

CSEN 1003 Compiler, Spring Term 2020
Practice Assignment 6

Exercise 6-1

Answer the following questions:

- a) Left recursion is a problem in LL top-down parsing, is this the case in LR parsing?

Solution:

No it is not. Because we do the reverse of a right-most derivation.

- b) What grammar property could be a problem in a bottom-up parser?

Solution:

Right recursion can be a problem in a bottom up parser.

Exercise 6-2

Handles

Given the following grammar:

$$S \rightarrow SS+ \mid SS* \mid a$$

indicate the handle in each of the following right sentential forms:

- a) $SSS+a^{*+}$

Solution:

$S \underline{SS+} a^{*+}$

- b) $SS+a^{*}a^{+}$

Solution:

$\underline{SS+} a^{*}a^{+}$

- c) $aaa^{*}a^{++}$

Solution:

$\underline{a} aa^{*}a^{++}$

⁰Exercises are due to Dr. Carmen Gervet

Exercise 6-3

Given the following grammar:

$$S \rightarrow 0S1 \mid 01$$

Indicate the handle in each of the following right sentential forms:

a) 000111

Solution:

00 01 11

b) 00S11

Solution:

0 0S1 1

Exercise 6-4

Shift-Reduce Parsing

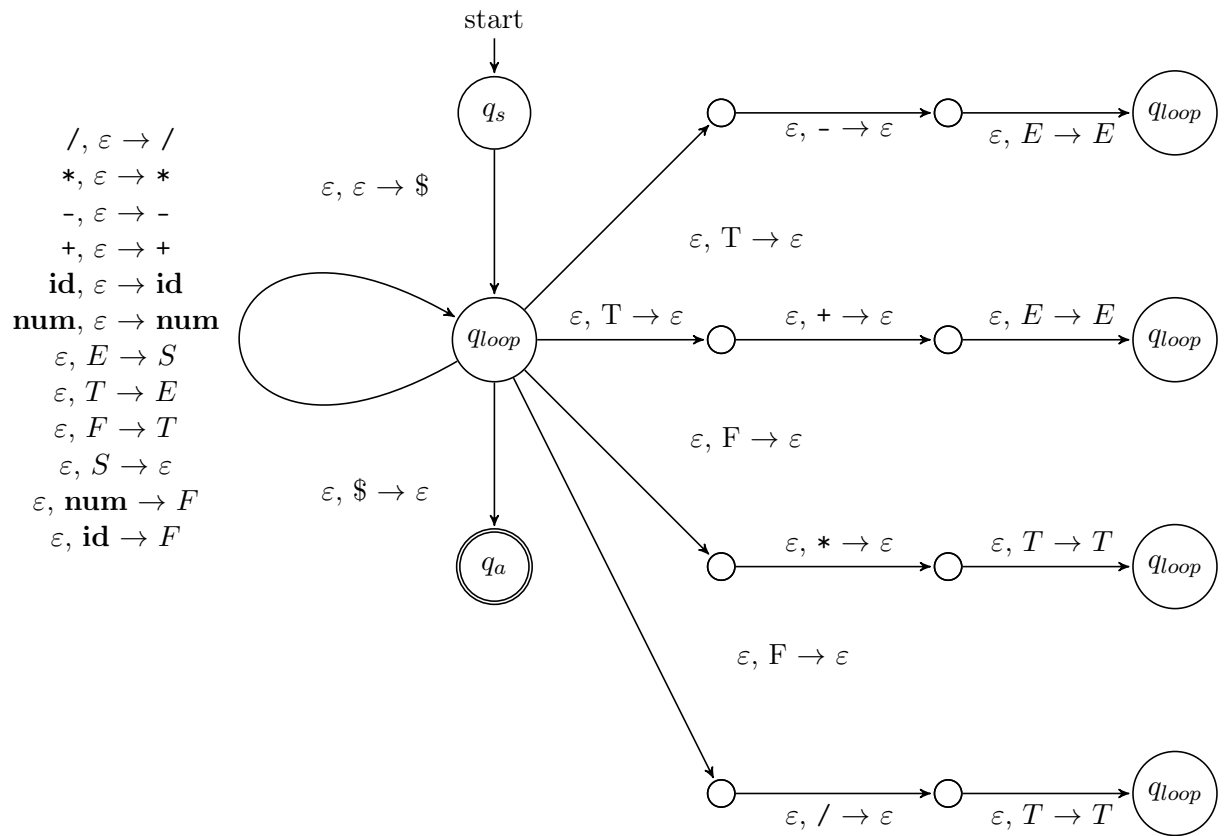
Consider the following grammar:

$$\begin{aligned} S &\rightarrow Expr \\ Expr &\rightarrow Expr + Term \mid Expr - Term \mid Term \\ Term &\rightarrow Term * Factor \mid Term / Factor \mid Factor \\ Factor &\rightarrow \text{num} \mid \text{id} \end{aligned}$$

and the string: **id - num * id**

a) Construct the corresponding Shift-Reduce PDA.

Solution:



b) Give the shift-reduce parser action in terms of:

Stack	Input	Action
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Solution:

Stack	Input	Action
\$	id - num * id \$	Shift
\$ id	- num * id \$	Reduce $Factor \rightarrow \mathbf{id}$
\$ <i>Factor</i>	- num * id \$	Reduce $Term \rightarrow Factor$
\$ <i>Term</i>	- num * id \$	Reduce $Expr \rightarrow Term$
\$ <i>Expr</i>	- num * id \$	Shift
\$ <i>Expr</i> -	num * id \$	Shift
\$ <i>Expr</i> - num	* id \$	Reduce $Factor \rightarrow \mathbf{num}$
\$ <i>Expr</i> - <i>Factor</i>	* id \$	Reduce $Term \rightarrow Factor$
\$ <i>Expr</i> - <i>Term</i>	* id \$	Shift
\$ <i>Expr</i> - <i>Term</i> *	id \$	Shift
\$ <i>Expr</i> - <i>Term</i> * id	\$	Reduce $Factor \rightarrow \mathbf{id}$
\$ <i>Expr</i> - <i>Term</i> * <i>Factor</i>	\$	Reduce $Term \rightarrow Term*Factor$
\$ <i>Expr</i> - <i>Term</i>	\$	Reduce $Expr \rightarrow Expr-Term$
\$ <i>Expr</i>	\$	Reduce $S \rightarrow Expr$
\$ <i>S</i>	\$	Accept