

Homework # 6

due October 14

1 Reading

Please read Chapter 9 in the textbook.

2 Discussion

In class, we discussed several dubious type rules. In particular, we discussed something similar the following system:

$$\begin{array}{c} \text{T-VARA} \\ \hline x : T \end{array} \qquad \begin{array}{c} \text{T-ABSA} \\ t : T \\ \hline \lambda x.t : T \rightarrow T \end{array} \qquad \begin{array}{c} \text{T-APPA} \\ t_1 : T \rightarrow T' \quad t_2 : T \\ \hline (t_1 t_2) : T' \end{array}$$

... additional rules for booleans and “if” ...

Suppose we try to prove progress and preservation (for closed terms) with this “type system.” Can we do it? Explain! Give concrete examples.

If we changed the rules to

$$\begin{array}{c} \text{T-VARB} \\ \hline x : \text{Bool} \end{array} \qquad \begin{array}{c} \text{T-ABSB} \\ t : T \\ \hline \lambda x.t : \text{Bool} \rightarrow T \end{array} \qquad \begin{array}{c} \text{T-APPB} \\ t_1 : T \rightarrow T' \quad t_2 : T \\ \hline (t_1 t_2) : T' \end{array}$$

... additional rules for booleans and “if” ...

Can we prove progress and preservation? Discuss!

3 Proofs

Read Exercise 9.2.3 and prove that if $\Gamma \vdash tt : T$ then we have a contradiction. Do the proof of preservation (Theorem 9.3.9). You will need to use the substitution lemma (Lemma 9.3.8).