Abstract

In this dissertation, we study sortings for reactive and bigraphical reactive systems. Both classes of systems have transitions derived from reactions in such a way that if the category underlying the system in question has sufficient relative pushouts, then bisimulation on the derived transitions will be congruence.

It turns out that *every* application of bigraphical reactive systems in the literature has required an extension of the category of pure bigraphs. Usually, such an extension takes the form of a sorting. Thus, for every application, it has been necessary to redevelop substantial parts of the theory of bigraphical reactive systems in such a sorted category.

Up until now, it has been an open question what extensions would admit such a redevelopment. We given the present dissertation a partial answer, by identifying a rather large class of extensions for which such a redevelopment is possible. Moreover, we give a method for automatically constructing sortings for such extensions.

The key observation is that most sortings in the literature exists solely to get rid of bigraphs that are meaningless for the application at hand. That is, most sortings exists solely to impose a predicate on the morphisms in the category of pure bigraphs. We give a method to automatically construct a well-behaved sorting for any decomposible such predicate; that is, any predicate which satisfies that $P(g \circ f)$ implies $P(g)$ and $P(f)$. All but one of the above-mentioned applications fall into this class.

Altogether, by identifying a large class of predicates for which we can construct well-behaved sortings, we make it potentially easier to work with bigraphical reactive systems and we push back the limit for what we can hope to achieve with them.