blinded them to the existence of multicursal literary structures and to the possibility that the concept labyrinth (in their post-Renaissance rendition) might have more analytic accuracy in connection with texts that function as game-worlds or labyrinths in a literal sense" (1997, p. 8; original emphasis).

These and other types of maze structures have also been used in narrative analysis of games. Murray (1997) has been criticized for confusing the structure of mazes with those of rhizomes (Gazzard, 2013, p. 14). In her discussion of the maze and its potential to be used to tell stories, she argues that "[t]he maze is a road map for telling […]" the story of Theseus, the love of the princess of Crete, and how it leads to Theseus' defeat of the Minotaur (J. H. Murray, 1997, p. 130). On a similar note, Jenkins wants to "[…] consider in what ways the structuring of game space facilitates different kinds of narrative experiences" (2004b, p. 122). He draws from amusement park designers to discuss how important the environment is for situating a given ride in a story or fantasy world, and, other than in amusement park rides, how video game designers similarly design worlds in which we can touch and interact with everything; although the former have to consider the safety of their visitors. He further argues that games can function as "evocative spaces" (Jenkins, 2004b, pp. 123–124, 2007, p. 56), which players enter with a preconception of the game's overall story and which "[…] center around their ability to give concrete shape to our memories and imaginings of the storyworld […]" (2004., p. 124) in a world of transmedial storytelling. Evocative spaces can be understood as follows: while the player in *Naruto Shippuden: Ultimate Ninja Storm 3* (CyberConnect2, 2013) mostly follows the story, setting, and places of the original anime series, only re-enacting important confrontations, the players of *Star Wars: Shadows of the Empire* (Nintendo, 1996) – and other game titles of the franchise – are thrown into the Star Wars universe, complete with familiar characters and places, but completely new events. Lastly, he describes game spaces as containing "embedded narratives" (2004b, pp. 126–128), which the game designers must scatter around the gameworld to assure that the player does not miss information contained in particular areas or structures due to exploration of the gameworld or overcoming an obstacle. Here, Jenkins explicitly mentions the maze again: “We may have to battle our way past anatagonists, navigate through mazes, or figure out how to pick locks in order to move through the narratively impregnated mise-en-scene” (idem, p. 127).

In a more careful attempt to bridge the gap between narratives and games, Aarseth (2012) approached narrative in games by first establishing what the common denominators of narrative and games are (a world, objects, characters, and events). His study is, amongst other things, informed by his earlier discussion of quests in games (Aarseth, 2005) – which in turn considers other discussions of quests in games (e.g. Tosca, 2003; Tronstad, 2001) – and adapts the world categories, which are of interest here, from his own earlier work (Aarseth, 2005), in which he connects what might be interpreted as narrative structures in games to actual spatial restrictions. In other words, he observes that (at the time) game designers rely on spatial limitations to tell stories and that these restrictions can be mistaken for the traditionally linear structure of narratives. However, in his later study he describes world structures on a scale with six points for orientation. On one pole of the scale are inaccessible worlds, followed by single room worlds (e.g. *Keep Talking and Nobody Explodes* (Steel Crate Games, 2015)[78]). The scale continues with games that occur in a linear corridor (*Half Life*) and a multicursal or hub-shaped labyrinth (*Star Wars: Knight of the Old Republic* (BioWare, 2003) and *Far Cry 2* (Ubisoft Montreal, 2008)). It is here that the metaphor of labyrinths and mazes emerges once again. Finally, on the other pole of the scale are open landscape games (*Fallout* (Interplay Productions, 1997)*, The Elder*

[78] I am deliberately deviating from Aarseth’s example *Façade* (Procedural Artists, 2005) here, as the game starts in the hallway and proceeds to the apartment room in which most of the gameplay takes place. In fact, I managed to end the game before even entering the *second* room. Of course, this brief discussion is based on the representational aspects of the game, as one can argue that it is possible to interact with the other entities in the game *through* the door. Thus, mechanically speaking, the game constitutes one room, while representationally at least two. However, by replacing the example with my own one I have avoided this issue entirely.

Scrolls IV: Oblivion (Bethesda Game Studios, 2006) and *World of Warcraft*)). While these topological structures are interesting for the upcoming classification of space in games, another distinction made by Aarseth must be noted first. He describes ludic and extra-ludic space as the “arena of gameplay” and “the surrounding non-playable space” (Aarseth, 2012, p. 131) respectively. A distinction that was also made by Bonner (2018), and which leads to categorizations of merely visual spaces.

5.4.4 Classifications of Visual Space

As discussed earlier, the term ‘space’ is used in many different ways in game studies, describing the underlying formal relation of nodes, the topology, as well as the gameworld. Here, I want to illuminate some literature that describe different types of visual spaces, or space as represented. While marginal to the main goal of this thesis, it is useful to describe these endeavors for two reasons. First, even though the classifications describe visual spaces, I cannot know *a priori* that the classifications do not also illuminate some aspects of the underlying formal systems. Second, the present review can serve as a basis for future endeavors of filling the UGO’s subject field of ‘representation’ in the facet ‘space’. Thus, this section can be skipped by the reader who is only interested in the original scope of the present project.

In a broader discussion of video game aesthetics, Egenfeldt-Nielsen *et al*. (2013, pp. 97–131) discuss different, space related aspects of games (idem., p. 107-119). For example, they discuss how visual representations of space can be interpreted as either completely abstract or representing a three-dimensional space on a two-dimensional plane (ibid., 115). In other words, the visual representation of video games can be interpreted as conveying different underlying spaces. For the later classification this means that it must cover all possible interpretations of a particular visual representation, which is a perhaps impossible endeavor. However, the challenge will be to create a system that is capable of describing the broadest possible range of underlying spaces.

To return to the classification of visual spaces, Egenfeldt-Nielsen *et al*. also describe active and passive off-screen spaces (idem., pp. 117-118). They adapt the concept of off-screen spaces from film, where a scene in a building can include the sound of a busy street, which then is part of the film space, but not actually shown (idem., p. 117; their example). Following the classification of the authors, such off-screen spaces in video games are active or passive. In passive off-screen spaces "nothing really happens" (ibid.), such as the background scenery in *Brothers: A Tale of Two Sons* (Starbreeze Games, 2013). In active off-screen spaces, "[w]hat happens beyond the frame inevitably affects the course of the game. Thus, the off-screen space here is radically different from that of [*Brothers: A Tale of Two Sons*]. It is dynamic, living, or *active*" (idem., p. 118; original emphasis; replaced their game example with my own). Thus, their active off-screen spaces are what Björk and Holopainen describe as "inaccessible areas", which "[…] are parts of the Game World the player can perceive but cannot currently enter […]" (2005, p. 62). They also state that these areas can be affected by other means, but not navigationally accessed (ibid.).

Bonner makes a similar, but threefold, distinction as Egenfeldt-Nielsen *et al*. of "[…] architectures and landscapes in digital gameworlds: the ludic navigable (active level structures), the merely visual (passive level structures) and the implicit (*Skybox*)" (2018, p. 134; original emphasis; translation by the author). As his focus lies on the navigability by the player, the active and passive categories do not completely overlap with Egenfeldt-Nielsen *et al*.'s. Bonner's passive level structures instead overlap with Egenfeldt-Nielsen *et al*.'s active off-screen space, as the space has influence on the gameplay but is – as *off-screen space* – not navigable by the player. Egenfeldt-Nielsen *et al*.'s passive off-screen space, however, covers both Bonner's passive level structures, as well as the skybox.

Furthermore, Egenfeldt-Nielsen *et al*. describe “scroll” as “[…] the gradual unveiling of game space” (2013, p. 119), a perspectival mechanic that can be described in Elverdam and Aarseth’s terms as “vagrant” (Elverdam & Aarseth, 2007, pp. 7, 9), but refers to a two-dimensional representation of space. I emphasize its nature as ‘perspectival’ because the practice of scrolling is not a mechanic in the sense of the definition that was adopted here (see Section 5.3.1), and was considered a possible ‘meta-mechanic’ (Section 5.3.3). These actions – to avoid the term mechanic – only change the state of the game’s representational layer by showing a different part of the gameworld, but they do not change the mechanical game state.

One of the earliest taxonomic approaches towards video game spaces is Wolf’s article *Inventing Space: Toward a Taxonomy of On- and Off-Screen Space in Video Games* (1997). His taxonomy is focused on the spaces as represented on the screens, rather than the represented spaces. Through the examination of early video games, he arrives at eleven types of space. (1) All text-based space describes games such as *Zork* (Infocom, 1980), which display only strings of text to the user. The user then reads and responds to the text with written commands. Thus, while there is arguably a navigable space represented through text (see also Fernández-Vara *et al*., 2005), Wolf describes them as games without visual space. He continues with games that (2) have one screen that is static and constantly contained on the display-screen. *Space Invaders* (Taito, 1978) is such a game in which the player will only be presented with one screen. This type leads to a similar, yet different screen: (3) games with screens that have a “wraparound” (Wolf, 1997, p. 14). *Pacman* (Namco, 1980), for example, offers only one screen, but the player is able to exist this screen to the right and re-enter it on the left. The term ‘wraparound’, thus, describes a type of screen that could be imagined as wrapped around a cylinder (in this case, other games would be wrapped around other types of geometrical objects) and thus connected in the particular locations on the right and left of the screen (see Fernández-Vara *et al*.,

2005) with something that could be described as a "tunnel" (see Debus, 2016). The next two types (4, 5) describe games that scroll on one and two axes respectively. Wolf mentions *Street Racer* (Atari Inc., 1977) as an example for the first type and *SimCity* (1989) for the second type. If these spaces were separated in discrete screens that are displayed one after another, as for example in *The Legends of Zelda*: *A Link to the Past* (Nintendo EAD, 1991), they would be considered of the type (6) "adjacent spaces displayed one at a time" (Wolf, 1997, p. 16). Types seven and eight (7, 8) begin to include the Z-axis. *Super Mario Bros.* (Nintendo, 1985), for example, displays, in addition to the navigable 2-dimensional world, a background image that is seemingly detached from the navigable one and moves independently of it, creating the illusion of depth (7) (Wolf, 1997, pp. 17–18). Another type of Z-axis involvement includes elements of the game moving in and out of the screen along it (8), as for example in *Starship 1* (Atari Inc., 1977) or *Star Wars* (Atari Inc., 1983). What is nowadays commonly referred to as 'split-screen' describes type nine (9): multiple, non-adjacent spaces displayed on the same screen or several screens. Contemporarily the most widespread type of space is (10) the "interactive three-dimensional environment" (Wolf, 1997, p. 20). Lastly, Wolf created an individual category for "represented or 'mapped' spaces" (idem., p.21). These refer to, for example, mini-maps that represent the general game space in a smaller area of the screen in form of a map. In contemporary video games this type of space is most commonly used in strategy games, but also in role-playing games, in which the players sometimes have to access the map specifically, instead of it being continuously displayed.

5.4.5 The Relation of Games and Space

It is, in fact, paradoxical to speak of 'space in games'. All individuations of games are played *in* space (cf. Juul, 2005, p. 164), but claiming that they *contain* space would be too simplistic. First of all, it must be stated that there are games without explicit spatial limitations, such as a designated playing field. Augmented reality games, for example *Pokémon Go* (Niantic, 2016), can be played anywhere on this planet. Limitations are only set by network and GPS coverage. Even less spatially restricted is the drinking game Buffalo. Its rules are simple:[79] once a player decides to join the game, she is not allowed to drink with her dominant hand anymore. If they are right-handed and takes a sip from a drink in their right hand, another buffalo-player can call her out ('Buffalo!') and they will have to chug the drink.

Buffalo is a truly ubiquitous game. No marked playing field is required and, once they join, people are technically in-game forever. There is no escaping the game temporally or spatially. Even if a buffalo-player encountered another buffalo-player on the International Space Station or on Mars, they would still be at risk of 'being buffaloed'. While it is also interesting to note that players do not necessarily know who else participates in the game, more important for the present case is that the game is not restricted in space, neither explicitly by a designated field, nor implicitly by practical limitations as in *Pokémon Go*.

However, it is safe to state that most games do either restrict or organize space in a certain way. Some games (e.g. Tennis, Soccer) limit the playing field explicitly through rules and lines. Others, such as physical card games, board games, and many drinking games (e.g. Meyer), limit the area of play implicitly: participants play at the same table, so that all necessary information is explicitly available to everyone (e.g. *Monopoly* (Magie & Darrow, 1935)).

Aside from the limitation to a particular area in space, games also organize the space within their boundaries in different ways. One common organization of space are discrete areas. Chess, for example, organizes its board into 64 discrete areas. Each of the areas may only be occupied by one

[79] There are more rules that regulate, for example, what happens if a drink is not chugged or what kinds of drinks are eligible for the game (hot drinks are excluded). However, I will limit the length of the description to the here necessary rules of the game.

figure and each figure can only be present in one square at a time. While it is physically possible for the figure to stand in two squares, in the frame of the game system it is not. Other games may use hexagonal areas (e.g. *Settlers of Catan* (Teuber, 1995)), or variations of triangular areas (e.g. *Orbital* (Pujadas, 2018)). A more detailed classification of spatial organizations by games will be conducted in Section 5.4.7. For now, it should be clear that non-digital games employ different methods for limitation and organization of space. I specifically refer to non-digital games, as the case of digital games is more complicated.

One could argue that digital games neither *contain*, nor *organize* space in any way. They merely *represent* space and its limitations and organizations. More specifically, digital games represent space by imitating how space is perceived. When one plays *World of Warcraft* (Blizzard Entertainment, 2004) the screen does not *contain* actual space as known in the physical world. As Vella points out, the space that digital games create is "[…] not continuous with the player's actual space […]" (2015, p. 2). The player cannot reach into the screen and experience the space as by reaching through a window. Instead, an illusion of space is created by a particular arrangement of lines and the illusion of movement is created by the adjustment and alteration of these lines.[80] By this I mean that the space visually perceived in digital games is an optical illusion. While 'real' space is perceived through the particular alignments of geometrical shapes, digital games – similar to optical illusions – use learned perceptions of space to create an image that imitates the real space. Ultimately, however, space and movement in digital games are nothing more than flat, two-dimensional images displayed in rapid succession. It is true that the visually represented space does not exist as perceived by the player. However, there is more to digital spaces than their visual representation of something familiar. Using

[80] For a historical account of the development and implementation of such techniques in digital games see Wolf (2009).

Lefebvre's (1991, p. 33) trifold distinction of representational spaces, elsewhere (Debus, 2015, p. 13) I have used the following example to illustrate the idiosyncrasies of digital spaces:

> In the practice of special effects, this difference [between two characteristics of virtual spaces] becomes more clear. If, for example, a special effects artist wanted to let a ball of energy fly through a street in a movie. The footage of the street is provided. The energy ball has to be created in any special effects software. The problem, which arises now, is that the footage of the street is just an image (whether it is a moved [sic] image or a still does not matter for this discussion). It is a 'representational space' [Lefebvre, 1991]. This image has strictly speaking no depth. But not only that, the image itself does not have any kind of space attached to it. The reason we see the street as a space is that our brain translates lines and curves that are arranged in a certain way as depth and space. But the image itself does not deliver either of those. That is why the special effect artist has to give this information to the computer. The lines as shown in the mere image have to be translated into a grid which the computer then can interpret as depth, the representation of space, and through which it can calculate the flying energy ball. Finally, this grid has to be fit onto the image of the street.

Digital games, other than pure digital images, do not only represent space as we know it, they also represent space as organized by the underlying simulation. Using the above example, digital games contain the image of the street, but also the grid – in itself another representation of space – that is necessary to make the mere image *navigable*. This navigability, as has been pointed out earlier here, as well as by Tuan (1977), is an essential characteristic of space.

The purpose of the above discussion was twofold. First, it is necessary to distinguish between the game space that is navigable and limited or organized; the gameworld that is the representation of a fictional world, *as well* as the underlying game space; and video games as places within the real world, as well as artifacts that subsequently contain places, which are created through the practice of players within the gameworld (cf. Section 5.4.2). To disentangle and explicate the game space terminology, Nitsche's five analytical planes of video game spaces (2008, pp. 15–17) are useful. The planes of *play* space (the space the human player occupies while playing) and *social* space (surrounding spaces, such as the shared space during play but also communities around games) are of little interest here. More important are the planes of *rule-based*, *mediated,* and *fictional* space.

To start with the latter, the fictional space describes the game's world as produced by the imagination of the player (idem., p. 16). The fictional space is constructed (or "imagined" (ibid.)) by the player after and through the perception of the mediated space. The mediated space consists of the images that are presented to the player on the screen. One can now see how the fictional space and mediated space differ: many video games use teleporters or discrete levels that are fictively connected, but these connections are never displayed to the player as mediated space. For example, when players travel between 'Kalimdor' and the 'Eastern Kindgoms' in *World of Warcraft* (Blizzard Entertainment, 2004), they mount a ship or zeppelin. After a short time of movement in the gameworld, the players enter a loading screen in which the map of Azeroth – the world of Warcraft – is portrayed and the course of the vessel is displayed as red dots. On arrival, a short period of movement is shown on the screen again, before docking. Through this, the players are able to imagine that there is something in between the two continents, even though this 'space' is never shown to them (cf. Debus, 2015, pp. 61–63). Lastly, Nitsche describes the rule-based space as the space that is "[…] defined by mathematical rules that set, for example, physics, sounds, AI, and game-level architecture" (Nitsche, 2008, p. 15). In the domain of space, this layer is comparable to the earlier mentioned grid that is added to an image in special effects. More specifically, by 'grid' I do not mean the visual grid, but what makes the gameworld (until now a mere image) *navigable*.

To reiterate the terminology for the above discussed concepts, I will refer to game space as the navigable, limiting, and organizing formal structure and gameworld as the (mostly) visual representation of a fictional world, in and with which players can interact. Gameworld, here, subsumes the mediated space and fictional space, as I am not further interested in a classification or distinction of the representational layer of games. The gameworld is considered to be added *on top* of the underlying spatial and navigable structure.

This leads to the second reason for the above discussion, which was to illustrate that the space of and within digital games is different from physical space. Ultimately, video gameworlds are "allegories of space" (Aarseth, 2001) that represent the real world and imitate how it is perceived by the player, as well as its spatiality. To make these imitations of a world playable, digital games allegorize them (Aarseth, 2001, p. 169) by deviation in the forms of downscaling and short-cuts. Simply put, it takes mere minutes to travel by foot from one city to another in games, while such a distance in the real world might take hours or days. Thus, digital game spaces as allegories ultimately originate from a discrepancy of spatial relationships between places in the real world and places in gameworlds, or as Aarseth (2001a, p. 169) puts it:

> […] the topology of even the most 'open' computer generated landscapes makes them quite different from real space, and controued [sic] in ways that are not inherent in the original physical objects they are meant to represent. This makes them allegorical: they are figurative comments on the ultimate impossibility of representing real space.

However, Aarseth also observes that the landscape of *Myth: The Fallen Lords* (Bungie, 1997), "[…] for all its initial beauty, and as all computer game landscapes, merely *looks* like a landscape, but is really a three-dimensional scheme carefully designed to offer a balanced challenge to the player" (Aarseth, 2001, p. 168; original emphasis). While suggesting 'worldness' to the player, gameworlds are actually nothing more than polished versions of the structural limitations and organizations of space that many physical games also offer. The ‘world’ of Azeroth (*World of Warcraft*, Blizzard Entertainment, 2004) does not consist of continents, but of limited playing fields that are separated into discrete areas. The visual representations of planets in *Destiny 2* (Bungie, 2017) serve the same purpose. Inside of these discrete areas the player can move freely, but ultimately the digital artifact *Destiny 2* limits the player’s actions to the spaces it mediates.

I will continue with a classification of game space on a structural level without differentiating between physical and digital games, because both digital and analog games organize space in particular ways. The two different methods of organization are here the (mostly) the limitation of space by physical games and the limited creation and representation of space by digital games. The classification will aim at the limitations and organizations of space by games through rules, implicit or practical boundaries, and code (in the case of digital games).

5.4.6 Classifications of Navigable Space

A general classification of game spaces was developed by Aarseth *et al*. (2003) and later refined by Elverdam and Aarseth (2007). While not distinguishing between what, here, has been separated into space and gameworld, the earlier typology delivers three dimensions for space: *perspective*, *topography*, and *environment*. The perspective in games, according to the authors, can be vagrant or omnipresent. A vagrant perspective forces the player to parse the game(world) incrementally, whereas an omnipresent perspective reveals it wholly to the player. This distinction was also adopted in Elverdam and Aarseth’s typology (2007), for both virtual and physical space.

With topography, Aarseth *et al*. (2003) describe whether the game allows continuous, free movement or if it consists of discrete areas. This distinction is a commonly accepted one in regards to games (e.g. Debus, 2016; Elverdam & Aarseth, 2007; Fernández-Vara *et al*., 2005; Günzel, 2008) that is also supported by earlier theories of space, such as Deleuze and Guattari's distinction between smooth and striated space (1987, pp. 474–500). However, the later typology of Elverdam and Aarseth shifts the focus from the topography of the environment to a more player-oriented distinction based on their positioning. The question in the 2007 typology is whether a player's position can be determined in an absolute manner ('the pawn is in C5') or only with relative means ('I am next to the yellow house').

The environment dimension of Aarseth *et al.*'s (2003) typology describes whether the players are able to alter parts of the game environment (dynamic environment) or not (static environment). Elverdam and Aarseth (2007) later apply the environmental dynamics to their dimension of virtual space (idem., p. 8), but interestingly *not* to the dimension of physical space (idem., p. 9). I argue that, in their typology, the possibility to alter space must be added to physical space as well. Curling would be one example in which it is very important to alter certain parts of physical space. However, the dimension of environmental dynamics will be excluded from the present classification of space. First, Elverdam and Aarseth's category aims at the alteration (or addition) of certain entities within the game space: houses, windows, etc (Elverdam & Aarseth, 2007, p. 8). Thus, they are not referring to space as it is understood here, but instead to the 'gameworld'. The alteration of the gameworld is then actually the execution of particular mechanics directed towards entities: creating an object (house), removing an object (window). Thus, because the notion of gameworld can be described in smaller units and because alterations to it are covered by mechanics that are directed towards entities, the dimension of environment dynamics will be excluded from the present classification.

