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Exercise Sheet 9: Specification and Verification with Higher-Order Logic (Summer Term 2011)

Date: 12.07.2011

Exercise 1 Big and Small Step Semantics

In this exercise we consider the While-language IMP introduced in the lecture. In particular, we want to create and show properties about an adequate small step semantics for IMP.

a) Download the file "`While.thy`" from our webpage and define a small step semantics for IMP within Isabelle/HOL.

Hint: Remember that there are two different kinds of configurations: terminal and non-terminal ones. The theory already contains a datatype `config` *for such configurations, which also has an additional nice syntax defined.*

b) Prove that terminal configurations are stuck w.r.t the semantics, i.e.

$$\neg\ \langle s \rangle\ \rightarrow_1\ y$$

c) Prove that non-terminal configurations are not stuck w.r.t the semantics.

d) Formulate a strong property relating the small and big step semantics.

Remark: The prove of such a property is interesting, but too long for this exercise. You are of course encouraged to try it!

e) Formulate the property that the big step semantics is deterministic and prove it.