Project Proposal: DependentLambda

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Dependently-typed Lambda Calculus

In this project, I would like to implement a lambda calculus with dependent types using Haskell, a pure functional programming language well-suited for type system exploration. My work will be based on Stephanie Weirich’s "Implementing Dependent Types in pi-forall" tutorial, which provides an excellent starting point for understanding and implementing dependent types in a toy language known as pi-forall.

The main objectives of this project are to gain a deep understanding of dependent types and to implement a bidirectional type checker for a lambda calculus with dependent types in Haskell. I will develop both an inferType/synthesize function and a checkType function (which are mutually recursive) to perform bidirectional type checking. This implementation will be accompanied by a formal mathematical component, which will consist of a set of typing rules for the language.