Fernandez-Vara *et al*. limit their analysis to "[…] how computers generate visual spaces procedurally, rather than how they import from other media, such as digitized videos of photographs" (2005, p. 2), thus, so the authors "[…] games such as text adventures […] will not be accounted for by the terms defined here" (ibid.). With this limitation in mind, they use two major differences in space in games. First, they employ the distinction between continuous and discrete spaces. However, different from Elverdam and Aarseth (2007), and closer to Wolf (1997), they describe the screen as "[…] the basic unit of space in videogames […]" (Fernández-Vara *et al*., 2005, p. 3). They also conflate how space is represented through screens and the topographic (to use Aarseth *et al*.'s (2003) term) nature of the space. In other words: even though a digital game space is displayed on discrete screens, one could still argue that the space itself is continuous, rendering only its representation discrete.

Fernández-Vara *et al*. further distinguish the (1) cardinality of gameplay, (2) the cardinality of the gameworld, and (3) the spatial representation of the game. The latter describes the 'mere' visual representation of a world that is not (necessarily) navigable by the player and thus of no further interest for the present endeavor. The difference between cardinality of gameplay and gameworld, however, constitutes an interesting observation. With this, the authors make a distinction between the part of space that is navigable and the part in which gameplay actually occurs. Usually the cardinality of gameworld and gameplay coincide, and examples in which they are disconnected are sparse. However, Fernández-Vara *et al*.'s distinction is applicable and necessary for special cases. They mention *Doom* (id Software, 1993), as the gameworld is visually spread out in three dimensions, but the player can only navigate it moving forward and sideways. However, as the authors state themselves, in some cases the players are able to fall down, which means that the authors (implicitly) restrict 'navigation' to 'intentional' or 'controlled' navigation. After all, it is the player's decision to fall down. A potentially better example (which was, of course, not available at the time) is *Astebreed* (Edelweiss, 2014). In this shoot 'em up game, the player's navigational options are always limited to two axes, but the automatic movement changes between combinations of the X, Y, and Z axis. Thus, the gameplay is (in every temporal instance of the game) two-dimensional, while the gameworld is clearly three-dimensional, as indicated by the shifts of used axes. In some cases, opponents also move on the axis that is not currently available to the player, to effectively become invincible and still attack the player from the third plane.[81]

5.4.7 Classifying Game Space

The following sections will describe the Unifying Game Ontology's facet of the space element. They will start with an important distinction between space, location, place and the gameworld, as these notions are often used interchangeably, but a distinction is necessary for deeper discussions of game elements and their relations. The classification will then continue with facets describing how the underlying formal system of games organize space.

Space, Location, Place, and Gameworld

The difference between space, locations, places, and the gameworld is included as a pragmatic tool during the analysis of games, but formally not always possible to uphold, as 'location' is distinguished by a representational label of the game and 'place' refers to the players' practices, which are both informal elements outside of the formal game system.

Space was discussed and considered to be the purely formal underlying structure as delineated by the game system. This space is filled with entities (objects) such as forests or mountains, as well as buildings, the sum of which must be understood as the *gameworld*. Space was then contrasted to *place*, which can be considered an area or location that gains meaning through the inhabitation and practice of humans (players) (cf. Hayot & Wesp, 2009; Tuan, 1977). Places are not just any random area within the gameworld; they are where trade and combat occur, as well as areas that gain meaning through

[81] For example, early in Chapter 2 of the game, around 5:30 into a play-through of the game.

necessity of efficient communication (cf. Hayot & Wesp, 2009). A place is an area that gains meaning through human practices.

A *location* is different, as it is an area that gains meaning prior to human behavior and is assigned by the game (not the system). Thus, locations are those parts of the game space that can be considered to have a 'name'. The city Orgrimmar is a location in *World of Warcraft* (Blizzard Entertainment, 2004), as are the areas The Barrens and Durotar. The representational layer assigns these labels to areas in the gameworld, which turns them into discernable locations. However, being labelled does not add any meaning to a location other than its discernibility. In this sense, Orgrimmar is a location *a priori* to its 'placeness' as a hub for players to trade and learn. In fact, the placeness of cities in *World of Warcraft* changes majorly with each new add-on to the game. For example, when *World of Warcraft: The Burning Crusade* (Blizzard Entertainment, 2007) was released, the original capitals of Azeroth were deserted, as all players used the new capital Shattrath as the main location for tasks that required travel to one of the other capitals before.[82] This shows that locations are not necessarily places but the inverse is possible as well.

As previously mentioned, Hayot and Wesp (2009) describe how particular inns in the game *Everquest* were given numbers (i.e. names) by the players to be able to communicate the exact location of dangerous gryphons along a road. These inns had no meaning attached to the game itself and were thus not locations. Due to the communicational meaning they were given by the players they became places without being locations.

It must be remembered that space, place, and location are distinguished by informal differences. They were included in the present classification to offer a pragmatic tool during the analysis of

[82] Some particular tasks, however, remained only possible within the original capitals. Thus, the properties of their placeness changed from covering a broad range of tasks and interactions, to places with very specific meaning to the players.

particular games, and due to the appearance in previous literature and the common conflation of formal and informal elements. In other words, including these informal distinctions highlights the difference between formal and informal elements of games.

Continuous and Discrete

As discussed in the *Unattached Facets* (Section 5.2.3) the *continuous* and *discrete* nature of game spaces has been pointed out before (see Aarseth *et al*., 2003; Debus, 2016; Günzel, 2008). The distinction can be compared to Deleuze and Guattari's two types of smooth and striated space (1987), but should not be equated with it. What Deleuze and Guattari describe is rather the difference between a naturally occurring, more or less chaotic topography, and the human operation of organizing this smooth space into a striated, fabric-like grid. In (game) practice, discrete spaces are nearly always connected to the latter rigid organization of space by lines. Discrete spaces in contemporary digital and board games are ordered in squares, hexagons, or other shapes, but the particular shape is unimportant for the space's discreteness – after all, shapes are representational elements. Here, text adventure games are a special case as discrete spaces do not have to take any such particular forms but can be rather chaotic and arbitrary. The reason for this might be associated with reliance on textual, instead of visual, representation. Discreteness essentially means that one particular entity can be in either one space or the other, but never both at the same time. While it is possible for a figure in Chess to stand on the seam between two squares, the formal system necessitates it to be placed in one or the other.

Continuous space can then be understood as the opposite of this definite spatiality. In continuous spatial elements, the position of an entity is determined not by the description of a particular location in the system, but by its relation to other entities (cf. Elverdam & Aarseth, 2007). In continuous spatial elements there are no discernable locations in which the player is first before moving to another; navigational transitions between locations are smooth (cf. Günzel, 2008), as the space that Deleuze and Guattari described.

In *World of Warcraft* (Blizzard Entertainment, 2004), both types of spatial elements are present. When a player wants to visit the orc capital Orgrimmar they can enter through a gate in Durotar. After a few virtual meters the player has to make a right, cross approximately three times the distance from before, and then make a left, to see the buildings of Orgrimmar tower before them. But when is the player *in* Orgrimmar? After entering the gate? After leaving the gate? And where is the invisible wall 'after the gate' that determines whether the player is in the 'neutral gate zone' between Durotar and Orgrimmar? It is this relativist view that continuous space brings with it.

This particular example also enables me to point out an important commitment one subscribes to if using the distinction between continuous and discrete space in digital games: it is only possible from a phenomenological point of view, as "[…] every computer *Game World* is, in fact, discrete, as the positions and the environment are expressed in digital format" (Björk & Holopainen, 2005, p. 56).[83] The reason is that the invisible wall I asked for *does exist*. There is a particular point when entering Orgrimmar for the first time where the game system assigns experience points to the player for 'discovering Orgrimmar'. The invisible border in question is located at the first gate, right after the player leaves Durotarian soil. This is when the player is *in* Orgrimmar. In non-digital games this phenomenological commitment is, I argue, weaker, as arguing this would in turn argue that each location in physical space can be described with a definite location. If this argument is followed, it

[83] Björk and Holopainen (2005) conflate the concept of the game space and the entities within it. For them, the Game World is constituted by the spatial relationships of game elements. Game elements are materializations of entities (those objects that players use to interact with the game state) in the current project. Thus, Björk and Holopainen mix the spatial relations between these entities, and the underlying spatial layout (continuous and discrete). However, while their term Game World is inaccurate, their observation towards the issue of 'continuous space' in digital games remains correct.

ultimately ends up on the quantum level of physics where, at the current state of knowledge, locations can only be determined after measurement, but are also determined *by* measurement.

Topology

The types of topological properties of game spaces will be adapted from Aarseth's classification of worlds in games (Aarseth, 2005, 2012), but certain alterations must be made before inclusion in the UGO. Generally, the topology of game space describes how spatial elements in a game are arranged.

Aarseth's types of *single room* and *open landscape* will be clustered under the label *single space*. The reason for this is that the delineation of these three categories can only occur via addition of representational elements. The difference between single room and open landscape is implicitly made by a matter of scale. His examples are *Façade* (Prodecural Arts, 2005) and *The Elder Scrolls IV: Oblivion* (Bethesda Game Studios, 2006) (*Oblivion*). There is no formal difference between the open landscape of *Oblivion* and the apartment in *Façade*. The difference is one of scale: it is the relation of the player's avatar to the space. In *Façade*, the apartment can be traversed within minutes, while traversing the space in *Oblivion* takes hours. The problem with incorporating scale into the classification is that an application would ultimately be based on arbitrary thresholds that are either fluid between applications, or arbitrarily chosen in advance: how big must a space be to no longer be a single room? However, if one only considers the arrangement of the spatial elements, this problem does not emerge: one contained space in which the entities exist and move. A second possible difference between *Oblivion* and *Façade* is the existence of sub-spaces within one space. This, however, will simply be understood as nested single spaces within another single space, as long as they are not arranged in particular ways that will be discussed in the next paragraphs.

The arrangement of *linear corridor* refers to the arrangement of single spaces in an order where one space can always only be accessed from the same one or two other spaces. The spaces in a linear corridor are connected like the links of a chain. Aarseth's example is *Half Life* (Valve, 1998). It is important to differentiate between the arrangement of spatial elements and how a particular element is represented. In the case of *Half Life*, the player follows linear structures that resemble lines more than rectangles or squares. However, this is not meant by the topology of linear corridor. Instead, it refers to the arrangement of individual spaces with each other.

This linear arrangement can be broken up by introducing forking paths, where it is possible to reach the end location by choice of multiple different paths. Such spatial structures are *multicursal labyrinths*. In *Lylat Wars* (Nintendo EAD, 1997), the player must fight her way through several levels, represented as planets, which constitute single spaces. To reach the final level, the players can choose between different paths. Some of these paths are hidden or hard to enter, but in principle it is possible to arrive at the final stage through multiple combinations of single spaces. The overall structure of arrangement of these levels is a multicursal labyrinth.

Lastly, spaces can be arranged in ways that require players to always return to one particular space to enter other spaces. In *Glover* (Interactive Studios, 1998), players always return to one space where they try to remove an apparent curse from a castle. To do so, they enter other spaces to obtain items that bring the 'castle space' back to normal. These smaller spaces are only accessible from the castle space, which makes it the hub in a *hubshaped space*. I omit Aarseth's addition to the term ('hubshaped quest landscape') consciously to detach the spatial arrangement from the existence of quests in the game.

Cardinality

Cardinality refers to the dimensionality of the game space (cf. Fernández-Vara *et al.*, 2005). Here, it describes the dimensions that are available to mechanics of the formal game system. This is important because many games include visual dimensionality that is different from that of the underlying formal system, as it is not accessible to the entities for actions (cf. Bonner, 2018; Egenfeldt-Nielsen *et al.*, 2013). *Limbo* (Playdead, 2010), for example, is a mechanically two-dimensional game that displays elements behind these two accessible dimensions, suggesting a three-dimensional world that it is not.

Cardinality ranges from zero to three dimensions. Game space can have *zero* dimensions if one considers games in which real space does not play a role. In the card game *The Mind* (Warch, 2018), players draw cards which display numbers from one to 99 and keep their drawn numbers hidden from the other players. The players then, without communication, place the cards face up, one after the other, in the correct order of numbers. Thus, the game is essentially based on waiting and estimating how long another player will wait before placing a particular number. *The Mind* can, in principle, be played without any dimensionality, as the cards are merely an informal, material aid.

One-dimensional games are mostly experimental games, such as *Wolfenstein 1-D* (Lacher, n.d.). This game adapts the gameplay of the famous *Wolfenstein* series into only a line with differently colored entities. As the player can only move from left to right, and all actions are only executed within this line, the game's spatial element has a one-dimensional cardinality.

Spatial elements with *two dimensions* are much more common than one-dimensional elements. Historically, two-dimensional games were the only available digital games for a long period of time during the 1970s and 1980s.[84] Two-dimension spaces are common for platform games, such as *Super Mario Bros.* (Nintendo, 1985) or the earlier mentioned *Limbo* (Playdead, 2010), but also board games such as *Pandemic* (Leacock, 2008) or *Hellboy: The Board Game* (Mantic Games, 2019). Visually, two-dimensional spaces could be further classified by the axes they use (cf. Wolf, 2009). However, formally speaking it is not possible to discern whether a given spatial element has an X and a Y, or an X and a Z, axis. The connection of board games with two-dimensional space is, of course, not necessary. Jenga may, for example, be considered a three-dimensional board game.[85]

Three-dimensional spatial elements enable entities to act on three axes. Especially since the first 'actually three-dimensional' game *Mario 64* (Nintendo, 1996), three-dimensional games have dominated the market of digital games.

Not every game must use only one cardinality throughout the whole game, and not all cardinalities must take the same form. A curious case is, for example, *Little Big Planet* (Media Molecule, 2008), where continuous and discrete cardinalities are combined. The game initially appears to be a common two-dimensional platform game, but also allows the player to move into the game space (z-axis) as well. The X and Y axes can be used continuously by the players, but in the third dimension only three discrete areas exist. In this case, two continuous spatial elements are complemented by a discrete third dimension.

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[84] While *3D Monster Maze* (Evans, 1981) was released in 1981, the game is only visually three dimensional, not mechanically.

[85] This also shows that the genre 'board game' is a difficult category, as Jenga does not include any board. In many cases, 'board game' contemporarily simply means 'not a digital game'.

Limitation

Limitation refers to whether and how the space element is limited by the formal system. The most common limitation of game space is *prescribed*. Here, the formal game system defines an area within which players can engage with the system. In Soccer and other similar sports, this limitation is called a pitch or field and is usually demarcated with lines on the ground. An *implicit* limitation describes the playing area as not demarcated with such means, but where other circumstances narrow the space in which play occurs down to a certain degree or areas. *Pokémon Go* (Niantic, 2016) can in principle be played anywhere. However, due to the necessity of a GPS signal for play, the game system implicitly limits the area of play to those areas on planet earth where GPS is available. Games with *unlimited* spaces can actually be played anywhere, regardless of physical or technological restrictions. The drinking game Buffalo can be played anywhere on earth, as well as any other place in the universe. While there are physical limitations to the game that restrict it from being played by humans on, for example, the sun, the game system itself does not prescribe such limitations nor rely on technology or materials that would exclude the sun as an area of play for entities that are immune to heat.

5.5 Time in Games

Time was identified as a game element, as temporal aspects were employed by three classifications. While LaBrie *et al*. (2013) referred only to simultaneous actions in one of their five drinking game categories, Aarseth *et al*. (2003) and Elverdam and Aarseth (2007) engaged more deeply with the structure of time in games. Before providing an overview of the different approaches towards time and games, I will take a step back and briefly reiterate how time is understood outside of games.

I will examine two relevant positions towards the nature of time: Reductionism and Platonism (cf. Markosian, Sullivan, & Emery, 2016). “Reductionism with Respect to Time” (ibid.; henceforth ‘Reductionism’) argues that time only exists because of temporal relations of things and events (ibid.). In other words, time is not a phenomenon that exists independent of other things; if everything in the universe disappeared, there would be no time. “Platonism with Respect to Time” (ibid.; henceforth ‘Platonism’) opposes this idea, and considers time as having an independent existence, “[…] like an empty container into which things and events may be placed” (ibid.). Following this perspective, the universe and its events are only placed in time; if they disappeared, time would still exist and could possibly be filled with other phenomena. Without taking sides, it is useful to remember time as either dependent on things and events or as empty container into which things and events can be placed.

Another question is that of the topology of time. Markosian *et al*. state that both positions are connected to certain assumptions about the topology of time (ibid.):

> For if Reductionism is true, then it seems likely that time’s topological features will depend on contingent facts about the relations among things and events in the world, whereas if Platonism is true […], then time will presumably have its topological properties as a matter of necessity. But even if we assume that Platonism is true, it’s not clear just what topological properties should be attributed to time.

In other words, if time exists in itself (Platonism), then its topology should be a property of time, even if we are unsure exactly what this property would be. If time is only based on events and things (Reductionism), then the topological property of time must be found within the nature of these relationships.

Markosian *et al*. also note that both positions are quite similar to the arguments of the same schools of thought in regards to space (ibid.). According to Boroditsky (2000), this is an observation that could be explained by “metaphoric structuring”. While she states that “[…] there is no evidence that spatial schemas are necessary to think about time” (ibid.), indeed, “[…] similarities between space and time in language have deeper conceptual underpinnings” (ibid.). That is, while a discussion of time does not *require* spatial metaphors, evidence suggests that our understanding of space, as a domain that we directly experience, influences our understanding of time through their underlying connections in language. These connections explain why we refer to events in time as ‘before’ or ‘after’, which are strongly related to locations in space. With this, I arrive at the examination of time in videogames, as ‘before’ and ‘after’ also strongly refer to history.

Rughiniș and Matei (2015) identified four interconnected ways that video games treat and remember historical events. While the remembrance of past events is clearly connected to time, their approach does not offer further insight into the structuring of time by the game system. The authors divide levels of remembrance into four categories, which include: (1) involving specific historical events, (2) claiming truthful representation, (3) inviting empathic understanding and (4) offering players opportunities for reflection. Though useful for analyzing historic games, these categories cover representation (1 and 2), players’ emotions and perception (3) and cognition (4), instead of particular elements within the game system itself. Other approaches towards the representation of past events include Crogan’s (2013) analysis of *Combat Fighter 2: WW II Pacific Theatre* (Microsoft, 2000) and San Nicolás Romera *et al*.’s (2018) study on the Middle Ages and representation thereof in videogames. However, such analyses on representation are outside the scope of this project, which focuses on the underlying formal system of games.

Alvarez (2018) takes a cognitivist and design-oriented approach, suggesting three temporal categories for the analysis of time in games: "*change of state, space-time,* and *conditions*" (idem., p. 52; original emphasis). Change of state refers to the changes in the audiovisual output; space-time describes the placement of elements within space, the design of the space itself, and the resulting structuring of events; and conditions indirectly restrict the order of events by setting particular incentives, such as objectives or countdowns (idem., p. 53). Due to Alvarez' design-oriented perspective, these categories function on a different level than the content of this project. He proposes categories that serve as frames for the analysis of what effect a particular arrangement of elements in the gameworld has on the unfolding of events. However, within the category "change of state" Alvarez discusses certain concepts that are strongly related to properties of time in games as understood in the current project. His category "pace" describes "*constant* or *variable*" (idem., p. 52) pace in time, or the player's ability to alter the speed in which successive events occur (variable) or not (constant). In this study, this is considered the mechanic of change-of-element as it changes a property of the time element (speed) in the game. He also discusses "pause" (idem., p. 59), which on one hand refers to the ability to pause the game completely, and on the other to freeze entities within the gameworld in time (idem., p. 60). In other words, it is a partial pause, limited to particular elements in the game. Alvarez' discussion covers several elements at once, such as the simultaneous actions within *Quake* (id Software, 1996) and the possibility to slow down time in *SimCity* (Maxis, 2013) in the pace category. His categories were inspired by Zagal *et al.*'s game ontology project (e.g. Zagal & Mateas, 2007, 2010), which leads me to the most formal approaches towards the structure of time in games.

A common topic is the relation between game time and time outside the game, in what we could call the 'real-world'. According to Zagal and Mateas (2010), "[r]eal-world time is established by the set of events taking place in the physical world around the player" (idem., p. 848). This temporal frame is useful to understand how time passes within the game in relation to how time passes around the player engaged with the game. As the authors note, in some games the player might have to wait several days until an action within the game is completed (idem., p. 849). A similar but inversed model was developed by Juul (2005) and Elverdam and Aarseth (2007). Juul discusses how a few minutes of play time (the time the player actually engages with the game) might account for years in the fictional time of the game (idem., p. 145). Elverdam and Aarseth's dimension *representation*, within the metacategory *external time*, covers this relation between real world time and fictional time with the label "arbitrary" (2007, p. 10), meaning there is no apparent connection between time that passes in the gameworld and in the real world.

As Zagal and Mateas (2010) define their frame "gameworld time" as "[…] established by the set of events taking place within the represented gameworld—this includes both events associated with abstract gameplay actions as well as events associated with the virtual or simulated world (the literal gameworld) within which an abstract game may be embedded" (idem., p. 849). This definition is a clear result of their preference for the reductionist view on time. This frame essentially describes the passing of time within the world of the game. The authors illustrate it with the example of day and night cycles that may or may not differ from the same cycle in the real world. Curiously, the authors create the additional frame *fictive time*, which describes the "[…] application of sociocultural labels to a subset of events" (idem., p. 850). This is surprising, as the frame of gameworld time strongly points towards the arbitrary connotation of passing time within the game with the label 'day', and the authors deliver day and night cycles as an example for the strengthening of fictive time (idem., p. 851). Nevertheless, these approaches to connect time inside and outside the game are beyond the scope of this project. Fictional time, whether in the gameworld sense or the 'fictive time' sense, is created through representational elements, such as audiovisuals or narrative elements. Within the game system, events simply occur, and actions take a certain amount of 'game system time' to be executed.

The "arbitrary" representation of time (Elverdam & Aarseth, 2007) that enables the player to create a ludic tank within seconds would be meaningless if the game was stripped of its representational layer. Here, the game system prescribes an amount of real world time to build unit X. The game system only borrows real world time as a referent for a span of production for the entity, yet this referent could be eliminated in the case of turn-based games, where the building of unit X may take three turns. Thus, concepts that relate in-game time to real world time, or that describe time through representational and material elements of games, will be disregarded. Some of them were discussed before and I could add for example, Tychsen and Hitchens, who discuss the times that the material engines and servers run (2009, pp. 185, 186). They also discuss the time that it takes a player to progress in the game (idem., p. 188); the time as constructed by the story of the game (idem., p. 191) – which is comparable to fictive or fictional time; the "world time" (idem., p. 192), which can be understood as the complete history of the gameworld, without narrative tools such as flashbacks or ellipses; and the perceived time (idem., p. 195) that describes the individual's player's perception of time flowing fast or slow in the game. These times refer to material (engine, server), fiction (story, world) and player aspects (perceived, progress) of games and are not formally describe by the underlying system of the game as understood in this project.

