Software-Modellierung und Verifikation
Informatik 2
Prof. J.-P. Katoen
RWTH Aachen

Priv.-Doz. T. Noll noll@cs.rwth-aachen.de
Ch. Jansen christina.jansen@cs.rwth-aachen.de

6. Exercise sheet *Compiler Construction 2010*

Due to Wed., 1 December 2010, *before* the exercise course begins.
Hand in your solutions in groups of three or four!

Exercise 6.1: **(6 points)**

Implement a recursive-descent parser for the following grammar using flex as the corresponding scanner. The parser should output the leftmost analysis for every input word w or an error message, if no such analysis exists.

Program	$\rightarrow$	**var id** *Init Ids* ; *StmList*
Ids	$\rightarrow$	, **id** *Init Ids* $\mid \epsilon$
Init	$\rightarrow$	:= *AExpr* $\mid \epsilon$
StmList	$\rightarrow$	*Statement StmList* $\mid \epsilon$
AExpr	$\rightarrow$	**id** $\mid$ **number** $\mid$ (*AExpr* **arop** *AExpr*)
BExpr	$\rightarrow$	*AExpr* **relop** *AExpr* $\mid$ **not** *BExpr*
Statement	$\rightarrow$	**id** := *AExpr*; $\mid$ **begin** *Statement StmList* **end**
		$\mid$ **if** *BExpr* **then** *Statement* $\mid$ **while** *BExpr* **do** *Statement*

Let **id** $\in A(A \cup N)^*$, **number** $\in NN^*$, **relop** $\in \{=, <, >\}$ and **arop** $\in \{+, -, *, /\}$ with $A = \{a, \ldots, z, A, \ldots Z\}$ and $N = \{0, \ldots, 9\}$.

Please send your source code with at least two nontrivial example runs to `christina.jansen@cs.rwth-aachen.de`. Include your names and matriculation numbers in the subject!

Exercise 6.2: **(3 points)**

A language $L \in \Sigma^*$ is called prefix-free, if $L \cap L\Sigma^+ = \emptyset$, i.e. if no proper prefix of a word in L is in L, too.

Show that the following holds for all non prefix-free languages L: $L \notin \mathfrak{L}(LR(0))$.

Exercise 6.3: **(1.5+1.5+2 points)**

Consider the grammar G given by:

S'	$\rightarrow$	S
S	$\rightarrow$	$A \mid b$
A	$\rightarrow$	$Aa \mid Sb$

- Construct the $SLR(1)$ sets for G and give the corresponding NFA.
- Construct the $LR(1)$ sets for G and give the corresponding NFA.
- Provide the analysis tables for both $SLR(1)$ and $LR(1)$ analysis of G.