

Abstract

Programing in machine code is a tedious task. Programming languages ease the job of the programmer by providing useful abstractions such as for loops, object hierarchies and recursive data types. Often, however, for the most modern and trendy of these ther is a lack of adequate semantic understanding and so they come without sound reasoning principles. Thus, when trying to prove programs correct, one is forced to work under the abstractions.

This dissertation presents two approaches to obtaining abstractions with reasoning principles and the semantics ensuring soundness. The main contributions are two parametric models of $PILL_Y$ a language with parametric polymorphism and recursion and a model of Hoare Type Theory a language with impredicative polymorphism and dependent types where certain types may include specifications in separation logic.