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Matthias Keil Summer Term 2015

Essentials of Programming Languages

http://proglang.informatik.uni-freiburg.de/teaching/konzepte/2015/

Exercise Sheet 1

1.1 Subversion Repository

To be able to take part in the lecture's exercise you have to have a subversion repository. If you have not already done so, send your *pool account* to `keilr@informatik.uni-freiburg.de`.

1.2 PLT Redex

In the lecture's exercise we use *PLT Redex* for development. *PLT Redex* is a domain specific programming language which allows a rather simple implementation of syntax and syntax related relations. *PLT Redex* comes with a Racket implementation which is available at `http://racket-lang.org/`. You need to set up an environment to work with.

1.3 Arithmetic and Boolean Expressions

The concrete syntax of the language of arithmetic and boolean expressions is described by the following grammar:

$$
\begin{aligned}
\langle val \rangle \;&::= n \\
&\quad \mid \texttt{true} \mid \texttt{false}
\end{aligned}
$$

$$
\begin{aligned}
\langle exp \rangle \;&::= \langle val \rangle \\
&\quad \mid \langle exp \rangle + \langle exp \rangle \mid \langle exp \rangle - \langle exp \rangle \mid \langle exp \rangle * \langle exp \rangle \mid \langle exp \rangle \,/\, \langle exp \rangle \\
&\quad \mid \langle exp \rangle < \langle exp \rangle \mid \langle exp \rangle \wedge \langle exp \rangle \mid \langle exp \rangle \vee \langle exp \rangle \mid \neg \langle exp \rangle \\
&\quad \mid \texttt{if } \langle exp \rangle \texttt{ then } \langle exp \rangle \texttt{ else } \langle exp \rangle
\end{aligned}
$$

Here, n is an arbitrary integer number. The semantics of the expressions should be as normal.

1. Transform the concrete syntax to abstract syntax.
2. Write down the *big-step* evaluation semantics of the language described by the grammar.
3. Write down the *small-step* evaluation semantics of the language described by the grammar.

Submission

Deadline The submission deadline is **01.05.2015, 12:00 (noon)**. Late submissions will not be accepted. Submit your solution to the subversion repository.

Submission Your solution will consist of one *folder* (**exercise1**) for each exercise sheet. Submit one *pdf* file (⟨**name**⟩**_exercise1_**⟨**nr**⟩**.pdf**) and one *rkt* file (⟨**name**⟩**_exercise1_**⟨**nr**⟩**.rkt**) per exercise.

Your solution may be either in German or in English. Clear and understandable style is required. You are strongly encouraged to test your solution. Your code must compile without errors (which did not necessarily mean that everything has to work). Provide your source code with comments to understand the intention.