Dependently Typed Languages in Statix

Jonathan Brouwer Jesper Cockx Aron Zwaan

Delft University of Technology, The Netherlands

March 13, 2023

Background: What are Dependent Types?

- Types may depend on values!

Example

```
concat : (A: Set) -> (n : Nat) -> Vec A n -> Vec A n
         -> Vec A (n + n)
```

- Curry-Howard correspondence

Research Question

How well Statix is fit for the task of defining a dependently-typed language.

Why is this important?

From the perspective of Spoofax research

Developing a language with a complex type system tests the boundaries of what Spoofax can do.

From the perspective of Dependent Types research

A rapid prototyping platform.

Calculus of Constructions

A lambda calculus with dependent types.

Example 1

```
(\v: Type. v) T
```

Example 2

```
let f = \T: Type. \x: T. x;
f (T: Type -> Type) (\y: Type. y)
```

Extra contributions

1. Implemented Inference
2. Implemented Inductive Data Types
3. Implemented Universes
4. Interpreter
5. Compiler to Clojure
6. Comparison with implementation in Haskell
7. Comparison with implementation in LambdaPi
8. Evaluation of Spoofax