Type-Theoretic Signatures for Algebraic Theories and Inductive Types

Theses of the Ph.D. Dissertation

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1 Introduction

The main goal of the thesis is to develop certain type theories as specification languages for algebraic theories and inductive types. In each type theory of signatures presented in the thesis, typing contexts specify algebraic theories by listing sorts, operations and equations.

The use of dependent type theories as specification languages confers significant expressiveness and allows us to develop their metatheory using standard methods from the broader metatheory of type theories.

We present three theories of signatures, in order of increasing expressiveness. In all three cases, there are further possible variations and design choices.

The current results extend and generalize prior work on signatures for inductive types, in the context of type theory. A primary motivation for the current results was to develop more expressive inductive types for future proof assistants. Thus, our syntaxes and semantics of signatures are close to what would be required in practical implementation. However, our results can be also viewed in the broader mathematical context of the study of algebraic theories.