

Semantics of Programming Languages

Exercise Sheet 5

General homework instructions

All proofs in the homework must be carried out in Isar style.

Homework 5.1 Rule Inversion

Submission until Tuesday, November 21, 10:00am.

We define a grammar for palindromes consisting of the two symbols a and b :

datatype $ab = a \mid b$

inductive $S :: \text{"ab list} \Rightarrow \text{bool"}$ **where**

a : $\text{"}S\ w \Longrightarrow S\ (a\ \# \ w\ @\ [a])\ \text{"}$
 b : $\text{"}S\ w \Longrightarrow S\ (b\ \# \ w\ @\ [b])\ \text{"}$
 nil : $\text{"}S\ []\ \text{"}$

Prove that if xux (where x is a symbol and u is a word) is a word in the language, then u is also a word in the language:

lemma

assumes $\text{"}S\ (x\ \# \ u\ @\ [x])\ \text{"}$

shows $\text{"}S\ u\ \text{"}$

proof –

– proof goes here

qed

Also prove that there are no words aub in the language:

lemma $\text{"}\neg S\ (a\ \# \ u\ @\ [b])\ \text{"}$

proof

– proof goes here

qed