Institue of Software Engineering and Compiler Construction

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Adding type checking and `do` notation to ClickyEvaluation

(Master/Bachelor)

Introduction

ClickyEvaluation (`http://stefankoegel.github.io/clickyEvaluation`) is a visual interpreter for a Haskell-like language. Expressions can be entered as text and will be displayed as interactive HTML. The user can control the order of evaluation by clicking (thus the name) on subexpressions. The goal of ClickyEvaluation is to help students understand the evaluation of expressions in functional languages, especially with regards to higher order functions like `map` or `fold`.

The project is written in PureScript, a Haskell dialect that compiles to JavaScript. Being compiled to JavaScript allows ClickyEvaluation to be used on any platform without the need to install additional software or to connect to a server.

At the moment, ClickyEvaluation supports most of the Haskell language features used in the *Paradigms of Programming* lecture. Some of these are:

- Integers, Strings, Lists, and Tuples
- Operators and functions from the Prelude
- Function definitions with pattern matching, anonymous functions, and operator sections

Unfortunately, other features are still missing:

- Type system
- Algebraic data types
- `do` notation

Goals

This thesis consists of three goals that should be achieved. One of these could be omitted in a bachelors thesis.

1. Understanding the type system is a critical part of learning Haskell. Thus ClickyEvaluation should be extended to give students as much insights about the inferring of types in Haskell as possible. This goal consists of research about Haskell's type system, an implementation of a (simplified) version, and an interactive visualisation thereof.

2. `do` notation simplifies working with Monads in Haskell, which is an important topic of the *Functional Programming* lecture. It is not clear how the desugaring or evaluation of `do` notation should be depicted to students. Finding a creative solution to this problem and implementing it is another goal.

3. Implementing tools with nice visualisations is all well and good but there is still a need to evaluate the usefulness of ClickyEvaluation in a teaching context. Thus designing and conducting a study constitutes an important goal of the thesis.

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