For my purposes, a useful category is Tychsen and Hitchens' "turn-based games" (idem., p. 199, or games that occur in discrete chunks of time. Within each chunk, players may either perform their actions individually, or plan out their actions in advance and all players' actions are executed simultaneously. Zagal and Mateas would describe these turns as "coordination events" (2010, p. 850). They describe *coordination time* as "[…] established by the set of events that coordinate the actions of multiple players (human or artificial intelligence [AI]) and possibly in-game agents" (ibid.). One difference between the two concepts is Zagal and Mateas' recurrent description of time as constituted by sets of events and Tychsen and Hitchens' description of turns as temporal frames in which interactions occur. The two models can be ascribed to the reductionist and platonic views on time, respectively.

Elverdam and Aarseth's (2007) metacategory *internal time* is also highly relevant, and includes three dimensions. The dimension "haste" (ibid., p. 11) builds on Aarseth *et al.*'s typology in which the same category was discussed as the presence or absence of "timebased rules" (2003, p. 53), exploring whether the mere passing of time influences the game state. This may be the case if, for example, a game has a countdown. This is different from previously excluded references to real world time, as it does not refer to durations of processes and their comparison between in game and real-world durations. Instead, the game system adopts real world time into its own system for purposes of measurement of temporal passage. The dimension *synchronicity* explores turn-based games, already described by Tychsen and Hitchens (2009, p. 199), where if synchronicity is present, operators can take actions simultaneously, and if it is absent operators take turns taking their actions. Elverdam and Aarseth's last dimension in *internal time*, *interval control*, will be disregarded in the present classification, as the possibility of advancing time intervals is a mechanic and covered by temporal navigation. In this sense, advancing to the next round is the mechanic of a temporal move in discrete time. Finally, Elverdam and Aarseth (2007), as well as Aarseth *et al*. (2003), distinguish between *finite* and *infinite* games, depending on whether a game ever ends (*finite*) or could "in principle go on endlessly" (*infinite*) (Aarseth *et al*., 2003, p. 51).

Finally, the element game state was identified through Elverdam and Aarseth's dimension *savability* (2007, p. 15). Savability could also be considered a mechanic. However, as time can be considered as the order of events, it appears useful to me to place savability as the possibility of exporting the current state, which is the result of all past events, within the element of time. Alvarez also described the act of pausing the game in relation to speeding up and slowing down time (2018, p. 59), and resetting as the rewinding of time (ibid. p. 63). Returning to an earlier save state must be considered a temporal relocation but the possibility to save this state should be considered a property of the time element of the game. Elverdam and Aarseth (2007) consider three types of savability: cases in which saving is not possible (*none*), in which savability depends on the particular situation (*conditional*), and in which saving is an unlimited option always available to the operators (*unlimited*).

5.5.1 Classifying Game Time

The following section describe the facets within the element of time. They start with the distinction between discrete and continuous organizations of time. This is, in fact, an 'unattached facet' that was already described earlier in this chapter (Section 5.2). However, due to its common application the unattached facet was added here as an individual section. The following two facets describe particular properties of temporal elements, while the last facet considers types of savability as different methods to enable later retrieval of a current game state.

Continuous and Discrete

Discrete elements of time order the events in a game into discernable units. The most common *discrete* elements of time in games are turns, rounds, halves, or quarters. A turn is an individual player's time frame to take action. Usually, these frames are not limited to real world time, but this is possible. A round is the accumulation of one turn of each player, meaning if each player took the actions that are possible within one of their turns (or ceded them), a round is concluded. These discrete chunks of time can be understood through Platonism as containers in which events will be placed. They are pre-existing elements of time, as described by the game system, and can be filled with actions, events and entities.

Many sports are ordered by discrete elements of time, usually halves or quarters, with the purpose of allowing the players to rest and making adjustments in strategy. American Football combines quarters and halves. After each quarter the teams switch sides on the field, but the interruption of the game is only limited to this switch. During halftime, teams return to their own zones for a longer period of time, usually about fifteen minutes. Halftime also counts as a quarter in the sense that teams switch sides. Within each quarter, the game is further ordered into plays. The offense has an amount of time (depending on the individual league, but usually around thirty seconds) to execute their offensive play. Within each play, time flows continuously.

The element of *continuous* time can be understood from the reductionist perspective. In continuous time, there are no clear time frames in which events are placed; time is only delineated through the relation of events to each other. This does not mean that the existence of discrete temporal elements automatically excludes the possibility of continuous temporal elements in the game. In fact, temporal elements are often nested. For example, the time within the two halves of Soccer is continuous.

Teleology

Games can end, but they can also continue forever. For this distinction I adapt the terms *finite* and *infinite*. Finite games have end conditions that determine when a game concludes.[86] Ending a game does not include the possibility of returning. This means that leaving the computer for the day is not ending the game, but only the particular play session. When a game ends, all events, items and properties that occurred in or were obtained in the game only remain meaningful outside of the game system, as the particular instantiation of the game is void and inaccessible. It is important that the end of a game is prescribed within the game system for it to be considered finite. For this classification, external factors such as the destruction of a board game, the shutdown of a company, or the explosion of Earth must not be taken into account, for this would lead to all games being finite. Chess is a finite game, as it ends with the checkmate of one of the operators, as is Solitaire, which ends with the removal of all cards from the deck. Ludo-narrative games often end in a similar way after the exhaustion of their content.

Infinite games do not have such prescribed end conditions and can only end through disruptive factors as discussed above. As opposed to finite games, events, items and properties in infinite games will always be relevant. Even if a guild beats the final content in *World of Warcraft* (Blizzard Entertainment, 2004) (an infinite game), the items they received from it will always remain, which will help them in other parts of the game. While the content can be exhausted in principle, these games do not bring a conclusion of the game system with it. Similarly, the drinking game Buffalo never concludes, and even exists in principle if no players are signed up for it anymore.[87] People can still join

[86] For a discussion of end conditions see Section 5.7.2.
[87] After players join Buffalo they must not drink with their dominant hand. If another player sees a Buffalo player drink with their dominant hand they can call them out ('Buffalo!') and the person has to chug their drink. One rule of Buffalo is once a player has joined the game, they can never quit.

the game system, regardless of the number of actual operators. Many contemporary massively multiplayer online role-playing games are infinite games, as their conclusion is only tied to the servers or the company.

Synchronicity

Synchronicity describes whether operators can take actions simultaneously (*synchronous*) or not (*asynchronous*). Asynchronous games order player action in ways that they do not overlap. This could be with turns, in which each player has a designated time to take action. Another example of an asynchronous game is *Magic: The Gathering* (Garfield, 1993) (*Magic*). While the game has obvious asynchronous elements as players take turns, there are certain abilities and spells that one player can execute during the other player's turn. This would render it a synchronous game. In fact, watching a match of *Magic* is like watching a synchronous game, with players constantly taking actions and counter actions. However, there is another asynchronous element in the game: 'the Stack'. Each ability and spell is placed on this stack, so the players can react to the each action. A possible counter action is then added to the stack. This process is continued until there are no more counter actions. Finally, the stack is resolved top to bottom. Thus, while in a match of *Magic* it looks as if actions are taken synchronously, if there is disagreement, players must resolve the actions one by one as the formal system of the game dictates. In this sense, it is not possible for something to happen without a reaction, as it is in synchronous games.

Synchronous games allow multiple actions to be executed at the same time. This means that once an action has been executed and resolved, it is impossible to react to it. While in an asynchronous game, e.g. *Magic*, it would be possible to invoke the Stack and demand the possibility to react. Synchronous elements of time usually lead to fast paced actions within a game.

Even though asynchronous actions by players are strongly connected to discrete chunks of time, it is important to remember that synchronous elements of time can occur within discrete chunks of time. In ‘Simultaneous Turns’ mode in *Age of Wonders III* (Triumph Studios, 2014), the game is still ordered in rounds, but all players’ turns are executed simultaneously. This leads to uncommon situations in the regular turn-based mode of *Age of Wonders III*. For example, normally when a player sees a group of opponent units approaching a bottleneck in a tunnel, they can calculate in advance whether their own units will be able to pass the bottleneck, or if the opponent’s units will block the way. In Simultaneous Turn mode, the round starts and both players will quickly try to move their units to the bottleneck first.

Savability

Savability was included into this classification due to Elverdam and Aarseth’s (2007) employed difference. Saving could also be considered a mechanic, but as it only stocks the game state and does not alter it, it was moved to the time element. Elverdam and Aarseth also described the mutability of given game state changes, which were included as a subdivision of the change of element mechanic. The three savability classes will be adopted into the present classification and complemented by the entity triggering the save. I will first describe the classes in the frame of digital games, followed by a discussion of savability and non-digital games as a special case.

The threefold distinction is based on the availability of saving to the players, which can be *unlimited*, *conditional* or *none* (Elverdam & Aarseth, 2007, p. 15). Unlimited savability presents the player with the ability to save a game state at any point during play. This usually takes the form of a designated ‘save’ button, or a similar option available through the game’s menu. Unlimited savability is very common in single player modes of strategy games (e.g. the campaign or matches against a bot in

StarCraft II: Wings of Liberty (Blizzard Entertainment, 2010)), as well as in strategy games where one match can take several hours (e.g. *Stellaris* (Paradox Development Studio, 2016)).

Conditional savability, or the possibility to save under certain circumstances, can be subdivided by the nature of these circumstances. In *Ori and the Blind Forest* (Moon Studios, 2015) the player can manually save the game state at fountains in the game world, or through holding the 'B' button, which creates a 'Soul Link'. The soul link functions primarily as access to the ability tree; generating a Soul Link also saves the game state. Using this ability costs energy, which means a player cannot use it if they do not have enough resources available. *Ori and the Blind* Forest contains two versions of conditional savability: *location* and *resource*. A third possible sub-class within the subdivision of conditional savability is *time*. In this case, saving depends on the passing of time (i.e. a cooldown, or the change of turns/rounds).

No savability is present in contemporary 'rogue-like' games, where once the player-controlled entity is removed from the game, all progress is lost and the player has to start anew. Other games that include no option to save are multiplayer games with short match spans, such as the popular battle royale games *Fortnite* (Epic Games, 2017) *Apex Legends* (Respawn Entertainment, 2019) and *Player Unknown's Battlegrounds* (PUBG Corporation, 2017), multiplayer online battle arenas, such as *League of Legends* (Riot Games, 2009) or *Dota 2* (Valve Corporation, 2013), as well as many arcade games, such as *Pac-Man* (Namco, 1980) or *Donkey Kong* (Nintendo, 1981). Non-digital games arguably represent a group where savability is not an option.

So far, I have outlined the explicit option of saving a particular sate to the holistic game object for the purpose of later retrieval. In non-digital games, such explicit options are not present. One could argue that every non-digital game has either an implicit option of saving the game state by simply stopping the play and returning later, or a more explicit option such as taking a picture of the current state. A different perspective is that the first option (stopping the play) is simply a pause in the game, and not a particularly saved game state. The method of taking a picture, or noting down the state of the game, must be considered a method that is employed from outside of the game system. This is why I ultimately argue that non-digital games have no savability; all methods to return to a given state are employed from outside the system, and non-digital games have no system intrinsic means to achieve what digital save states do.

5.6 Entities in Games

With entities, the formal game system describes the function and role of those entities with which play occurs during the game. This excludes the spatial and temporal aspects, which are those *within* which play occurs. The element was created on the basis of classifications that employed differences based on players, player relations and material objects (Sections 4.3.8 and 4.3.9). Some of these classifications employed or discussed the categorization of games on the basis of the material objects they use (e.g. Culin, 1907; Jünger, 1959; H. J. R. Murray, 1951). Objects in this material sense were excluded from this classification, due to their material and informal nature (Chapter 4). However, game systems still need to describe formal object positions for items to be played with, even though these formal objects do not refer to any particular object, but certain functions an object must fulfill, instead. This is why formal objects were included in this classification, next to what can commonly be called players and other agents. Furthermore, while it was stated that it is possible to examine games without the player (cf. Aarseth & Calleja, 2015; see also Chapter 3), it is easily argued that the player has an important role in games, without whom games could not be played and who's "[…] involvement is fundamental to the phenomenon under scrutiny" (Leino, 2009, p. 2).

There are several perspectives on the player as a subject of study. In 2008, the IT University of Copenhagen hosted a conference on the explicit study of the player: *the [player] conference*. The topics covered a broad range of methods and perspectives. To mention only a few: Jørgensen (2008) explores the methodological possibilities and implications of qualitative methods for researchers who want to understand the players' relation to the game and gameworld better; Bergroth (2008) uses recordings of verbal communication to analyze how game culture and expertise develops over time in a case study on *World of Warcraft* (Blizzard Entertainment, 2004); and Kayali and Pichlmair (2008) take a more design oriented approach by examining how particular emotions relate to players during the act of play, arguing for a stronger inclusion of emotions into the practice of game design. Other perspectives explore the player and their relation to the figure they are controlling within the game (Vella, 2015), or psychological aspects of players, such as immersion (Ermi & Mäyrä, 2005). This latter study also touches on possibly the longest established tradition of player studies - player types - as it identifies different types of immersion and that different players' preference of types of immersion might differ (ibid.). This line of player type research has two most prominent examples. Bartle (1996) identifies four general types of players in games based on their preferred actions within the game: killers, achievers, socialisers and explorers. Yee built on this work, developing an empirically-grounded model of motivation for games with three categories: "achievement", "social", and "immersion", and ten further subcategories (2006, p. 773). Motivation for play and players should not be juxtaposed, but as Yee's model is based on empirical research, I argue that different types of players responded in ways that enabled him to construct such categories.

Others have focused on the role players take towards a game. Thorhauge (2003), for example, distinguishes between two kinds of players. One "[…] acts in accordance with the rules" (n.p.), and the other is "[…] the one who recognizes the separate frame of reference and who acts in accordance with this knowledge" (ibid.). She derives the former role of the player who acts according to the rules from Suits' definition of games and the necessity of the player to accept the "lusory attitude" towards arbitrary rules (Suits, 2014, p. 43). In fact, it appears that early approaches towards games and players identify the player as one who submits themselves to the rules of the game. Aside from Suits' inclusion of necessary submission to the arbitrary rules, Huizinga also states that "[t]he player wants something to 'go', to 'come off': he wants to 'succeed' by his own exertions" (1949, pp. 10–11). According to him, players naturally follow the rules of the game in order to succeed within its frame. Huizinga further argues that acceptance of the rules is of the utmost importance, as even the cheater accepts the rules (but finds ways around them), and that the only real threat to the game as such – or the "play-world" in Huizinga's terms – is the spoilsport who does not accept the rules. This leads to transgression of the rules and the collapse of the play-world (idem., p. 11). Like Suits and Huizinga, Caillois also sees the player devoting "himself spontaneously to the game, of his free will and for his pleasure […]" (1961, p. 6), but emphasizes that the player always has the possibility to leave play of their own will (ibid.). Thus, in the terms of Caillois, Huizinga and Suits, a player who transgresses the game's rules is not playing the game, they are the spoilsport that breaks the game. This act of transgression is only possible in Thorhauge's second understanding of the player as recognizing the game as a separate frame of reference.

Smith (2006, pp. 21–42) identifies a similarity between Thorhauge's first type of player and his own "Rational Player Model", and continues with a more detailed fourfold distinction based on the relationship of game design and player behavior (idem., p. 23-24), which reflects different positions a researcher can have towards the player. The "susceptible player model" sees players' behavior influenced after playing; the "selective player model" refers to player choices of different games based on individual preferences; the "active player model" sees players as engaged with the game in ways that go against the intention behind the game’s design; and, lastly, the “rational player model” sees the player as trying to optimize their actions within the frames of the game. These perspectives on players are helpful to identify one’s own research and inform choices of methodology, though they refer to four types of views onto the player, not the player positions described by the formal game system. In this classification, the most relevant perspective is Smith’s “rational player model”, as players are understood as entities that fill a position prescribed by the game. This position does not prescribe any further behavior. Instead player behavior is guided through the availability of mechanics and the inclusion of goals as particularly desirable game states. To clarify, there is a difference between the position prescribed by the game system to be filled by an entity and the behavior this entity is capable of displaying during the act of play. Due to the specific focus on the underlying formal system, this behavior can only be in “accordance with the rules” (Thorhauge, 2003, p. 2), as it would be paradoxical to claim that the system can prescribe behavior that goes against the system. With this in mind, three of Smith’s models are excluded as the game system does not prescribe behavior that goes against its own design (active player), the players’ preferences outside of the game (selective player), or their behavior beyond the game (susceptible player).

As discussed earlier (Section 3.6), it is possible to examine games without necessarily including the player (cf. Aarseth & Calleja, 2015; Leino, 2009). Nevertheless, even studies that are interested in games as systems must acknowledge the player to the extent that the system always describes a formal position to be filled by someone or something. It is this formal player position and its particular compositions that will be described and classified in the following sections.

One way to differentiate between types of this formal player position is to examine the number of players present in a game. Some classifications remain on a rather superficial level, only distinguishing between team games and non-team games (e.g. Borsari, 2004; LaBrie *et al*., 2013), while others dedicate more scrutiny to this topic (e.g. Elverdam & Aarseth, 2007). Another player-related distinction regards the relationship between the players, whether they compete (e.g. Caillois, 1961; Polizzotto *et al*., 2007), or how power is distributed between their pieces (e.g. Murray, 1952).

To start with the number of players and their composition, Elias *et al*. (2012, pp. 22–24) have seven different categories of games based on the number of players: zero player games, one-player games,[88] two-player games, two-sided team games, one-sided team games, multiplayer games, and massively multiplayer games.

It is possible to argue that a game without players is not a game at all. Elias *et al*.'s examples describe mostly phenomena in which no *active* player role is present; only the role of an observer exists. While the term 'zero player game' is justified as the inclusion of a player into the definition of 'game' would be nothing less than essentialism and would contradict some of the earlier mentioned 'underlying ideas of games', their particular approach does not withstand further scrutiny. For example, the authors mention Conway's *Game of Life* as a zero player game but neglect that the game needs an input for an initial start state and must be initiated. The same can be applied to their second example *Progress Quest*, in which an operator must create (or roll) a 'hero' and start the program, which will then automatically level up. From then on, the user can only watch the process. All of these operations must be executed by something that we can easily call the player, despite their subsequent inactivity. However, it is not impossible to imagine the invention of a game without players, which is why this category is of interest in the later classification.

The other categories are also covered by Elverdam and Aarseth's typology (2007), which are more detailed in some areas than Elias *et al*.'s. For example, Elias *et al*. neglect the possibility of

[88] This category is further split into "pure" single player games and games in which one human competes with a simulated other. They call the latter subcategory "one and a half player" games (Elias, Garfield, & Gutschera, 2012, p. 22), a term which indicates their anthropocentric definition of a player.

cooperative two-player games and appear to consider only competitive ones, and they define massively multiplayer games as games "[…] where the number of people a given player interacts with is much smaller than the number of people playing" (2012, p. 24). This definition applies to all of the currently successful battle royale games, such as *Apex Legends* (Respawn Entertainment, 2019), *Fortnite* (Epic Games, 2017) and *Player Unknown's Battlegrounds* (PUBG Corporation, 2017), in which up to one hundred players jump onto a map and it is possible to not engage with a single opponent until only two squads are standing, or to be killed by the first opponent they encounter. It can also apply to particular instantiations of Soccer, where the goal-keeper of a skilled team has no contact with the other team during a whole match. The problem with this definition is that it is hardly generalizable and easily dismantled by individual examples such as these.

Elverdam and Aarseth only describe six categories in their metacategory "player composition": single player, single team, two player, two team, multiplayer, and multiteam (2007, p. 12). With this they cover most player compositions found in games and also avoid the problem of defining the colloquial term 'massively multiplayer' games.

Another one of Elverdam and Aarseth's metacategories subdivides the "player relation" (idem., p.13). "Bond" describes whether the composition of players can be changed during play (dynamic) or not (static). This ability to alter the player relation will be left out of the present classification, as it is covered both by the unattached facet 'fixedness' as well as the mechanic 'change of element'. Their second division in "player relation" describes whether, at the end of the game, players are evaluated individually, as a team, or both. While the evaluation of players is related to the players, the category does not answer any questions about the formal player position, rather how the achievement of certain goals is evaluated. Thus, this distinction will be moved to the element of goals later on.

5.6.1 Classifying Game Entities

In the following section, it is necessary to discuss the clustering of players, agents and objects under the same element, which will constitute the introduction and discussion of facets within the element of entities. This discussion will conclude with the observation that it is difficult to distinguish between players and other agents in the gameworld, as well as those other agents and objects. The clustering of players, agents and objects under 'entities' is due to this difficulty of formal distinction. For example, it is much easier to distinguish between objects and agents when representational or material aspects are taken into account.

However, due to the particular method of identification of elements through abstraction of differences from classification, and the resulting identification of entities as one prominent factor of division, the present classification will include objects and attempt to identify the difference between players, agents and objects on the level of the formal system. Later iterations of the Unifying Game Ontology will be able to use the here developed classification system and examine it from the perspective of these informal subject fields in order to clarify these distinctions in more detail.

The following sections will begin with a discussion of this threefold distinction, and subsequently develop two facets for the classification of the 'operator position'.[89]

Agents, Operator Positions and Objects

Pragmatically speaking, it is very easy to distinguish between the player, who is constituted by a human being, non-player characters, which are coded into the game, and objects, which have no agency and are only in the game to be used. These descriptions, while accepted in colloquial discourse, are only

[89] The operator position will be introduced as the position that has to be filled with an independent entity from outside the system itself.

possible through extensive reductionism and oversimplification. It is difficult to formally define the difference between a player and a non-player entity, as well as between these and objects in a game. There are two possible positions towards this problem. The first invokes actor-network theory (e.g. Bueger & Stockbruegger, 2017; Latour, 2005) and argues that everything in a game that is capable of changing the game state must be considered an agent:[90] if a button opens a door, the button is an agent, as is a non-player character that alters the player's character's attributes. The second argument states that only those entities that can execute mechanics without prior input from another entity should be considered agents. This renders both the button and the non-player character objects. I will subscribe to this argument so as to approach a definition of objects and agents that reflects the intuitive distinction between a button and a non-player character, which is ultimately based on their representational aspects. I conclude that, functionally, they are the same and must be considered objects. First, I will introduce the concept of the formal operator position within games by discussing the problematic nature of the term 'player'. Then, I will distinguish between agents and objects, where agents encompass operators as well as non-operator agents, and are both defined by their capability of executing mechanics (cf. Sicart, 2008). This will lead me to the discussion of non-operator agents and objects.

In the award-winning game *Journey* (Thatgamecompany, 2012), players travel through a virtual world. In the multiplayer version they are accompanied by other entities with the same visual appearance and abilities. Interestingly, some players were confused about these entities. As

[90] Actor-network theory (ANT) is a prominent theory in science and technology studies (STS). Its founders can be considered Michel Callon, John Law, Bruno Latour (sometimes under the pseudonym Jim Johnson) and Anne-Marie Mol (Bueger & Stockbruegger, 2017, p. 43). ANT is an empirically grounded approach that explores the intersection between and roles of technology and society. One of the key points of ANT is that technological objects are assigned human-like agency (Bueger & Stockbruegger, 2017, p. 42). One famous example is the discussion of a door-closer's idiosyncratic behavior, which forces human behavior to adapt (Johnson, 1988, p. 301) and without which society could not function in its present form (Bueger & Stockbruegger, 2017, p. 45). Thus, technology has agency over individual people's behavior, as well as the development of society as a whole.

communication was not possible, some players believed that these entities were controlled by the game system. This could be explained by the fact that there are yet other entities in the game that have the same mechanical abilities, but look different, which are, in fact, controlled by the game system. We now have three entities: the player controlled entity; the other, identical entities; and the visually different but mechanically identical entities. The second kind of entities were real players, connected to the game session through online play and some players imagined them to be part of the system. This example demonstrates the distinction between the epistemological statuses of entities can and will often be made on a representational level. The visually different entities were identified as non-player entities. As these entities were the first to be observed, the observation was then transferred onto actual other-player-entities due to their mechanical similarities to the non-player entities.

This example also demonstrates that players could be considered the humans operating the game system, emphasizing the human nature of the operator. This position is highly anthropocentric and would neglect the fact that artificial intelligences are competing against humans in games, filling those same formal positions historically filled by human players. In early 2019, OpenAI Five, an artificial intelligence trained to play *Dota 2* (Valve Corporation, 2013), competed against thousands of players, after already beating pro-gamers, over the course of a weekend. The specification of humans as players also rules out the possibility of animals participating in games. Finally, defining the player position as filled by a human includes the property of the individual as material subject and renders this approach informal.

The player can also be considered as a position that the game system ascribes special value or importance to. This stance allows the player to be identified formally, analyzing, for example, which entity in the game executes the most mechanics or the removal of which entity ends the game. Unfortunately, it is impossible to say whether any of these approaches would actually identify the entity that is commonly addressed as the player. For the removal of an end boss in a game ends the game, as well – as the name suggests. And simply counting the number of executed mechanics *might* lead to the identification of the player, but does not *necessarily* lead to their identification. Similar to the idea of the entity that ends the game, the ability to win the game could be considered essential to the player. This would work in competitive games such as *StarCraft II* (Blizzard Entertainment, 2010 -), in which one of the units might end the game by removing the last opponent building, where the victory is not assigned to that individual unit, but the controlling player instead. However, not all games have a win state, which renders this approach inapplicable, as well.

These issues allow me to introduce a new term: the formal operator position. While this position refers to the description of it within the formal game system, 'operator' refers to the entity filling this position. The operator position describes a formal position in the game system that has to be filled with entities, and can be filled by entities that are capable of instantiating the system in ways that the system does not prescribe. This entity can be a human, animal or AI. For the system to become a process it is only important that there is an entity filling this position. It is also possible that the operator position is filled from within the game system, such as in a match against a computer bot in *StarCraft II* (Blizzard Entertainment, 2010 -). This is why a difference was made between 'must be filled' and 'can be filled by entities that are capable of instantiating the system in ways that the system does not prescribe'. While the bot only executes mechanics in a way the system prescribes (after all, the bot can be considered part of the system) it fills a position that is potentially filled by a human. It is this potential that distinguishes the operator position from any other agent in the game. When filling the operator position, an external entity becomes an agent within the game system.

An operator position can also be filled by more than one entity. If a group runs into the issue of having five members when the game only has four formal operator positions, two people can 'team up' and fill the same operator position. This position does not go as far as Aarseth's "implied player" (2007, p. 132), which describes a much more specific "[…] role made for the player by the game, a set of expectations that the player must fulfill for the game to 'exercise its effect'" (ibid.). Instead, the formal system does not initially impose any expectations on the operator position, only that it exists and must be filled by an operator.

To distinguish between agents and objects it is useful to return to mechanics as those methods that influence the game state (cf. Sicart, 2008). First, any entity in a game that is incapable of changing the game state can be considered an object. This distinction is easily made in pre-digital games, where there are usually either players who execute mechanics or objects with properties that the players' mechanics are directed towards. Contemporary videogames complicate the matter, frequently representing entities that execute mechanics as something we might more commonly understand as objects. Buttons and levers that can open doors, for example, ultimately mechanics as it changes the game state. If it is true that buttons execute mechanics, they must be considered agents.

This position aligns with actor-network theory (ANT), which assigns agency to technological artifacts (and animals) (e.g. Bueger & Stockbruegger, 2017; Johnson, 1988; Latour, 2005). This, however, would lead to the inclusion of objects with attached mechanics into the agent category, and if taken to the extreme, even objects without attached mechanics could be considered agents if they influence behavior of other agents. Latour, for example, argues that the particular mechanism of a door closer influences the behavior of people using the door (Johnson, 1988, p. 301), which is a form of agency in the frame of ANT: "[…] agency is understood as an effect or as the modification of a state of affairs. Agency in that sense is everything that has an impact and makes a difference in the world" (Bueger & Stockbruegger, 2017, p. 50). Agency in the frame of ANT can only be realized in relation to other actants within the network (ibid.); no actant can act on their own but only in relation to others within the network (ibid.). Consequentially, everything that influences a state of affairs executes agency: if I walk around a wall in a game, the wall has agency over my navigation of the gameworld. At this point, no distinction between agents and objects can be made, as every effect on the world and behavior within it must be considered agency. While a proponent of ANT considers every entity within the game an agent (i.e. something that executes agency), I will instead consider objects with attached mechanics different from agents, as objects with attached mechanics cannot execute mechanics, but only *react*.

In the classification of mechanics, it was necessary to introduce 'activation' to describe the mere initiation of a mechanical system within the game system. This 'other mechanical system' is what must be understood as an object with attached mechanics. If an entity has access to mechanics but only acts upon activation by an agent, it must be considered an object with attached mechanics. While pressing a button in a digital game might open a door, the button never presses itself. Björk and Holopainen describe "controllers" as "[…] game elements fixed in particular locations in the Game World that allow players to perform actions that would not be possible otherwise" (2005, p. 84). These controllers are objects with attached mechanics, such as opening doors through activation, or shooting Mario into the sky in *Mario 64* (Nintendo, 1996) (ibid.; their examples). However, objects with attached mechanics range further than Björk and Holopainen's controllers, as they are not limited to "game elements fixed in particular locations".[91]

This definition of objects with attached mechanics includes many other things under the category of objects, such as non-player characters. The majority of inhabitants of *World of Warcraft* (Blizzard Entertainment, 2004) are not capable of executing mechanics, but only respond to the operators' actions, such as the merchants, quest givers and trainers. Giving money to a trainer changes

[91] Björk and Holopainen describe as 'game elements' what is here understood as entities.

the game state by adding a skill to the operator character's skillset, but the trainer only does so after the active input of an operator. Meanwhile, other creatures engage in combat, execute mechanics to damage and heal others, and take particular decisions to do so. Of course, these decisions are pre-coded. None of the critters in *World of Warcraft* have 'free will'. But their actions do not require operators to activate them. These creatures, then, are agents, as opposed to the non-player characters that should be formally considered objects with attached mechanics. I argue that it is only on a semiotic level that we can distinguish between objects with attached mechanics and non-player characters.

This leads us to the final distinction within agents: operator and non-operator agents. To reiterate, if an entity executes a mechanic *only* because of the command of an operator, it remains formally an object, despite its possibly humanoid appearance or narrative description as a character. If, however, it can execute mechanics without further attention or influence of an operator, we can consider it an agent. Agents, however, are only capable of acting in ways that are pre-scribed by the game system. The aforementioned critters in *World of Warcraft* act upon prescripted behavior patterns that can be discovered and exploited by players. Operator positions, however, must be filled with entities external to the game system, which can operate the system in ways that are not prescribed by the game system. A Space Marine in *StarCraft II* (Blizzard Entertainment, 2010), for example, will always act in the same way in a particular situation, as its behavior and execution of mechanic are pre-coded. An operator, on the other hand, is capable of acting in ways that the game system does not prescribe: instead of shooting as soon as another entity comes into range, the operator can flee or hide. Operators can create new strategies and even act against the game's intrinsic goals. Speedrunning (see Scully-Blaker, 2014) and "transgressive play" (e.g. Aarseth, 2007) are good examples of operator behavior within game systems that are not directly encouraged by the formal system.

This operator position is the object of the following classification, which is the reason for the frequent replacement of the term 'player' in source-classifications with the term 'operator' in the present classification. 'Player' will then be used to describe the entities that are filling this position, which can refer to non-humans. The distinction between player and operator is useful, as several players can fulfill the position of one operator. In principle it is also possible that one player fulfills the positions of two operator positions, such as someone playing Chess against themselves.

To summarize, entities can be distinguished into agents and objects. Agents are those entities that are capable of executing mechanics, and objects are entities that are used only for play. These object entities must be understood in a broad sense: they cover objects in the colloquial sense, such as artificially created items (tables, weapons, buildings), as well as natural objects (mountains, trees), and abstract concepts (resources, information, stories). In addition, some objects have mechanics attached to them. If an entity only executes a mechanic after input from an agent, it is an object with a mechanic, not an agent. Agents can be further divided into operators and non-operator agents. Non-operator agents can execute mechanics by themselves, without further attention of an operator, as opposed to objects with attached mechanics. Finally, operators are entities that can take sequences or combinations of actions that are not prescribed by the formal game system: while players are limited to the available mechanics in *Tetris* (Pajitnov, 1984), the order in which to execute them is not prescribed.

Operator Composition

A game can have differently organized structures of operators. The present classification mostly adapts from Elverdam and Aarseth's metacategory 'player composition' (2007, p. 12), but also draws from Elias *et al.*'s category of "zero player" games (2012, p. 22). While Elias *et al.*'s examples of zero player games were discussed and criticized, the existence of a game without operators is possible when considering certain underlying ideas of games, such as development and distribution inheritance (Section 2.7).

Games with a *single operator* position require players to fill only one position in the formal game system, such as in Solitaire, *Darksiders 3* (Gunfire Games, 2018), or *Donkey Kong* (Nintendo, 1981). *Single team* describes a composition that contains at least two allied operator positions. Examples include cooperative games with at least two allied operators (otherwise it would be a single operator game), such as *Pandemic* (Leacock, 2013) or *ibb & obb* (Sparpweed Games, 2013). Games can also describe two operator positions that are struggling for dominance in some way, like in Chess or one-on-one versions of many videogames (e.g. *StarCraft II* (Blizzard Entertainment, 2010 -). This is considered a *two operator* composition. If at least one of the opposing forces consists of more than one operator position, the composition is considered a *two-team* composition. Soccer, for example, is usually played with equal numbers of multiple operators on each side. Special cases would be asymmetrical games (see below) in which one team consists of more operators than the other, such as in *Evolve* (Turtle Rock Studios, 2015) or *Dead by Daylight* (Behaviour Interactive, 2016). In this sense, as soon as one side of operators is clustered into a team, the composition changes to a two team composition, a principle that is also important for the next two compositions. *Multioperator* compositions describe more than two operators that all struggle with each other. In colloquial language this might be described as a 'free for all'. The singleplayer mode in *Fortnite*'s (Epic Games, 2017) battle royale mode is a multioperator battle. Similar to the principle of two team compositions, as soon as a number of operators are formally clustered in a team, a multioperator composition turns into a multiteam composition, with one team consisting of many operators and all other teams consisting of only one.

Operator Relation

In order to accurately describe formal operator positions, two distinctions must be made, which will also be useful to examine particular compositions and possible changes. While the title of this section suggests a further adoption of Elverdam and Aarseth's "player relation" category (2007, pp. 12–13), this is not the case. Their dimension of bond is here described through an unattached facet and the 'change of element' mechanic, and the dimension of evaluation was moved to the categorization of goals. Instead, operator relation will distinguish two facets: contract and power.

Contract describes the particular relation that two operators have with each other. It is divided into three classes: *team*, *neutral* and *opposition*. If two operators are in an alliance, they are considered a team. However, to not be allied does not automatically mean that two operators are in opposition to each other. In *Endless Space 2* (Amplitude Studios, 2017) and many games of the *Civilization* (Meier, 1991 -) series, operators can be in a neutral relation to each other, though this disables combat. They are also not necessarily in a team, as one operator could win the game without the other. To be in a team with few exceptions means victory will be achieved together.

Power refers to the power relation between two operator positions. It is derived from classifications of games into symmetrical and asymmetrical (e.g. Murray, 1952). In games with *symmetrical* power relations, both operators are equal in properties and owned entities. In Chess, both operators have the same amount and type of tokens, and in *Dota 2* (Valve Corporation, 2013) both teams have access to the same heroes and items. In *asymmetrical* games, such as Murray's "hunt games" (1951, p. 98), one operator controls many pieces, while the other operator controls few pieces. It means that each individual piece of the side with more pieces would very likely lose against the piece of the side with less pieces. Asymmetry does not necessarily bring imbalance with it; designers may balance the asymmetry in strength or numbers,[92] or through other factors such as additional turn taking. Likewise, slightly imbalanced asymmetrical compositions do not necessarily bring defeat. Consider three friends playing *Warcraft 3: Frozen Throne* (Blizzard Entertainment, 2003) where two of the players are set up as a team. This is clearly an asymmetrical composition, as the number of operators in the teams is two versus one, and all operators are given comparable properties and strengths. The single operator is formally at a disadvantage. However, depending on the skills of the player that fills the operator position, it is still possible that the disadvantaged operator position wins this imbalanced asymmetrical game. Usually, however, asymmetrical games are balanced with other means as we saw with *Evolve* (Turtle Rock Studios, 2015) or *Dead by Daylight* (Behaviour Interactive, 2016).

In some cases, the decision of whether a composition is symmetrical or asymmetrical is not easily made. Especially in contemporary multioperator videogames, players can choose between many different classes, characters or heroes to use during battle, and in many cases some of the choices are clearly superior to others. This explanation of asymmetrical operator relation may also help to clear up the colloquial discussion. If a player is at a disadvantage due to a poor choice of hero, they engage in an asymmetrical instantiation of the game. However, this does not mean much for the outcome of the particular match.

[92] More information about the concept and practice of balancing can be found in Adams (2009, pp. 324–355) or Elias *et al*. (2012, pp. 129–131).

5.7 Goals in Games[93]

While the ontological differences of goal particulars are an understudied phenomenon, goals have not been completely ignored in the field of game studies. So far, they have been distinguished by their definiteness, or connection to the game's end condition (Elverdam & Aarseth, 2007; Juul, 2010a; H. Smith, 2006), their non-deniability (Leino, 2010), location inside or outside the game (Björk & Holopainen, 2003) and their visibility or explicitness (Costikyan, 2002; Elverdam & Aarseth, 2007). Järvinen's (2008) discussion drew from Schank & Abelson's (2013) seven types of goals, as well as Björk & Holopainen's (2005) list of 26 goal patterns and additional 17 patterns that describe goal structures. The ambitious Game Ontology Project (Zagal, Brown, *et al*., n.d.) is a hierarchical model that encompasses the distinction between optional and required goals, goals that are pursued by in-game agents and the metrics to measure attainment of certain goals. I will briefly discuss these approaches below.

In a discussion of how games assign value to certain events, Smith (2006) distinguishes between ultimate and proximate goals, where "ultimate goals are end conditions while proximate goals are steps towards that end" (2006, p. 67). Destroying forts in *Heroes of the Storm* (Blizzard Entertainment, 2015) is a proximate goal towards the ultimate goal of destroying the enemy's core, as it is necessarily fulfilled before victory, but is not the game's end condition. Here, we must differentiate between the goals 'destroy the enemy's core' and 'win the game'. Björk & Holopainen (2003) describe a similar yet less rigid relation between goals as "goals" and "subgoals". Juul describes something

[93] The research for this chapter was conducted in collaboration with José P. Zagal and Rogelio Cardona-Rivera during my visit to the Entertainment Arts and Engineering Department at the University of Utah in Salt Lake City. The major part of the literature review, as well as the initial examination of 34 games, I conducted myself. All further work, such as the refinements of the theory and the writing process are collaborative work of equal parts. This collaboration shall also explain the partial shift from the pronoun 'I' to 'we' when describing the original work done during my visit.

similar to Smith's ultimate goals, "permanent goals" (Juul, 2010a), where the distinguishing factor is the goal's persistence. Permanent goals will always be achieved, such as finishing the campaign in a single player game. Playing it again, from the perspective of achieving the goal, would be pointless. Opposed to this, reaching a 'transient goal' is merely an achievement over one instance of the game, such as winning a *Counter Strike* match or finishing a game of Solitaire. These two binaries are closely linked to the game's end and winning conditions.

Leino (2010, p. 137) describes the goal of invading the Scramble Space in *Scramble* (Konami, 1981) as "undeniable", while achieving the highest score possible is a "deniable" goal. This is also linked to the implicit and explicit character of goals, as well as their endogenous or exogenous location (see below). Some scholars have pointed out the existence of explicit and implicit goals in games (Costikyan, 2002; Elverdam & Aarseth, 2007; Juul, 2010a). While the specific ontological nature of this difference remains vague, it roughly points towards how visible the goal is to the player: Is there a specific, visual imperative telling the player to kill the dragon, or is it merely implied by the game through the possibilities provided to and restricting to the player? Costikyan states that "most games have an explicit win-state, a set of victory conditions" (2002, p. 12), yet these are missing in other games, such as in *Sim City* or Role Playing Games and Multi-User Dungeons. According to him, character advancement is an implicit goal of the latter type of games. Elverdam & Aarseth, while in a visualization in the appendix using the same terms as Juul and Costikyan, refer to a different distinction. Their goal dimension "[…] describe[s] if the game has exact and unchanging victory conditions (absolute) or if the goals are subjective to the unique occurrences in a specific game or the players' interpretations (relative)" (2007, p. 14). In the appendix they describe this very dimension as explicit and implicit goals. While the appendix' terminology appears to be a mistake in this particular case, the resulting confusion is symptomatic and exemplifies the general conflation of terminology regarding this topic.

Järvinen (2008) touched upon the topic of goals in games in his dissertation. While discussing the psychological processes connected to goal attainment in games, he compares two approaches towards a classification of goals. The first is Schank & Abelson's (2013) psychological perspective, which defines seven types of goals. The second is Björk & Holopainen's (2005) listing of goal patterns in *Patterns in Game Design*.

Earlier, however, they distinguished game goals as endogenous or exogenous (Björk & Holopainen, 2003), or goals located inside or outside of the game. This can be compared to the familiar distinction between intrinsic and extrinsic motivation (e.g. Hennessey, Moran, Altringer, & Amabile, 2005). Intrinsic motivation originates from the individual, resulting in the activity being purely self-motivated, or done for its own sake. On the other hand, extrinsic motivation gives the individual an external incentive, such as money. This distinction has been, while not explicitly discussed, employed throughout this thesis since the formulation of focus on the underlying formal system of games. In *Patterns in Game Design* (2005), Björk and Holopainen also gathered an elaborate list of goals in video games. They describe 25 patterns that form goals, subsumed under four main categories (idem., pp. 277):

1. Goals of Ownership and Overcoming Opposition: Gaining Ownership, Overcome, Stealth, Eliminate, Rescue, Capture, Evade, Conceal, Race
2. Goals of Arrangement: Collection, Alignment, Enclosure, Configuration, Connection, Delivery, Herd, Contact
3. Goals of Persistence: Guard, Survive, Traverse, King of the Hill, Last Man Standing

4. Goals of Information and Knowledge: Gain Information, Gain Competence, Exploration, Reconnaissance

As discussed earlier (Sections 1.2.1 and 5.3.2), many of Björk and Holopainen's categories suffer from informalism and conflation, due to their practically oriented approach to gather patterns for game design. Unfortunately, a complete description of these would exceed the scope of this discussion, but the following examples should suffice.

'King of the Hill' describes the defense of a particular position. This position can be a physical (or virtual) spatial location, or a more abstract, social position, such as the winner of the match. The king of the hill's goal is to remain on that hill. This example is an informal description of the more formal goal of defending (not letting others obtain) the abstract position of the king. To do so, the king must fulfill one of two possible goals on a more formal level. If the king of the hill has to defend a location, then the goal is to prevent other players from obtaining this position. If the player needs to remain the victor in a one-versus-one game to be the king of the hill, their goal is to win. Formally speaking, king of the hill and "guard" (Björk & Holopainen, 2005, p. 297) are essentially the same goal, with one referring to a material location and the other to an abstract one. While this classification of goals in games has been highly informed by Björk and Holopainen's list, my aim is to remain on a more formal level than theirs.

Some scholars have pointed out the explicit and implicit nature of goals in games (Costikyan, 2002; Juul, 2007b). Explicit goals are specified victory conditions (Costikyan, 2002), while implicit goals emerge from the game artifact but are not directly pointed towards. For Costikyan, leveling in an RPG is an implicit goal, as well as many things that players aim to achieve in *The Sims*. This connection, if examined closely, raises several questions. Most sports and multiplayer games have explicit victory conditions: 'Have a higher score than your opponent', 'have a lower score than your opponent', 'remove your opponent's ability to participate in the match', 'remove all opponents from the match'.

Hence, the terms explicit and implicit are not well suited for the description of goals. The problem here is that explicitness usually refers to a very specific instruction, which does not leave room for interpretation. In cases of videogames, however, the borders between clear instructions and learned cultural conventions start to blur. When is something an explicit goal? If a non-player character in the beginning of the game tells one 'You have to safe the princess', this is very explicit. If the game, simultaneously, gives one a score counter in the top right corner, is achieving a high score then explicit? Let's say no, the mere existence of a score counter is not an explicit instruction to achieve as high a score as possible. What if, then, one had a counter that indicated that the player collected X out of ten items. Is the instruction to collect ten items here explicit enough?

When we start a round of *Player Unknown's Battleground*, the game never specifically instructs the player to eliminate others, nor to be the last man standing. The interface includes a counter of the starting number of players, which is reduced when a player is eliminated. Is this explicit enough for the victory condition 'last man standing'?

Lastly, Aarseth pointed out a distinction between different goal structures (2005). He observes that goals in quest games can be ordered *nested*, *serial*, *concurrent* or a combination of these categories (idem., p. 497). A hierarchical organization is observable in, for example, proximate and ultimate goals, where one must be fulfilled before the other. The concurrent structure describes any game in which multiple goals are active at the same time, and serial structures cluster individual goals into indivisible units. These three categories will not be included in the following classification, though, as they constitute three types of goal structures, not types of goals.

5.7.1 Classifying Game Goals

In this section I develop the Unifying Game Ontology's classification of goals in games. From the literature discussed above, two ontological distinctions can be presumed. Most of the existing literature discusses what are called universals – borrowing from the philosophical distinction between universals and particulars (e.g. Klima, 2017; Wolterstorff, 1970). In other words, these distinctions describe *how* goals are and what positions they can take, and not what particular types of goals exist. These universals will be briefly summarized in the first section. After this, I will describe how formal types of goals in games were identified and describe them.[94]

Universals

Here, I will briefly reiterate on the previous distinctions made regarding goals, which were discussed in the review of goal related game studies literature. They describe certain positions goals can take within a game, or 'how goals can be', instead of what types of goals there are. This means that each identified goal can be described in the following terms.

Juul (2010b) distinguished between *permanent* and *transient* goals. The distinction is based on "what happens when the player succeeds or fails at them" (idem., p, 88). Permanent goals will always be achieved after once successfully passing them. If a player finishes a narrative game, such as *Bastion* (Supergiant Games, 2011), they will always have achieved to finish the game. Transient goals refer to only particular instantiations of a game. Winning in Soccer or *Heroes of Newerth* (S2 Games & Frostburn Studios, 2010) – a multiplayer battle online arena – always means that players have only won

[94] This method will deviate from the general synthesis of literature, shifting towards an inductive approach of game analysis and clustering of groups by similarities. As this chapter is based on research conducted during my visit to the EAE at the University of Utah, the classification can also be considered an adoption of the research conducted there, instead of originally created data.

one particular match. It seems that permanent goals are closely connected to what will, in the following sections, be called the ultimate goal of finishing, and transient goals to the ultimate goal of finishing.

Leino (2010) describes *deniable* and *undeniable* goals in games.[95] Undeniable goals are those that a player must pursue in order to keep playing the game. Not letting the ball drop between the paddles in a Pinball machine is a necessary goal. Deniable goals have no further impact on the player's existence in the gameworld, such as achieving a high score. In a different example, Leino states that it is an *undeniable* goal in *Scramble* (Konami, 1981) to invade the Scramble system (idem., p. 137), whereas achieving a high score is, again, a deniable goal. Thus, undeniable goals are necessary for the player's progress in the game (ibid.).

Smith's (2006) distinction between *proximate* and *ultimate* goals could be considered a subdivision of Leino's undeniable goals. Smith describes ultimate goals as end conditions (idem., p. 67), meaning that the game concludes after fulfilling the ultimate goal of a game. Proximate goals are those goals that are necessarily fulfilled before reaching the ultimate goal. For example, to reach the ultimate goal of removing the opponents' core in the multiplayer online battle arena *Heroes of the Storm* (Blizzard Entertainment, 2015), players must first remove all fortresses and keeps of at least one opponent lane. As the core cannot be destroyed without the removal of one lane's buildings, this removal is a proximate goal.

Imperative goals

We surveyed a variety of games to identify common imperatives. For each of these we enumerated and analyzed the different goals we identified in them. We began by examining 34 games across genres,

[95] Juul (2007b) describes the same concepts as *obligatory* and *optional* goals and Zagal *et al.* (n.d.) use the terms *required* and *optional* goals.

platforms, and play styles. Some games included different "modes" which were considered separately for a total of 46 game modes. For example, *Overwatch* (Blizzard Entertainment, 2016) was split into its four existing game modes (Assault, Control, Escort, Hybrid). Through this process we identified a total of 125 informal goals, such as "get the ball and kick it into the net" (Soccer) or 'obtain the flag and return it to your base' (WoW – Warsong Gulch). These informal goals were then translated into more abstract and formal ones (e.g. 'obtain flag' and 'get the ball' are the same type of goal: 'obtain object'). Through this process, we arrived at twelve more abstract descriptions of goals in games.

Preliminary Goals	**Examples**[96]
Control	*Endless Space 2* (Control a certain amount of space to win) *WoW* – Eye of the Storm (Teams must control areas to accrue points)
Create	*Endless Space 2* (Create Wonders to win)
Conquer	*Endless Space 2* (Conquer home worlds of all other races to win)
Defend	*Counter Strike* (Counter Terrorist must defend a location) *WoW* – Strand of the Ancients (each team has to defend an object in turns)
Deliver	*Darksiders 2* (The player must deliver a scroll to the "Eternal Throne") American Football (Teams must deliver the ball to the end zone)
Incapacitate	Wrestling (Incapacitate the opponent) Chess (Incapacitate the opponent's king)
Obtain	*WoW* – Warsong Gulch (Obtain flag and deliver back) *Darksiders 2* (Retrieve a hammer and bring it back to its owner)
Reach	Tag (Reach other players) Super Mario Bros. (Reach end of level)
Remove	Solitaire (Remove all cards from the deck) *Pac-Man* (Remove all dots)
Score	Soccer (Score points by delivering ball into area) Golf (Score lowest score) *Pacman* (Achieve high score)
Survive	*Tetris* (Survive as long as possible)

Table 4: Preliminary List of Goals in Games.

[96] Game references: *Endless Space 2* (Amplitude Studios 2017); *Counter Strike* (Valve Corporation, 2000); *Darksiders 2* (Vigil Games, 2012); *World of Warcraft* (Blizzard Entertainment, 2004); *Pac-Man* (Namco, 1980); *Tetris* (Pajitnov, 1984).

To discuss all iterations of these imperatives would exceed the scope of this section. The following examples will suffice to indicate what decisions were made during the process. First of all, we disentangled descriptions with multiple goals (e.g. 'obtain flag' and 'return it to base' in capture the flag) and translate them into separate imperatives. We realized that some of the seemingly formal descriptions were still referring to particular contexts or objects. ***Survive*** and ***Defend***, for example, are nothing more than the negation of a ***Removal*** of the player's avatar and a location or object, respectively. Thus, we included the negation of all imperatives as possible imperatives, and removed ***Survive*** and ***Defend*** as individual imperatives. It also became clear that ***Control*** and ***Conquer*** only differed in that the player must first conquer something in order to then exert control over it. First, we formalized ***Conquer*** further and described it with the imperative ***Obtain***: to ***Conquer*** a planet is to ***Obtain*** it. Subsequently we split ***Control*** into the imperatives: '***Obtain*** object' and 'Prevent other players to ***Obtain*** that object'. The imperative ***Incapacitate*** was, in the end, considered a ***Removal*** of options from the opposing player. We also encountered the need to add new imperatives, such as during the analysis of rhythm-games. The goal of pressing a button when elements on the screen align in a particular way could not be described by any of the initial imperatives; as the goal ***Reach*** was considered a stretch. Thus, we introduced ***Synchronize*** to account for this idiosyncratic goal. After these refinements, we arrived at a final list of formal goals in games.[97]

We call these goals *imperative goals*, borrowing the term from Juul's statement that "[t]o say that a specific game *has* a goal is to say that it is an activity which contains an imperative[…]" (Juul, 2010b, p. 193; original emphasis). It is through the imperative goals that the player knows what the game necessitates them to do in order to succeed within it. To win in football you should score more

[97] The following pages (265-270) are an excerpt of a paper currently under review at a journal, co-written with José P. Zagal and Rogelio E. Cardona-Rivera.

goals than your opponent. In a shoot-em-up you destroy enemy ships while avoiding their missiles in order to survive. And in an adventure game, you may have to solve a series of puzzles in order to finish the game. Our final list of ten imperative goals is, in alphabetical order: ***Choose***, ***Configure***, ***Create***, ***Find***, ***Obtain***, ***Optimize***, ***Reach***, ***Remove***, ***Solve***, and ***Synchronize***.

Choose refers to the act of making a decision in a given task from limited options provided. Often, but not always, one of the options is the 'correct' one. In the game show *Who Wants to be a Millionaire*, players must choose an option from four possibilities as the correct answer to a series of increasingly challenging questions. Other games offer binary choices. In *Reigns* (Nerial 2016) players are presented with suggestions from advisors and must choose to swipe left or right. If the range of possible answers is not explicitly limited, the imperative is not **choose**, but **solve** (see below).

Configure refers to the need to manipulate game objects such that they are in a state (or configuration) deemed appropriate or acceptable. Consider a Rubik's Cube where players must configure the cube such that each of its faces has only one color. Configure is often seen in the context of virtual objects that must be manipulated in puzzle games and adventure games where, say, switches must be left in certain positions (open/closed, rotated one way or another). In *The Room* (Fireproof, Games 2012) players make progress by manipulating a series of puzzle boxes: by configuring different moveable/interactive parts of each box hidden compartments are opened, clues are revealed, and so on. This imperative aims at a specific configuration to be reached for its fulfillment.

Create refers to bringing an object into existence which was not present in the gameworld before. This can include crafting, building, or summoning a minion. Sometimes, this creation is "out of thin air"; it might also be the result of an economic transaction (buying), or from combining existing objects (crafting). In the board game *Galaxy Trucker* (Chvátil, 2007), players each create a spaceship from a common pool of tiles, and players can achieve victory in *Age of Empires II* (Ensemble Studios, 1999) by building (creating) a 'world wonder'.

Find is an imperative that relates to the goal of identifying or locating something in a game. Games with this imperative often "feature visually rich scenes stocked with a number of particular objects (such as hats, magnifying glasses, and pinecones) that the player must find" (Consalvo, 2009, p. 51). ***Finding*** is about identifying, not ***Choosing*** (the correct 'X') or ***Solving*** any kind of riddle, mystery or situation.

Obtain refers to the need to gain control or ownership over something such as items (e.g. key or weapons). It can also mean spatial locations or even characters in a game. For example, some strategy games require the player to control parts of the gameworld to achieve victory (e.g. control the most territory or your opponent's capital city), and a common goal in role playing games is to obtain an object from an in-game character. In the traditional outdoor game Capture the Flag teams must obtain an opposing team's flag (and then bring it back to their own area). In the board game Go, the winner is the player who has obtained the larger total of spaces on the board under their control plus captured enemy pieces.

Optimize refers to the maximization or minimization of a resource, score, or amount. There is a notion of a resource or amount that it is necessary for the player to manage such that its final value is acceptable. This is a common goal in games that require players to achieve certain numerical values in terms of a score, or in racing games where players must arrive in a certain position (e.g. must place at least 3rd) in a race. Minimizing the time used to complete a track is another common incarnation of this goal.

Reach generally refers to the idea that the player (usually through the direct control of a character) must act such that the character reaches a certain spatial location in the gameworld. Many platformer games require the player reach a specific location in the gameworld (e.g. the right-most area of the screen) in order to proceed. However, reach can also include the indirect control of an object that should be located in a spatial location (e.g. kick a ball such that it lands in a goal zone). The goal is fulfilled once a specific character or object arrives at the location.

Remove refers to removing an object from the gameworld. This includes the colloquial uses of the terms 'killing', 'eating', 'destroying', and 'eliminating' seen in many games. For example, a game might require that the player Remove all the enemy soldiers from an area in order to proceed. Or, they may have to ***Remove*** (by exploding) all of the mines in a battlefield. Many multiplayer games are also won by causing an opponent to be removed from the game – with the winner being the last player standing.

Solve refers to the goal of providing an answer. It is often implied that the answer must be 'correct' such as with riddles. In the board game *Cluedo* (Pratt, 1949), players compete to determine who the murderer is, what weapon was used, and where the crime occurred. In some puzzle games, e.g. those in the *Professor Layton* series (Level-5, 2007 -), players must often provide an answer (e.g. "15" or "house") to a question or prompt. The ending of classic RPG *Ultima IV: Quest of the Avatar* (Origin Systems, 1985) is also like this, requiring that players type in words as answers to a series of questions in order to complete the game (Addams, 1990, p. 212). We differentiate ***Solve*** and ***Choose*** as imperatives in that the former is open-ended, while in the latter players select from limited options presented to them.

Synchronize describes the imperative to perform an action that it is synchronous with an in-game event. This can be either a moment in time or within certain limits. This imperative is often seen in rhythm-action games like *Dance Dance Revolution* (Konami, 1998). Here players must "step on the corresponding arrow on the dance pad when a scrolling arrow overlaps the stationary arrow. The more precise the timing, the better the rating for that step" (Höysniemi, 2006).

Imperative	Example
Choose	A game in which an answer of a limited set of possibilities must be chosen.
Configure	Classic puzzles have the goal of being configured correctly.
Create	A game in which the creation of a tower is necessary to win.
Find	Hidden-object games require players locate specific items in a scene by clicking on them.
Obtain	Some strategy games require the player to obtain a part of the gameworld or the opponent's home world in order to succeed.
Optimize	Racing games have the goal of optimizing (minimizing) the time to complete a track.
Reach	Reaching the end of each level is a necessary goal for the player in many platformers.
Remove	A first-person shooter that is won by removing all enemy players from the map.
Solve	Riddles must be solved by the player.
Synchronize	Quick time events require pressing a button synchronously with events in the game.

Table 5: Final List of Imperative Goals in Games.

The prevention of an imperative is also an imperative goal: many games use the prevention of an imperative rather than its achievement as a condition for success. This is common in multiplayer games where one player/team tries to achieve something (e.g. remove an object), while the opponents try to prevent it from happening. ***Create*** and ***Remove*** are not exact opposites: to prevent the creation of an object is not the same as the removal of an object.

Imperative goals are usually used to achieve a higher goal. We could describe this higher goal as a state of affairs outside the game. These higher goals were here called *ultimate goals* and will be discussed in the next section. We argue that any game's in-game goals can be described using any imperative or combination of imperative goals we have identified. This, of course, excludes goals created by players outside of the game, which might be pursued within the game but are not part of the formal game system, as well as goals on a representational level or the narrative. It is also this level immediately subordinate to the ultimate goals where we can first establish connections between game play (what the player does) and the ultimate goal. Thus, imperative goals are those that help answer the general question: What does the player need to do in order to {win, finish, prolong} the game?

Ultimate Goals

So far, I have described types of formal goals players must meet in order to succeed in the game. Goals can be ordered hierarchically (Aarseth, 2005; Järvinen, 2008; McIntosh, 1996), where superordinate goals are more abstract than subordinate goals (McIntosh, 1996). In abstraction hierarchically higher than imperative goals are *ultimate goals*. The term is borrowed from Smith, who states that "[…] ultimate goals are end conditions" (2006, p. 67). Here, the term instead refers to a state that the player is constantly trying to achieve but should be considered as outside of the game.

Suits describes his prelusory goal as "*a specific state of affairs*" (2014, p. 38), such as kicking a ball in the net, or putting the golf ball in a hole. He contrasts this goal with the "lusory goal" of winning (2014, pp. 38–39), which is part of the game for him. Due to the formal nature of the goals outlined in the Unifying Game Ontology, I make the inverse argument: delivering something into something is a necessary part of the formal game system. Winning, on the other hand, is a state of affairs outside of the game, in which one team has won over another. Suits correctly observes that delivering a ball into a net is a goal that can be considered outside the frame of the game. The reason for this is that he uses the game entities' material properties to distinguish between what is inside and outside of the game. Kicking the ball into the net is only outside of the formal game system due to its inclusion of informal elements. Formally speaking, the goal is to reach a location with an object. For the second part of the argument, Juul's (2010a) distinction between permanent and transient goals is useful, too. Briefly put, players will always achieve a permanent goal (such as finishing *BioShock Infinite* (Irrational Games, 2013), whereas transient goals are connected to particular instantiations of games. In competitive games, such as Soccer, players can win individual matches, but they will never 'win Soccer' as such. This distinction aims at a state of affairs outside of the game, or in other words, what players can claim after the match has concluded. Ultimate goals work on these two levels of reaching a state of affairs and being able to claim something about a given game outside (or after) playing the game.

We have identified three ultimate goals, which cover every game that has an ultimate goal: *winning*, *finishing*, and *prolonging*. Winning is connected to competitive games in which an opponent must be overcome either directly or indirectly. Finishing covers especially, but not exclusively, narrative heavy games where the narrative content can be exhausted and the game concludes having reached this state of exhaustion. Prolonging is technically an ultimate goal that does not aim at the achievement of something, but its prevention instead. In many games, the player's ultimate goal is simply to keep playing and not be removed from the game. Contemporary survival games such as *Don't Starve* (Klei Entertainment, 2013) fall under this category. Historically, a major group of games in which prolong is the ultimate goals are arcade games. Here the ultimate goal has a very real, financial background: if the player cannot remain in the game by ludic means, they will have to pay with coins in order to continue.

As mentioned in the beginning of this section, ultimate goals are on a higher level of abstraction than imperative goals. Imperative goals are those that must be executed (or prevented in the case of prolong) to achieve the ultimate goal.

5.7.2 Victory and End Conditions

Two concepts that are easily confused are victory (or winning) and end conditions, as they are oftentimes tightly connected. In a Tennis match, if one player reaches an agreed upon point value, they win the match and it simultaneously ends. In Soccer, the victor is decided at the moment the game ends. Even though these two concepts are closely related, many games have clearly separate victory and end conditions. In racing games, the first to cross the goal line wins, but the game concludes when all participants have crossed it (cf. Björk & Holopainen, 2005, p. 23). Thus, it is important to distinguish between them in the analysis of game systems. As Elias *et al*. (2012, p. 87) point out, there are generally two combinations of end and victory conditions if both are present in a game: either winning ends the game, or the winner is determined at the conclusion of the game.

A victory condition is a function that determines how a player or team can win a match. They are higher level goal functions in games that either specify how (often) an imperative goal must be achieved or evaluate the performance of the two teams at the conclusion of the game. Thus, they determine a particular outcome as preferable to another outcome for all participants (cf. Smith, 2006, p. 67). In Tennis, this preferable outcome is to reach the agreed upon number of points. In Soccer, it is to have accrued more points than the opposing team when the game concludes. This is where the distinction between victory and end conditions comes into play. In one common version, Soccer ends after ninety minutes playtime. In some cases, the game ends, regardless of whether a winner was decided or not. The victory condition is to have more points than the other team at the time of the end condition. Another reason these two concepts are closely related is that sometimes, such as in Tennis, the end condition is that one player has achieved victory.

End conditions can be divided into three categories: *temporal*, *exhaustive*, and *quantified*. The end of a game by temporal factors means that the game is to be concluded after a certain period of time or at a particular point in time. Time periods can be measured either in real world time or in temporal chunks of the game. In Soccer, the time is restricted to ninety minutes of real time. In *Posthuman 2* (Mighty Box Games, 2019, forthcoming), the game ends after a certain amount of rounds if the final boss was not defeated during these rounds. Describing the temporal limitation of a game by the passing of real world time or by ending at a particular point in time are ultimately two perspectives on the same limitation; a game played for ninety minutes and coincidentally ending at 14:30 and a game officially ending at 14:30 are the same.

Exhaustive end conditions describe circumstances in which a resource, in the broadest sense, was exhausted, leading to the conclusion of the game. This category is inspired by Zagal *et al*.'s "Game Ends" class (Zagal, Brown, *et al*., n.d.: Game Ends). Conclusion by exhaustion can be further subdivided into endings where the player(s) failed at upholding their existence within the game (e.g. they 'died'), or where the content was exhausted (e.g. finishing the story). As with the imperative goals, exhaustive end conditions can be either tied to something the players are supposed to achieve or prevent. Exhausting the narrative content of a game is something players are supposed to achieve, while having all their lives removed is something they want to prevent. It shall be noted that conclusions of games have no formal value attached but that they will be evaluated by the players positively, negatively, or neutrally (ibid.). This distinction is especially beneficial in games with several narrative endings, where the game system does not attach any value to particular endings. Whether someone reaches a 'good' or 'bad' ending relies completely on representational aspects, as well as the individual's preferences. One could also argue that time is a resource that can be exhausted, which would make a temporal end condition an exhaustive one: the game ends when ninety minutes are exhausted. The difference lies in the player's ability to achieve or prevent the exhaustion. In some arcade race games, players need to reach checkpoints to gain new time to race further. In this case, time running out must be considered an exhaustive end condition, as the players constantly try to refill the resource time. Temporal end conditions prescribe the exact time frame in which the game occurs.

Lastly, end conditions can be quantified by connecting the end of the game to a particular point value to be obtained in the game. For instance, Soccer can be played to a joint score of eleven. This particular example can be understood as merely a different way to link the end condition to the victory condition 'first to six points'. However, if we play Soccer to the joint score of ten, there is the possibility of no winner. This means that if the quantity is even, no winner can be decided and the quantification of the end condition differs from the connection to a victory condition. This also means that the end conditions can be directly linked to the fulfillment of a victory condition in the game.

It is important to remember that victory and end conditions are not necessary elements of games. While individual parts of *World of Warcraft* (Blizzard Entertainment, 2004) can be won or exhausted, the game as a holistic artifact will only end if Blizzard shuts down its servers. Furthermore, victory and end conditions do not only refer to the ultimate end of a game, but also to parts within a game, such as levels (cf. Björk & Holopainen, 2005, p. 60).

5.7.3 Evaluation

Finally, I will include Elverdam and Aarseth's three types of evaluation into the classification of goals in games. It was moved from Elverdam and Aarseth's player relation metacategory, as it describes how the degree of achievement of a particular goal is evaluated. The three types of evaluation are *individual*, *team*, and *both*.

Team evaluation commonly occurs in games that can be won. A purely team-evaluated game is Soccer, where at the end condition teams are evaluated by the number of goals they scored. The individual performance of a player has no further meaning from the systemic perspective, while, of course, it is possible that it is evaluated in further discussions surrounding the game. The content of these discussions, however, is not formally evaluated by the game.

If the performance of individual players is also part of the evaluation of the game, the evaluation must be considered *both*. This is the case in *Apex Legends* (Respawn Entertainment, 2019), where squads of three players compete in a battle royal mode. First and foremost, the team's placement in terms of remaining squads is important, as players want to be the last remaining squad to earn the title of 'The Champion of the Arena'. Interestingly, if a squad wins, the game tells all three member that 'You are the champion' (singular). However, although the squad's placement determines all squad members' points within the present season,[98] each individual player's performance is also evaluated based on their number of kills and revived squad members. Thus, the evaluation of game goals is conducted both on a team and individual level.

Individual evaluation refers to only one player's performance's evaluation at the conclusion of the game. Individual evaluation takes place in one-on-one games, such as Boxing, or one-on-one matches in *StarCraft II* (Blizzard Entertainment, 2010 -).

5.7.4 Discussion

While this section has delivered a list of formal imperative and ultimate goals that can be used to analyze games, one important observation can be made: goals in games take the form of compound elements. By this, I mean that describing goals in games always takes the form of a mechanic directed

[98] This refers to *Apex*' second season, in which a ranked mode was first introduced.

towards another formal element of the game system: remove object, reach location, obtain area, create object, etc.

While one could argue that goals must be removed from the elements of games based on this observation, it is also clear that goals in games are not *only* these compound descriptions. If reaching location with object (kicking ball into net) were not a goal, it would be simply a random event within the game, such as shooting at a wall in *Apex Legends* (Respawn Entertainment, 2019). As goals are more than these random actions, we must consider them functions that describe the execution of a mechanic in order to reach a particular, preferable state within the game and evaluate its successful or unsuccessful execution.

The definition of goals as prescribed states and the evaluation of their achievement leads to the last element of the classification: the addition of types (or targets) of the evaluation.

5.8 Randomness in Games

This section will focus on types of randomness, and not on its particular implementation or deeper discussion of probability theory. I will start by discussing the term ‘randomness’ based on sources outside the field of game studies. I will then provide an overview of existing research on types of randomness within game studies, which necessitates a discussion of concepts closely related to and sometimes conflated with randomness, such as uncertainty, chance, luck, indeterminacy, predictability and complexity. I will then describe the faceted classification of randomness based on the existing literature, followed by a discussion and application of it. Finally, I will conclude the facet of randomness with some ideas that will be interesting for future investigations.

I will not be able to give a comprehensive account of the discussion surrounding randomness and its existence here. Briefly put, one could conjecture that if all necessary information was available, we could calculate everything, even the roll of a die, and nothing would be random. This is considered a deterministic worldview that means randomness is merely a subjective phenomenon. Eighteenth century French engineer and mathematician Laplace can be considered to be the founder of this theory (Bewersdorff, 2005, p. 42). However, in modern day physics, randomness *does* exist (see Bewersdorff, 2005, pp. 43–44). The reason why calculating the future (such as the outcome of a roll of a die) is ultimately impossible is that "[…] the entirety of the state parameters that determine the model can never be precisely measured" (idem., 2009, p. 43). Thus, the randomness of dice is a result of the pragmatic incapability to gather the data needed to calculate its roll. Bewersdorff calls these small, unmeasurable influences "chaotic" (2005, p. 44). Randomness can be understood in this pragmatic sense of not being calculable (to avoid the term predictable) on the basis of chaotic micro-events and influences.

A slightly different, yet related, definition of randomness is that true randomness cannot be reduced to a shorter function. In other words, a set of truly random numbers cannot be generated by or compressed into a function that is shorter than the original set (Chaitin, 1975, p. 48; Li & Vitányi, 1997, p. 49). Thus, there are two perspectives on the same definition of randomness. The second definition examines the outcome of a random process and states that this outcome cannot be described in a more efficient way than the outcome itself. The former looks at the circumstances *before* the random process and states that randomness means it is impossible to gather the necessary data to calculate the outcome accurately. So, randomness is non-calculable and irreducible. One could argue that these properties are inherently linked, as randomness is non-calculable because it is irreducible and it is irreducible because the information needed to create an accurate formula cannot be gathered.

A deeper understanding of randomness in games is necessary not only for design and game literacy, but also for contemporary discussions, as can be seen with 'lootboxes'. Generally speaking, these are items that players can buy in in-game shops, which contain a randomized sample of typically cosmetic items. In the broader public, the topic raised awareness and criticism due to the lootboxes resemblance to gambling, especially amongst politicians.

However, according to Nielsen and Grabarczyk (2018), lootboxes have existed for much longer than the current debate might indicate,[99] such as in booster packs of *Magic: The Gathering* (Garfield, 1993) cards or the first *Diablo* (Blizzard Entertainment, 1996) game. As these mechanisms are essentially lootboxes, but show minor differences, Nielsen and Grabarczyk introduce the term "random reward mechanism" (2018, p. 2) to cover all of these phenomena and propose a classification for such mechanisms based on their relation to the economy outside of the game (i.e. how 'real money' relates to the in-game random reward mechanisms). This shows how random reward mechanisms are, in fact, different from gambling, as most of the criticized random reward mechanisms are detached from any currency or reward outside of the game. However, their classification is not aimed at randomness itself, but its relation to the outside world. In the following paragraphs, I will demonstrate how randomness in games comes in many different types, whether we call it randomness, chance (e.g. Polizzotto *et al.*, 2007) or uncertainty (e.g. Costikyan, 2013).

Randomness has been broadly discussed in game design research, which is not surprising as one can consider the uncertainty of outcomes a constitutive element of games (e.g. Elias *et al.*, 2012, p. 137; Juul, 2005, p. 38). Its relation to gambling, possible negative outcomes and question of whether

[99] Nielsen and Grabarczyk mention "[…] dominant controversies discussed in the specialized gaming press in 2017" (2018, p. 1). In fact, the debate is still ongoing in 2019. Some see lootboxes as the reason for an increase in "child gamblers" (BBC, 2018b) and early studies on the topic seem to support a correlation between engagement with lootboxes and gambling behaviors (Brooks & Clark, 2019). Several countries, such as Belgium (BBC, 2018a), have taken measures to ban lootboxes completely, while others are more careful in their jurisdiction (see Giovanni, 2019).

certain mechanisms in games should be considered gambling was discussed above (cf. Griffiths & King, 2015; Nielsen & Grabarczyk, 2018). Costikyan (2013) dedicated an entire book to different types of uncertainty in games. Schell (2008, pp. 153–170) discusses the mathematical implementation and consequences of chance into games. Björk and Holopainen's *Patterns in Game Design* (2005), another design-oriented work, discusses randomness more implicitly by using it as one function that can instantiate patterns, such as "Narrative Structures" (p. 216), or modulate them, as in the case of "Uncertainty of Information" (p. 130). Chance is also discussed in the frame of Caillois' famous four-fold distinction, which designates games of chance as games of "alea" (Caillois, 1961; Ottens, 2016).

5.8.1 Randomness, Predictability, Uncertainty, Indeterminacy, Emergence and Complexity

In total, ten of the analyzed classifications employed randomness as a difference (Aarseth *et al*., 2003; Avedon & Sutton-Smith, 1971; Bell, 1979; Borsari, 2004; Caillois, 1961; Culin, 1907; Jünger, 1959; LaBrie *et al*., 2013; Murray, 1952; Polizzotto *et al*., 2007). Many of the classifications used the terms 'chance' (e.g. Culin, 1907; LaBrie *et al*., 2013) or 'luck' (e.g. Elias *et al*., 2012, pp. 137, 139) instead of 'randomness', which demands an elaboration on the choice of 'randomness' in this project. Following this explanation, the terms 'predictability', 'determinacy' and 'complexity' will be discussed in relation to randomness.

First of all, the term 'luck' is problematic as it is connected to the ability to 'have luck'. This concept indicates that it is possible to avoid randomness and win, despite how bad the odds are.[100] Second of all, both 'chance' and 'luck' are repeatedly used as the opposite of 'skill'. Especially in contemporary games, it is impossible to categorize games as *either* including chance *or* requiring

[100] The Merriam Webster dictionary, for example, defines it as "A force that brings good fortune or adversity".

skill[101]. To distance myself from this dichotomy of chance versus skill games, I use the term 'randomness' instead of 'luck' or 'chance'.

In the following section I will argue that the terms '(non-)deterministic', 'uncertainty', 'predictability', 'emergence' and 'complexity' must be separated from randomness in games, as well as from each other. The problem with conflating these terms is that they work different levels, such as ontological elements of the artifact (indeterminacy, randomness) and epistemic problems on the side of the player (uncertainty, predictability). Furthermore, the scholars who use them tend to conflate *causes* for, for example, indeterminacy (e.g. randomness) and indeterminacy itself.

Aarseth *et al.*'s inclusion of randomness in their list of classifications is based on their dichotomy of deterministic versus non-deterministic games (2003, p. 52). This distinction rises from whether any given situation will always bring forth the same result, if acted upon in the same way, or if there will be a "random function" included that might lead to different outcomes (ibid.). Costikyan (2013) also discusses the possible sources for non-deterministic outcomes in games. More specifically, he uses the term "uncertainty" (idem., pp. 9–16). One example of these sources is "player unpredictability" (idem., p. 78),[102] which describes the unpredictable outcome of a game (or situation) based on the unpredictable behavior of another player or players. Multiplayer scenarios are also mentioned by Aarseth *et al.* (2003) as a source for non-deterministic games. Thus, both Aarseth *et al.*

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[101] Poker, for example, is chance based due to the shuffling and distribution of cards, but also requires the skill of calculating odds and reading your opponents. A valid objection would be that 'skill' often refers to 'dexterity' and has a much closer meaning to 'physical skill'. Many sports would function as a counterargument for this, as there is chance involved in how a ball bounces off the bat of a Baseball player, or the foot of a Soccer player. Yet another valid objection is that that is not the chance meant by the dichotomy of chance versus skill, but that the inclusion of skill requires a device that is dedicated to the production of random values. Now we enter the domain of digital games. *World of Warcraft*, for example, requires a high amount of both mental (strategy, planning, coordination), as well as physical (accurately controlling mouse and keyboard, finger dexterity) skill. Yet, the game has explicitly random critical hits, as well as a randomized amount of damage per hit. Chance and skill are simply not ontologically mutually exclusive. It is easy to imagine a sport that includes a generator of random values. After all, coins are used in many sports to determine starting positions (e.g. Soccer, American Football).

[102] Notice the synonymous use of uncertainty and unpredictability.

and Costikyan connect non-determinism or uncertainty with multiplayer games. However, it is important to remember that while player behavior is non-deterministic and uncertain it is not necessarily 'truly random'.

The confusion with these terms can be explained by Grabarczyk's distinction between epistemological and ontological randomness (2018, p. 1). He describes the epistemological view on randomness as our incapability to "[…] discover a pattern enabling us to anticipate the next character or event" (Grabarczyk, 2018, p. 1) and the ontological view as "[…] an objective feature of the string (or chain of events)" (Grabarczyk, 2018, p. 1). Interestingly, he also connects the epistemological view with "unpredictability" (ibid.; in reference to Futuyma, 2005). This distinction between epistemological and ontological randomness is useful for alleviating confusion among these terms.

For a five-year-old child, Tic-Tac-Toe might be a non-deterministic game, because they are not capable of understanding nor do they not know the sequence of moves that will always lead to a draw. Here, we have a case of epistemological non-determinism. Similarly, Connect Four is a non-deterministic game for most grown-ups, but computers can calculate the winning move at every point in the game. Ontologically, Connect Four is a deterministic, predictable game, but for the average human, it is not. Here, we have a deterministic game that is *commonly* perceived as non-deterministic.

As mentioned, another factor for non-determinism are other players' behaviors in multiplayer games (Aarseth *et al.*, 2003, p. 52; Costikyan, 2013, p. 78). If we assume that the other players act on free will and are not following a particular scheme, it is correct to assume that their inclusion will lead to non-determinism. However, this consequential creation of a non-deterministic game does not also mean the inclusion of randomness, as studies have shown that human behavior is seldom truly random (see Tune, 1964 and Wagenaar, 1972; as cited in West & Lebiere, 2001). Thus, multiplayer games are ontologically non-deterministic and epistemologically uncertain, but the inclusion of other players does not amount to randomness. Their non-determinism results from the inclusion of other players whose behavior creates emergence (cf. Juul, 2005, pp. 73–82).

Fromm defines emergence as "[…] an effect or event where the cause is not immediately visible or apparent" (2005, p. 5). He distinguishes three types of emergence based on the feedback particular situations and systems give. The most relevant type of emergence he labels Type II emergence, or a "Multi Agent System (MAS) […]" that can be discussed on macroscopic and microscopic levels (idem., p. 9):

> On the low microscopic level of the agent, many individual entities or agents interact locally with each other. This interaction results in a new, usually unpredicted pattern which appears at a higher level. On the high macroscopic level of the group or whole system, we notice unpredicted patterns, structures or properties – emergent phenomena – which are not directly specified in the interaction laws, and which in turn influence the low-level interactions of the entities via a feedback process.

In the context of games, we can understand the behavior of operators, which is not prescribed by the system, as emergence. While operator behavior is limited to possible actions within the game system, the exact order, targets and reactions of these actions are not prescribed by it. Due to the addition of preferable outcomes for each individual (e.g. goals), their behavior is, in Fromm's words, "[…] predictable in principle, but not in every detail" (ibid.). We can predict that an operator will act in ways that bring them towards the desired state, but which of the possible ways they chose is impossible to determine. Furthermore, it is ultimately the operator's decision to act towards the prescribed goal at that point in time in the first place, and they could simply decide to pursue a different path or goals they created for themselves. This type of emergence by inclusion of other players is, thus, *a* cause for indeterminacy, similar to Aarseth *et al*. (2003) observation that a random function is *a* cause for indeterminacy, but they are not the same.

Ultimately the consideration of unpredictability as randomness is phenomenological: We experience a given mechanic or situation as random based on our incapability to make sufficient predictions with the available information (cf. Grabarczyk, 2018, p. 1). My criticism is that it is necessary to distinguish between determinism, uncertainty, subjective predictability and randomness. It is important to remember that non-determinism is a property of the game and should be examined separately from the perception of the players. A lack of predictability can lead to the perception and feeling of non-determinism, as well as randomness, but may be merely a result of our own limitations. In other words: A lack of predictability can be caused by epistemological randomness, or ontological randomness, as well as epistemological or ontological non-determinism. Here, I am much more interested in "an objective feature" (Grabarczyk, 2018, p. 1) of the game, which constitutes the ontological perspective of randomness (ibid.). But how does one differentiate between randomness and human behavior in games? To answer this question, I will use Culin's categorization of dice and guessing games (1907, p. 44).

Culin classifies chance games into guessing games and dice games (idem., p. 44). In his terms, in dice games the "[…] the hazard [to the player] depends upon the random fall of certain implements employed like dice" (ibid.) and in guessing games "[…] it depends upon the guess or choice of the player" (ibid.). In other words, it is the player's incapability to make the correct guess that causes them to lose in guessing games, whereas in dice games the object determines whether they win or lose. Ultimately, the ontological difference between these two types of games lies in the generator of randomness, not the cause for hazard.

Imagine two scenarios: We play the guessing game in which I distribute sticks in my hands behind my back. According to Culin, this is a chance game as you will not be able to know the correct answer. Now, I roll a die inside a black cup, put it on the table, and you have to guess what number we rolled. Both cases are formally the same, except the die is a 'true generator of randomness', whereas my distribution of sticks is only nearly so. As previously discussed, human behavior is never truly random (see Tune, 1964 and Wagenaar, 1972; as cited in West & Lebiere, 2001), and after enough attempts of the guessing game, you might be able to relatively accurately predict my choices.

Thus, we could instead speak of random (dice) and semi-random (guessing) games. This leads to the important observation that games are not either deterministic or non-deterministic; most of them are, in fact, semi-non-deterministic because of the inclusion of human behavior.[103] Ultimately, semi-non-deterministic games are a special type of non-deterministic games, simply because they are *not deterministic*. However, the throw of a die always has the same odds. Playing the guessing game with a human, on the other hand, will eventually reveal a pattern. This does not mean that the game is deterministic, as this pattern might change, or be more complex than initially thought. As randomness is understood as the impossibility to gather the necessary information to calculate an outcome, multiplayer scenarios are not random, as the information about a particular human's 'randomness generator' is theoretically obtainable through enough attempts. Thus, randomness will be understood as the only source of absolute non-determinism, whereas other strategies, such as the inclusion of other players, only lead to semi-non-determinism, emergence and unpredictability. Using Grabarczyk's

[103] The term 'semi-determinism' has been used in other fields (e.g. Ivorra, Hertzog, Mohammadi, & Santiago, 2006; Van den Bussche & Van Gucht, 1992), and *could* also be mistaken for a reference to compatibilism (cf. McKenna & Coates, 2018). However, here semi-determinism will simply describe games that lie somewhere between determinism and absolute non-determinism.

dichotomy we could describe semi-non-determinism as ‘ontological predictability’ but not ‘ontological *absolute* predictability’. The latter of which would describe a deterministic game.

Culin further classified guessing games by the type of objects that are used as the aim of the player’s guess, and describes ‘dice’ as an umbrella term for objects that are thrown for the purpose of generating a random value.[104] This points towards the possibility – or even necessity – to classify randomness further by the type of object that is used. However, as Jünger pointed out, it is impossible to make an exhaustive list of objects that are used for randomness generation (1959, p. 20). Therefore, the following classification will remain on a higher level of abstraction regarding the randomness generator and focus on the kind of randomness itself.

To summarize, we must distinguish between randomness, non-determinism, and uncertainty. Randomness can be one of many causes for non-determinism. Non-determinism is a property of a given artifact or situation and uncertainty is much more a description of the player’s perception of a situation or a game in general. A game can be deterministic, but its outcome can still be perceived as uncertain, as in the example of children playing Tic-Tac-Toe. Finally, a classification of objects used for the generation of randomness is, while possible if abstract enough, outside the scope of this project.

5.8.2 Classifying Game Randomness

This section will describe the dimensions of randomness in the present classification scheme. These dimensions are based on previous literature about randomness (as well as uncertainty, etc. as discussed above) in games. The following sections are separated in a pure description of the dimensions and a discussion of the system. The reason for this is that the classification equips us with a language of

[104] The most common version of ‘dice’ in North American Indian games were items with two sides, made of “[…]split canes, wooden staves or blocks, bone staves, beaver and woodchuck teeth, walnut shells, peach and plum stones, grains of corn, and bone, shell, brass, and pottery disks” (Culin, 1907, p. 45).

discussing certain relations between each dimension. These discussions will point out certain impossible and unlikely connections between dimensions, while each facet is still useful in their own regard.

Ontological and Epistemological Randomness

The difference between ontological randomness and epistemological randomness is based on Grabarczyk's observation that not all randomness in games is 'true randomness'. Epistemological randomness is randomness that is based on the lack of capability to interpret a particular situation in the correct way. Often, a particular event in a game is perceived as random, while its underlying system is not truly random. Any digital generator of randomness (e.g. a digital die) is not truly random, as the creation of the output value can be reduced to the algorithm that generated it. In these cases, the events are experienced as random based on the lack of knowledge of its underlying system. Ontological randomness, on the other hand, is randomness that is truly unpredictable and incalculable. Examples of ontological randomness are real life events, such as the weather or the roll of a die. On a pragmatic level, we can now distinguish random processes (ontological randomness) and non-random processes (epistemological randomness). On a more conceptual level, it is possible to distinguish epistemological randomness into three sub-categories: *pseudo random* processes, *non-fully reducible* processes, and *martingale randomness* (Asher, 2012). These categories by Asher also cover differences employed by Grabarczyk (2018) and Costikyan (2013), which will be mentioned where applicable.

Pseudo random processes include the aforementioned digital randomness generators, which "[…] generate random numbers by a deterministic process" (ibid.). These may use, for example, the run time of a computer to generate a number. Thus, the resulting number is not random but contingent on the source value and can be easily calculated. Similarly, card-shuffling machines can be considered pseudo randomness, as one starting order of cards results in the same output order of cards, if the machines work precisely enough (ibid.). The idea of pseudo randomness is also used by Grabarczyk's (2018, pp. 2–3) as an opposite to true randomness. According to him, true randomness "[…] relates to random sequences or values obtained from a source which is considered to be unpredictable in the stronger, ontological sense" (p. 3). We can think of instantiations of true randomness as the classic, analog generators of randomness, such as dice or manual shuffling of cards. Grabarczyk also mentions the implementation of true randomness in video games by accessing (i.e. recording) real life processes that are random, such as lava lamps or the weather. According to Grabarczyk, Pseudo-randomness accesses data that might be hidden to the player and is contingent, and generates a value from this contingent data (p. 2). This data is run through an algorithm to (a) make it fit the format needed for output (e.g. a number) and (b) disguise its pseudo-randomness to a sufficient degree. In this way, video games can simply access the current run-time of the operating system or the game and generate a pseudo-random number from it. As Asher and Grabarczyk describe the same concept of pseudo-randomness, Grabarczyk's opposite class of true randomness is also included in the present classification. Resulting in a dichotomy between 'pseudo' and 'true' randomness within epistemological randomness.

Non-fully reducible processes can be predicted to a certain degree, though a margin of uncertainty will always remain. Asher uses the probability calculation of developing heart disease as an example. Here, we can make a prediction based on some available data, without ever being able to make an absolutely correct prediction. As the opposite to non-fully reducible processes are fully reducible processes, which are by definition calculable, the class of non-fully reducible randomness has no opposite.

Last, *martingale randomness* are processes with distributed chances that cannot be changed. If we roll a die, the chance of rolling a six is always 1/6 and no information available to us can change this. In his discussion of randomness as a factor of uncertainty, Costikyan distinguishes between *stochastic* and *non-stochastic* systems (2013, p. 83), which explain the same type of randomness. The name refers to a branch of probability theory; in a non-stochastic system the outcome of one instantiation of randomness influences the probabilities of the next outcomes. When playing Blackjack, for example, each dealt card changes the chance for other cards to appear. A stochastic system is the opposite, where "[…] each event is unrelated to the previous one" (Costikyan, 2013, p. 83). Rolling dice is an example of a stochastic system, as the odds to roll a particular number do not change based on the numbers that were rolled before. Due to the lack of a term in Asher's classification, this dichotomy is described as stochastic and non-stochastic randomness.

Randomness Generators: Analog and Digital

The kind of object used to generate a random value is placed last in this list on purpose, as it aims at a classification of the *objects* used to implement randomness into games, not the randomness itself. Thus, technically, I must omit this dimension due to the limitations of this classification to the mechanical system of games. However, the discussion will show that there is at least one interesting observation regarding the relationship of digital randomness generators and 'true' randomness.

We can most generally distinguish between analog and digital devices. Several analog devices or processes to generate randomness have been mentioned in previous research: Culin described a broad range of devices that were used as 'dice' by native North Americans, such as animal bones, pottery disks or walnut shells (Culin, 1907, p. 45); Parlett (2000) describes card as devices for games of gambling (Parlett, 2000, p. XIII); Jünger's discussion adds mechanical machines used for gambling, coins, and fingers, among other things (1959, p. 20); and Grabarczyk (2018) mentions lava lamps and even the weather as referents of "pseudo random" digital randomness generators (2018, p. 3). Commonly, analog devices are rolled, thrown or shuffled, to create either a random string of values (e.g. cards), or a random number out of a given set of numbers to be utilized. More abstractly, any physical object or process can be used to create a random value by throwing it and determining, as long as its behavior is complicated enough.

Digital generators of randomness, on the other hand, are programs that run on a computational device to generate a random value. This can take the form of an explicit random function that imitates analog randomness generators, such as an app that displays a die and is simply used as a digital replacement for an analog die. However, much more common are lines of code in video games, such as role-playing games, to generate random results in, for example, damage and critical hits.

Discussion

As stated previously, there are certain combinations of facets that are, at this point, impossible to make. For example, there is no true digital random generator.

Grabarczyk describes the historical development of randomness creation in video games from functions that access not random, but contingent values (e.g. time sensitive data), in order to create a pseudo-random value, to functions that access truly random values, such as lava lamps or the weather (2018, p. 3). This also means that there is no true digital randomness. Ultimately, the 'true randomness' in video games relies on a non-digital source of randomness. Let me reiterate on Grabarczyk's (2018, pp. 1–2) initial definition of randomness:

> One interesting example of a definition of randomness which results in 2 ontological consequences and which is, at the same time, especially relevant in the context of video games, because it refers directly to the notion of computation, is Kolmogorov's definition which states, that a given string is random if it is longer then [sic] any procedure which can generate it (Li & Vitányi, 1997). The main idea behind this definition is that true randomness cannot be compressed in any way, because compression has to utilize patterns which the random sequence simply lacks.

Here, Grabarczyk explains why there cannot be true digital randomness: Implementing any function, such as randomness, into computers inherently requires reducing them into algorithms that are, by nature, calculable. As randomness was considered the inability to obtain the data that would be necessary for the correct calculation of an outcome, digitally created randomness is – at this point in time – never truly random, as it is based on functions that create the value, and thus reducible to the function itself. One would only have to obtain the algorithm, as well as the 'source data', to be able to calculate or reproduce a given outcome.

This does not mean that there is no true randomness in digital games. As Grabarczyk pointed out, contemporary digital games access analog randomness generators to generate a value. Even though the analog randomness is processed by a reducible function, the end value is still random, as the analog randomness generator fulfills the criteria of true randomness.

Lastly, during the classification of randomness in games it appeared that randomness is sometimes confused with emergence, uncertainty, unpredictability, and indeterminacy. While I was able to discuss and distinguish between these concepts, it also indicates that randomness itself should be located on a lower level of the classification. As discussed in Section 5.8.1, randomness is one factor that leads to indeterminacy, next to emergence and possibly others. Thus, the main element in this case should be ‘determinacy’ with different facets within ‘indeterminacy’. However, this change was consciously avoided, to adhere to the method employed in Chapter 4: randomness was chosen as one element of games because it was employed as a difference by game classifications. Future iterations of the UGO should take a restructuring of this element into consideration.

5.9 Summarizing the UGO

This section will summarize the UGO by providing a brief overview over each facet and class. The UGO was intentionally developed with possible alterations and additions in mind. Thus, while it is already useful for the comparison of games and more detailed analysis of individual elements, it is prone for changes in the future. The UGO was also designed as a classification of game elements, not games. This means that when stating that 'it is already useful for the comparison of games', I mean a qualitative comparison. A quantitative comparison of various games through, for example, multiple correspondence analysis may in principle be possible with the present model, but it was not designed for such broader scale approaches. Instead, the intention behind the UGO was to provide a toolkit for researchers, practitioners and teachers to identify and discuss individual differences between smaller parts of games within one game, or across asmall number of games. The following sections contain vrief summaries of all established facets, as well as visual overviews for them.

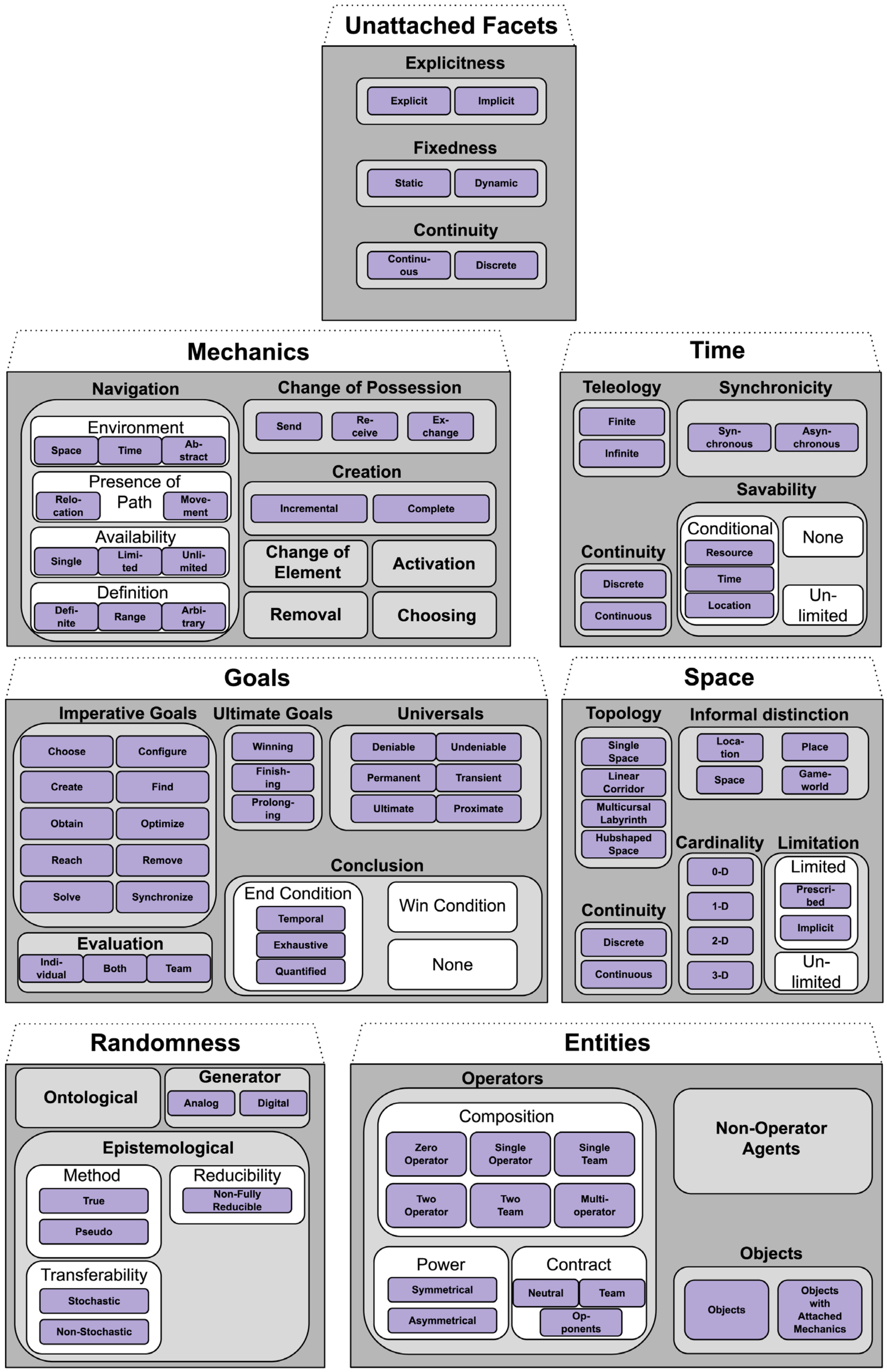

Figure 6: The Unifying Game Ontology

5.1 Unattached facets

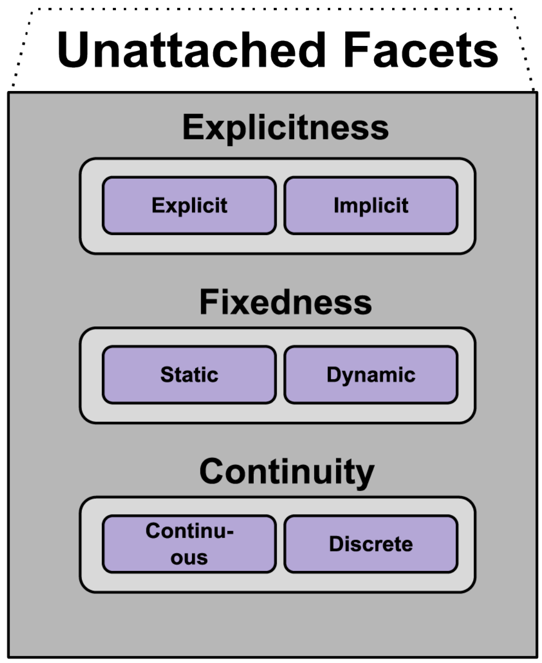

Figure 7: Unattached Facets.

Unattached facets are those facets including classes that can be applied across game elements. They describe how individual elements can be, not what different types there are within them. *Explicitness*, describes whether a given element is *explicit*ly or *implicit*ly communicated towards the player. The *fixedness* facet contains the classes *dynamic* and *static*, which indicate whether a given element is alterable or not. *Continuity* describes whether a given element is organized in discrete chunks or areas (*discrete*) or whether the element has a *continuous* nature.

5.2 Mechanics

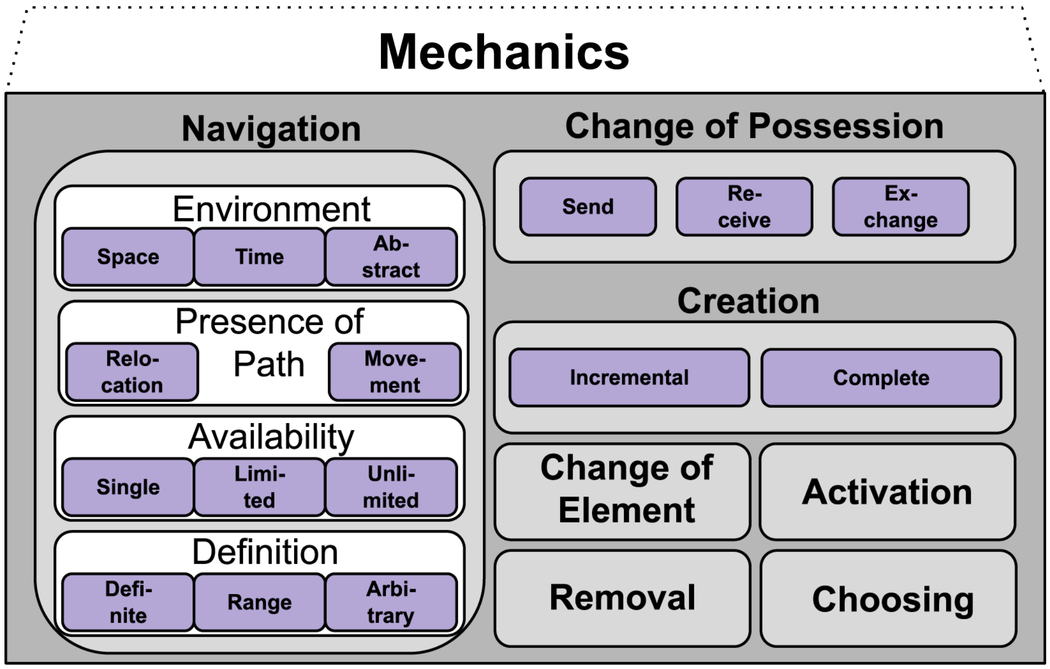

Figure 8: Mechanics in Games.

Mechanics are distinguished by seven identified main classes: *activation, change of element*, *change of possession*, *choosing*, *creation*, *navigation* and *removal*.

Four of these have no further subdivision in the present version of the UGO. When an object or ability merely requires the input to be activated but executes its effect autonomously afterwards, the player used an *activation* mechanic. *Change of element* describes the alteration of a game element, potentially rendering its ascription to a different class within the UGO. *Choosing* refers to mechanics that enable players to make a final decision between a given set of options. *Removal* stands for the complete removal of an entity or element from the game.

The facet *change of possession* includes three different mechanics that refer to altering the 'possessed by' status of a given element. Elements can be *sent* or *received*. This distinction aims to cover the possibility of involuntarily losing possession of an object, in which case the other player forcefully *receives* the element. The third type, *exchanging*, describes a special case in which both parties must receive *and* send elements for the mechanic to be possible.

The *creation* of elements was further divided into *incremental creation* and *complete creation*. In cases of *incremental creation* the process contains steps before the final creation of the element. *Complete creation* does not contain such steps and the element is create in its entirety.

The *navigation* facet contains the most subclasses. *Environment* is an informal sub-facet that describes what element the act of navigation occurs in: *space*, *time*, or *abstract*. The first two classes are self-explanatory. *Abstract* was included as the navigation of elements within the game system where no designated spatial or temporal locations can be identified. *Presence of path* aims at the distinction between *movement* and *relocation*, which is the presence of a path of adjacent locations between start and end point in the case of *movement*, and the lack thereof in *relocation*. Acts of navigation are further distinguished by their *availability* to the player. They can be usable only once (*single*), a *limited* amount of times, or available as long as the particular navigational act exists (*unlimted*). Lastly, the start and end points of a given navigational act can be *definite* (prescribed by the player or game system), restricted to a *range* of options within all possible options, or completely *arbitrary* within all possible options.

5.3 Space

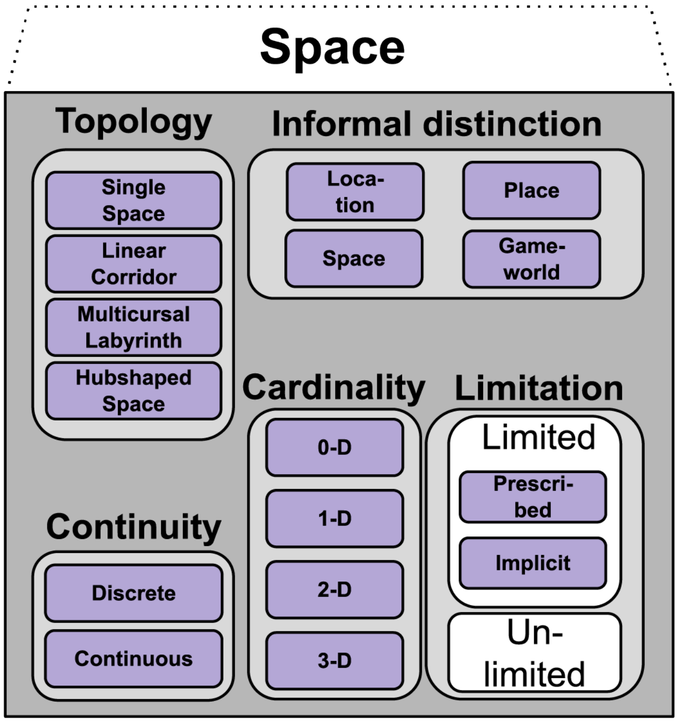

Figure 9: Space in Games.

First, the discussion of how games organize space introduced the difference between *space*, *gameworld*, *place* and *location*. Here, *space* is that within which relations between entites can be stablished. The game space is filled with entities (objects), such as mountains, forests, houses, or other more abstract elements, which constitute the *gameworld*. P*laces* are then created within this *gameworld* through inhabitation and practices by players, whereas *locations* are particular areas within the game as prescribed by the system. Thus, *places* and *locations* often coincide. For example, if the game prescribes a particular area as a city, it is likely that this area will become a lived place as well.

The unattached facet of *continuity* was especially mentioned within the space facet, as the organization of space in *discrete* areas is very common in games, while *continuous* describes the second option of organization of space.

The *topology* of space was described in four classes. *Single space* describes the organization of one spatial element that can range from a single room, to a vast landscape. The *linear corridor* refers to the structure of multiple individual spatial elements into a line or chain, where one must pass through each location in between the start and end points. A *multicursal labyrinth* arranges individual spaces in a way that there is more than one path. Lastly, the *hubshaped space* puts importance on one (or some) spatial element that the player has to return to frequently to be able to access other spatial locations. All of these topologies can be connected to each other or nested within each other.

Cardinality describes the dimensionality of the game space from zero to three dimensions. Some cardinalities are more likely to appear in a particular type or genre of games than others, but such connection is not necessary and it would be interesting to experiment more with uncommon uses of cardinality in different types of games.

Games' organization of space also includes their spatial *limitation*. Many games *prescribe* their limitation by marking a particular pitch or field to be played in. Others limit space *implicitly*, such as many video games as the game space is limited to that space which is represented and navigable within the digital gameworld. Some games have *unlimited* space. These are, however, restricted to a very small set of games that can, in principle, be played anywhere.

5.4 Time

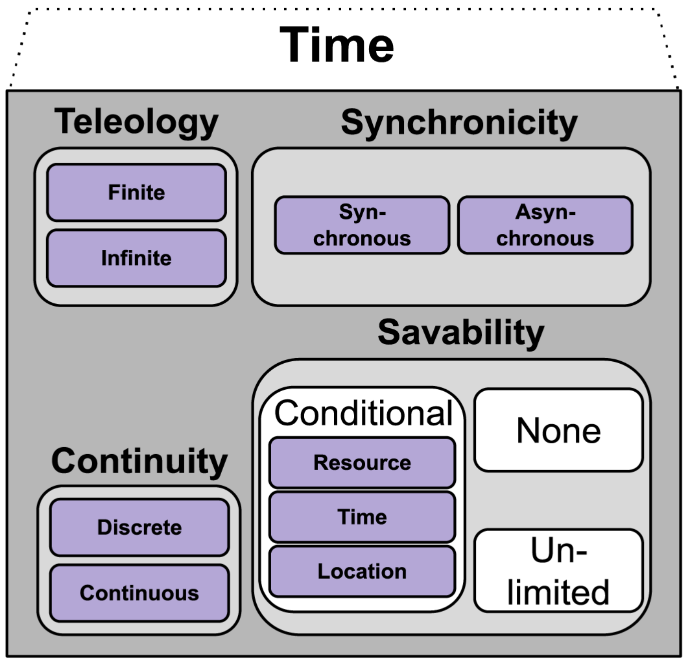

Figure 10: Time in Games.

Similar to the organization of space by games, they also employ certain types of temporal organization.

Teleology describes whether games have an ending or not. *Finite* games have an end condition that concludes (one instance of) the game. Games with *infinite* teleology can, in principle, go on forever. It is important to include the limitation 'in principle' as any game is implicitly limited by technological circumstances, such as the necessity of functioning servers, or ultimately the existence of the universe itself.

As within space, the unattached facet of *continuity* was explicitly mentioned here, as the organization of time into *discrete* chunks is a common practice in many games. These are commonly referred to as turns, rounds, halves etc. Time is organized *continuously* if it only exists through the order of events within the game as they occur.

The facet *synchronicity* describes whether players are able to take actions simultaneously or not. If a game structures actions *asynchronously*, each player's actions must be taken individually. The *synchronous* organization of time enables all players to take actions at the same time.

Lastly, *savability* was added into the facet of time, even though it is not strictly a temporal organization. However, as time can be understood as the order of events, savability was moved here as a facet that describes the possibility of saving the game state, which can in turn be understood as the result of all events in the game. The three sub-classes in savability are *unlimited*, *conditional* and *none*. Within these, only *unlimited* was further subdivided. This division is based on the condition for saving, into *time*, *space*, and *resource*. Temporal saving occurs with, for example, a certain cooldown on saving. Spatial saving required the players to be at a particular location to save. Lastly, some games demand the availability of a resource for the act of saving.

5.5 Entities

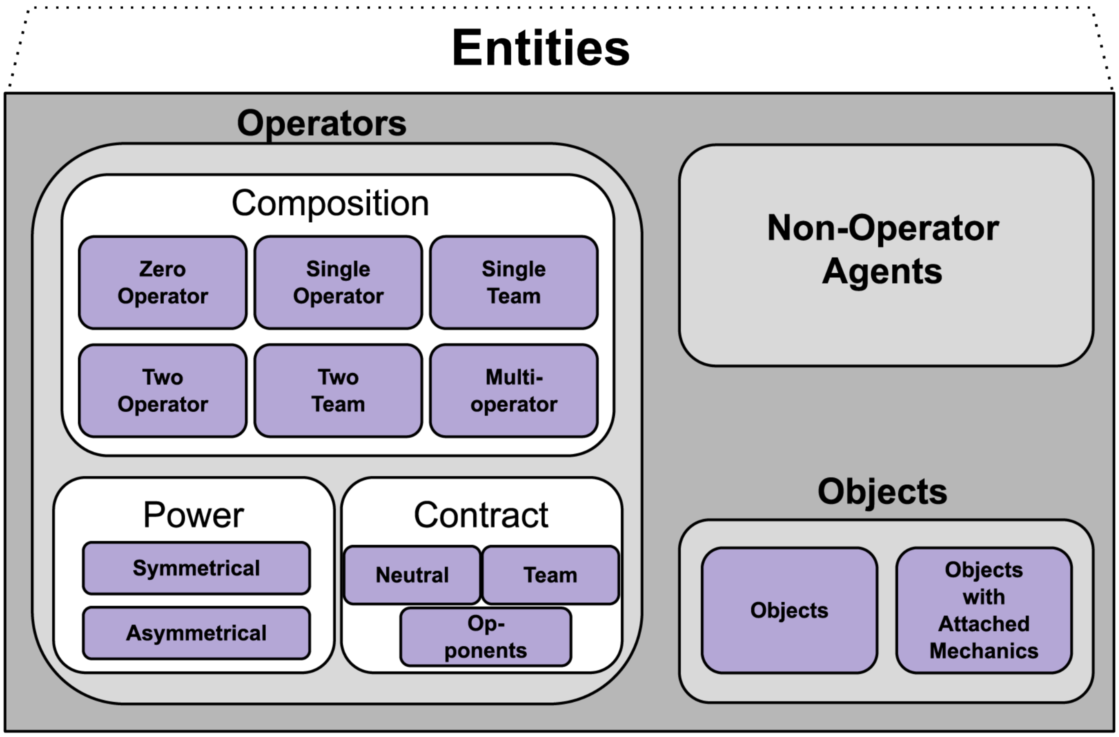

Figure 11: Entities in Games.

As entities are understood those elements that are usually represented with a material existence. Entities contain *objects* and *agents*. *Objects* are all items in the game that are described by the game system and those necessary for its operation. They also include structures such as artificial buildings and natural structures such as mountains or trees. Here, the notion of object was understood in a broad sense, also including information or stories as objects that can be possessed or obtained.

Agents are most easily distinguished from objects by their capability of executing mechanics. They are sub-divided into *operators* and *non-operator agents*. The operator role is a position described by the game system that must be filled with an entity that is capable of taking sequences of actions that are not prescribed by the game system. *Non-operator agents* are then those entities that are capable of executing mechanics, but only in ways that are prescribed by the system. A difficult distinction was that between *non-operator agents* and *objects with attached mechanics*. To avoid a classification of everything that can change the game state as an agent, it was decided that only those entities that can act without previous input from an operator will be considered *non-operator agents*. This means that, for example, many non-player characters must be considered *objects with attached mechanics*.

The *operator* position can further be subdivided by the structure between operators. *Operator composition* describes the number of and clustering of operators. A *zero operator* game does not describe any position from outside the game system itself. *Single operator* games require only one operator to execute the system. Games with a *single team* require more than one operator, which are allied. The *two operator* composition described games with two operator positions that struggle for dominance. The *two team* composition then broadens this struggle into a competition between two teams made up of multiple operators. A game with *multioperator* composition can more commonly be understood as a ‘free for all game’ where more than two operators struggle against everyone else. *Contract* is a second facet within the operator which described whether a particular set of operators are allied (*team*), *neutral* towards each other, or if they are situated within opposition (*opponent*). Lastly, *power* describes the difference between *symmetrical* and *asymmetrical* games. In symmetrical games the operator’s powers are distributed equally between all operators. In *asymmetrical* games there is a significant difference between power levels between some operators.

5.6 Goals

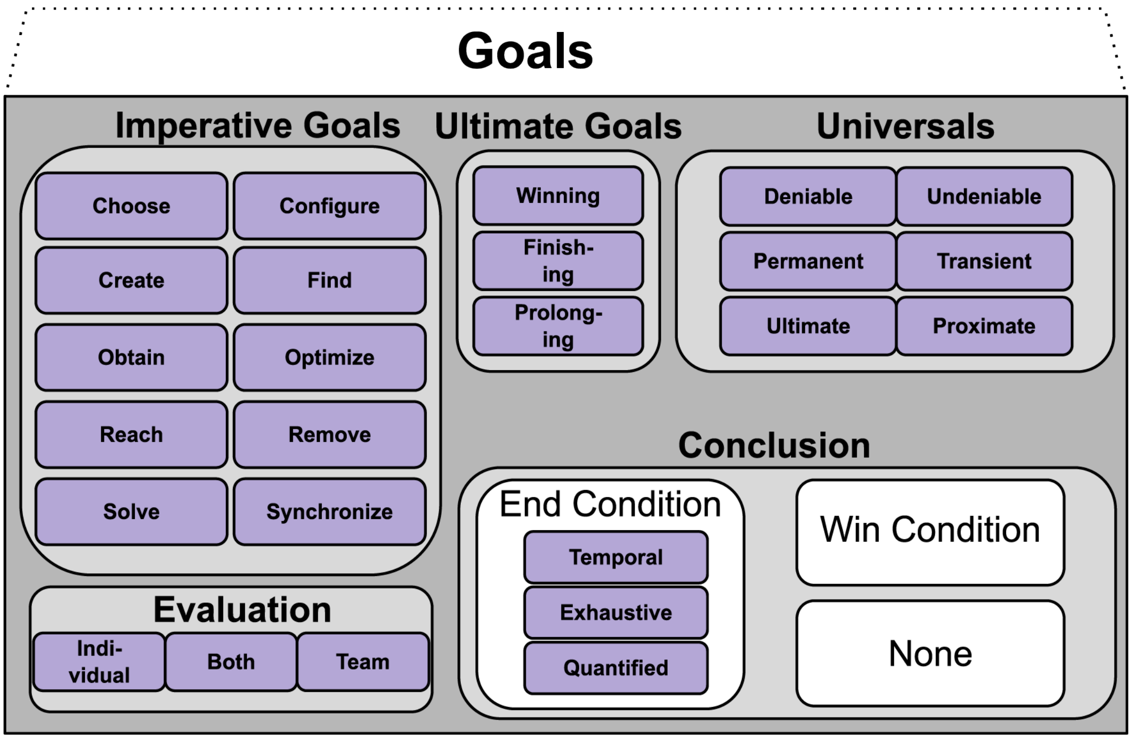

Figure 12: Goals in Games.

The classification of goals in games has its own section of 'universals', as previous studies mostly listed how goals in games are, instead of different kinds of goals. *Permanent* and *transient* goals are most easily understood by what can be claimed outside of the game after the achievement of the goal. If a goal is *permanent*, one can claim to always have fulfilled this goal. Finishing a ludonarrative game can be understood as such a permanent goal. *Transient* goals are those after which players can only claim to have mastered an individual instantiation of the game, such as winning a match in sports. *Deniable* and *undeniable* goals describe whether a particular goal is necessarily pursued by the players (*undeniable*) in order to succeed in the game or if it is of a more *deniable* nature. *Ultimate* and *proximate* are goals that end the game (*ultimate*) and are necessarily fulfilled before this end, but do not lead to the conclusion of the game (*proximate*).

Drawing from this last universal, on the highest level three *ultimate goals* were identified: *winning*, *finishing* and *prolonging*. *Winning* refers to games which contain a victory condition, and *finishing* to those that can be exhausted and conclude through other means than victory. *Prolonging* describes games in which the ultimate goal is simply to keep playing.

To achieve these ultimate goals, games provide ten different *imperative goals* that players are expected to work towards during play:

1. *Choose* requires players to make (often the right) decision of a range of options
2. *Configure* requires the configuration of game elements in a particular way
3. *Create* requires the players to bring an element into existence that was not before
4. *Find* requires the player to locate a particular element within the game
5. *Obtain* requires the players to bring a particular element under their control
6. *Optimize* requires the accumulation of an element to a requested amount
7. *Reach* requires the navigation to a particular location
8. *Remove* requires the players to eliminate a particular element from the game
9. *Solve* requires the players to deliver the correct response to a problem without explicit limited options
10. *Synchronize* requires players to bring particular elements into spatial or temporal unity

Lastly, the differences and relations between victory and end conditions were pointed out. *Victory conditions* were understood as functions that determine how a player or team can win the game. *End condition* describe how an instance of the game reaches conclusion. *End conditions* were further divided into *exhaustive*, *temporal* and *quantified*. Games with an *exhaustive* end condition conclude after the whole content or a specific part of it was experienced by the player. *Temporal* end conditions presecribe the end of the game after a certain amount of time or at a given point in time. Lastly, *quantified* end conditions prescribe the conclusion of a game after a particular value of elements was reached.

The *evaluation* of reaching goals was divided into *individual*, *team* or *both*. *Individual* evaluation takes place when the players' performance is judged for each player. If some players are grouped together for evaluation, they are evaluated as a *team*. The class *Both* combines the evaluation of players as a team and individually.

5.7 Randomness

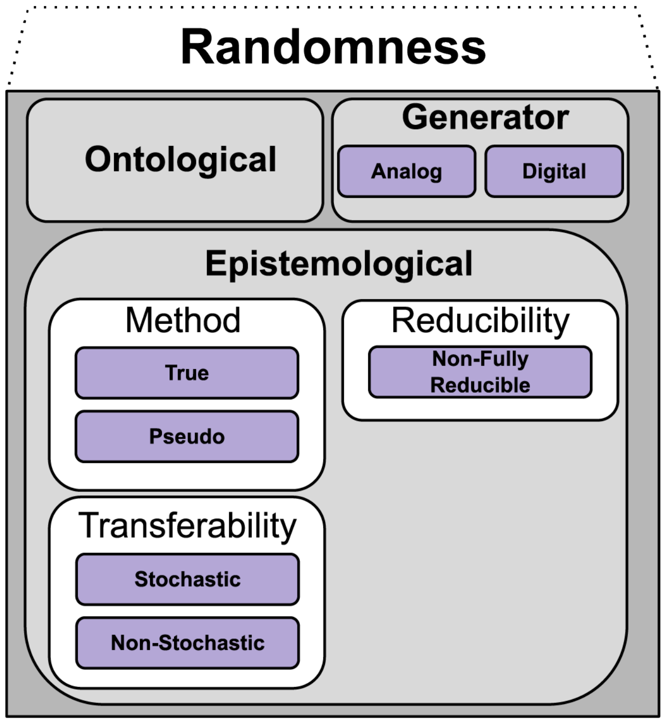

Figure 13: Randomness in Games.

Ontological and *epistemological* randomness describe whether a given instance of randomness is itself random, or only perceived as such due to cognitive shortcomings of the observer. Epistemological randomness was then subdivided with three facets, by *transferability*, *reducibility* and *method*.

True and *pseudo* randomness make a similar distinction that is based on the method of creating a random value. While *true* randomness relies on devices or occurrences that are ontologically random, *pseudo* randomness uses inaccessibility to information to generate a value that is random to the observer. Often *pseudo* random values are generated by accessing contingent data such as the run time of a computer and using it as the basis for an algorithm to generate a value. *Stochastic* and *non-stochastic* randomness describe whether the outcome of one occurrence of randomness has influence on each subsequent occurrence. In *stochastic* systems, each event is disconnected from the previous events (e.g. dice), whereas in *non-stochastic* systems one event changes the probability of subsequent events (e.g. drawing cards).

Lastly, a distinction was made based on the nature of the randomness *generator*. *Analog* randomness generators use devices or events from the real world to generate a random value, whereas *digital* generators rely on computational generation of randomness. One special case is a combination of both types of generators, where a digital system uses input from an analog randomness generator to then calculate a random value from it.

Chapter 6: Conclusions

In this dissertation I have asked the question 'What are games considered to be constituted by'? Chapter Two started by considering the term 'game' and its underlying concept as a social construct with morphing characteristics across time and space. To understand what this social construct currently encompasses, I have introduced 'underlying ideas', which are those understandings of the game-concept used in particular instances. I then examined the term 'game' for some of these underlying ideas, and through this examination identified and discussed a non-exhaustive list of five such underlying ideas.

Games as objects describe the material items that a game consists of, such as boards, but also including the code of digital games. Games as processes refer to the events that unfold while playing a particular game, and differ from each individual instantiation. The underlying idea of games as systems understands games as an underlying formal system, or relationships between particular formal elements, often, but not necessarily, described through rules. These systems can either be intentionally invented or understood as a game system by uncovering the rules that govern a situation. Games are also understood as an attitude towards situations. This attitude is commonly a non-serious attitude towards a situation or activity, and is tightly connected with the expectation of non-serious consequences, or the indifference towards serious consequences. Lastly, artifacts are also sometimes understood as games, due to the same development and distribution tools being used for their creation.

As a result of this, the artifacts in question look like established games and are marketed like established games, which contributes to their consideration as games.

Chapter Three then discussed and applied terms from general ontology to games. This led to the introduction of the ‘game-specific’, which conceptualizes games with the same name as groups of anonymous particulars consisting of all actual versions of the given game. With this, I discussed that these specifics are individuated in two ways. Materialization individuates game-specifics into particular material objects, while instantiation individuates them into particular processes. In addition to this concept, games were discussed within the ‘endurant’-‘perdurant’ distinction. To consider games ‘endurants’ means to consider them wholly present at any point in time, while considering them ‘perdurants’ means they are constituted by temporal parts, each of which is only present at one particular point in time. It was concluded that the adoption of the endurant position enables generalized claims about game-specifics more easily than the perdurant perspective. Chapter two concluded with the explication of this dissertation’s empirical focus in regards to games, which is the underlying formal system of ‘orthogames’ (cf. Carter, Gibbs, & Harrop, 2012b).

Chapter Four first summarized literature about classification systems and processes of libraries, in order to develop a framework for the analysis of existing game classifications and the construction of the Unifying Game Ontology (UGO). Drawing from this literature, I argued that ‘game elements’ can be identified by abstracting employed differences of existing game classifications, as good classifications are based on inherent properties of the classified subject (cf. Sayers, 1944, pp. 56–57). Of course, simply assuming that all game classifications are good classifications would be a mistake, and the “artificial classifications” (ibid.), which are based on external properties of a subject, were discussed and subsequently removed during the process. The abstraction of differences was conducted on seventeen game classifications. The classifications were described on two axes. One axis distinguished between classifications for the purpose of making a corpus of games more accessible and deliberate models for classification of an unknown set of games. The second axis loosely described classifications as either 'pre-digital' or 'post-digital' classifications, attempting to grasp what types of games the classifications were based on. Through this process of abstraction and subsequent clustering, eight main elements were identified to serve as the main facets of the UGO.

Chapter Five continued to utilize library studies by first exploring different classification methods and schemes. For the synthesis of existing ontological models into the encompassing UGO, a faceted classification scheme (see Vickery, 1960) was chosen. The advantages of faceted classifications, as opposed to hierarchical ones, include easy adaptability and the accommodation of different perspectives on the same subject within one classification. The earlier identified elements of games were then used as the UGO's highest-level facets. Each facet was discussed in an individual section, starting with a review of mostly game studies literature regarding the game element. Through these reviews, the highest-level facets were filled with additional subdivisions, which were exemplified with games, without aiming for the UGO's quantification. Chapter Five concluded with a summary of the UGO's divisions and subdivisions, while emphasizing the UGO's nature as a system intentionally designed for adaption and alteration.

6.1 Results

The Unifying Game Ontology is the first classification scheme of its scope that describes game elements on the lowest level of complexity and the highest formal level. It is, to my knowledge, also the first meta-study regarding game classifications, their types, aims, methods, and shortcomings by utilizing existing classification concepts. The UGO, in its current state, is able to describe the underlying formal systems of games across materialities. It can be used for comparative purposes in game analysis. The UGO is capable to decompose, describe and distinguish individual parts of games within their formal systems. Especially the decomposition of game elements is of utmost importance for scientific rigor. This refers not only to the necessity to carefully define what we talk about, when we talk about game elements, but more importantly to the decomposition and identification of parts of games when conducting media-effect studies. This dissertation has also laid the ground work for its further development as a general ontology of games that avoids conflations and componentization of more granular elements. Furthermore, the discussions during the analysis and synthesis of game classifications themselves bear results for game studies, and more specifically game ontology.

Through the examination of classifications and classification of game elements, several observations were made. Examining game classifications diachronically has shown that more recent classifications have started to employ a broader variety of differences. It was hypothesized that the reason for this is the development of digital games in two possible ways: either (1) the development of digital games has led to a deeper understanding and conceptualization of what games are, or (2) digital games are simply so different from non-digital games that more differences are necessary to classify them. Furthermore, it can be observed that older classifications predominantly employed hierarchical classification schemes, while newer classifications moved towards the use of faceted or mixed schemes.

Studies concerned with the classification of game elements construct two different types of classes. In the present study one of these classes was named ‘unattached facets’ or ‘universals’. These are constructed through differences in elements that can apply to more than one element. Whether a goal in a game is proximate or ultimate (cf. J. H. Smith, 2006) depends on the particular instance in which the goal is used, but every particular goal can be either proximate or ultimate. These are positions that particular elements take or properties they have. Opposed to this are different types of game elements that fulfill only one function within the underlying formal systems of games. The difference between these two types of classes was understood as the difference between *how* elements can be (universals) and *what* elements there are.

The UGO's creation necessitated certain abstractions to be used on existing classifications of game elements, which led to another observation. Many existing classifications have been constructed with a particular goal in mind that often necessitated the inclusion of multiple differences into the creation of one class. These classes were called compound elements and informal elements. Combinations of both, 'informal compound elements', were most prominently found in lists of mechanics where some definitions included multiple mechanics, as well as intentions of players. 'Attacking', for example, combines the intention of removal of an enemy with the act of moving a unit, towards said enemy.

The abstraction of the informal aspects that lie within the player (e.g. intentions) and those aspects of elements that lie within one of the other homogenous subject fields, has shown that individual elements that are often only distinguishable on, for example, a representational level, are very similar within the formal underlying system. The distinction between agents and objects with attached mechanics, and operators and non-operators agents, has exemplified this. It appeared that the distinction between a non-operator agent and an object with an attached mechanic can ultimately only be made on a representational level, although they are identical within the formal game system.

More generally, it was observed that many classifications struggle with the distinction between ontological types of game elements, as well as distinctions based on epistemological problems. While the current project may not be completely void of such conflation, this complex of problems was pointed out and attempted to be avoided. In the classification of randomness in games, for example, it became obvious that many terms used in connection with randomness (e.g. 'uncertainty', 'emergence', 'indeterminacy') are rather connected to the epistemic problem of the player's incapability to predict the correct outcome, not an ontological property of the element in question.

It was observed that applications of classifications to games as holistic artifacts are difficult, maybe impossible. Especially within contemporary digital games it is impossible to argue for a game to contain a particular organization of space throughout the game. Some strategy games (e.g. *Lord of the Rings: The Battle for Middle-Earth* (Electronic Arts, 2004)) contain a discrete organization of space in the campaign, but players are required to 'jump into' each discrete area individually to combat the opponents in a continuous organization of space. Similarly, stating that a game has an asymmetrical power relation would oversimplify things. *Evolve* (Turtle Rock Studios, 2015), for example, could be commonly understood as a game with asymmetrical power relations, as one player controls a beast that takes on four players represented as human marines. While the power relation between the beast and each individual human in the game is asymmetrical, the power relation between the two teams is in fact symmetrical, as is the power relation between each marine. To avoid such problems, it is necessary to only examine particular instances of game elements within a game (as in the space example), or in relation to particular other elements (as in the power relation example).

6.2 Future perspectives

By identifying and classifying elements of games in the present faceted classification scheme, it is possible to examine particular elements of games for likeness. To exclude particular purposes for the moment, the UGO enables comparative game analyses to pick out one component in two games that appear to be related or even identical, analyze them on the level of the underlying formal system, and discuss their relationship. Due to the inclusion of pragmatically interesting facets, such comparisons can also include differences between the ontological nature of a particular component and its epistemological counterparts, as well as observations that can only be made on the representational level of the game. Purposes of such comparisons can be found in various places. Legislators might be interested in comparing randomness generators in particular games to determine whether a given generator is harmful or fraudulent. Psychologists may be interested in the comparison of two different game elements to examine the effects of either one onto players. Particularly in the presently popular areas of 'violence' in, and 'addiction' to, video games, such distinctions contribute to scientific rigor and the validity of individual results. Journalists and critics may be interested to sharpen their toolbox of criticism, to move away from broad comparisons of games on a flawed genre level and the comparison of games holistically – 'This game feels like *Apex Legends*' – and instead towards a more nuanced description of those elements of the formal system that are comparable. In high schools, the UGO's more detailed terminology can be used to teach children "ludoliteracy" (Zagal, 2011) in a similar way to how rhyme schemes are taught in present curricula.

One currently ongoing debate within game studies is whether digital games and other games should be considered related, or if they are in fact two completely dissimilar phenomena that each require their own set of methods and analyses (e.g. Aarseth, 2017; Keogh, 2014; Tobin, 2015). While the present project implicitly took a stance in this debate, by using both types of games as examples, as well as examples, the project's outcome can already be used to further discuss this matter. Thinking on a larger scale, the classification of game elements can be used to identify trends within these two types of games, and compare them on a broader scale. Such comparisons would lead to observations of similarities and differences between their underlying formal systems.

However, as previously mentioned, this dissertation was, from the very beginning, considered to be only one step towards the unification of game ontological models. Thus, the main goal for future research should be to elaborate on this step in two main ways. First, this dissertation set its focus specifically on the underlying formal system of games. It was also clearly stated that this particular focus constitutes only one “homogeneous subject field” (Vickery, 1960, p. 14) of at least three subject fields that can be identified already. It can be argued that aside from this underlying formal system, games consist of a ‘materiality’ and ‘sign system’ (Aarseth & Calleja, 2015). To construct a complete faceted classification scheme for game elements, all homogenous subject fields of games must be examined and filled with divisions and sub-divisions. Thus, future endeavors towards a unified model of game ontology must explore these two additional fields, as well as potentially more. Such endeavors could potentially answer what materialities and sign systems games use, what their elements are, and how those can be formally classified. Furthermore, these three identified homogenous subject fields themselves should not be taken for granted and be questioned themselves. Perhaps a more detailed model (e.g. Aarseth & Grabarczyk, 2018) should be taken into consideration and the subject fields arranged accordingly.

Second, the developed classification scheme of the underlying formal system of games is prone to changes and improvements. Due to considerations of scope, the present project focused on the underlying formal system of orthogames. For example, menu structures, leveling systems outside the orthogame, market places, stores, and loot box systems are covered within parts of the UGO’s present version, but future endeavors could improve and add to this version by expanding the scope from elements of the orthogame towards the underlying formal system of holistic game artifacts. Especially in light of current discussions surrounding monetization of games and loot box systems, broadening this scope and examining these systems outside the orthogame appear to be a fruitful endeavor.

Furthermore, the UGO's explicitly open-ended nature invites future research to improve any of its divisions and sub-divisions. Some of the described facets were consciously included for pragmatic reasons, even though they either lay outside of the scope of the present project, must be considered to be part of a different homogenous subject field, or are of phenomenological or epistemological nature. An improvement of the UGO could attempt to isolate these facets and create and locate them within their correct subject fields.

These future possibilities with the UGO are on the one hand its application into studies, teaching, analysis, and practice, and on the other hand the improvement of the UGO's present version. However, all of them aim at a deeper understanding of what games are made of and how they can be conceptualized in a sophisticated, but still practical, way. With this dissertation I hope to have contributed to the possible and necessary distinction between particular elements of games, and to have raised awareness towards the complexity of topics surrounding games, such as used terminology and concepts, the problematic examination of games as holistic phenomena, and their effects.

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