Homework 3 Solutions

February 20, 2013

1 Associativity and Precedence

a) ! and @ are left-associative.

b) # and % are right-associative.

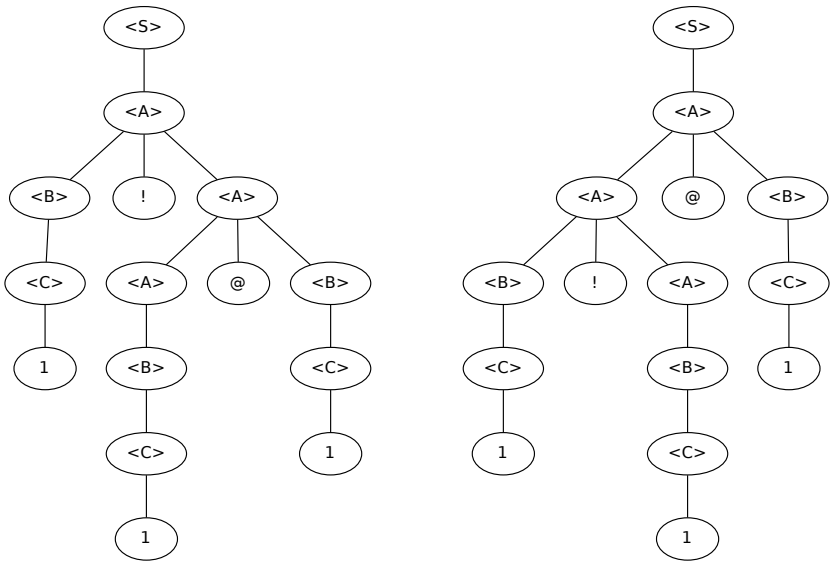
c) # and % have the highest precedence.

d) ! and @ have the lowest precedence.

2 Grammar Differences

a) 1@1!1@1 is a valid sentence is for the language described in question 1, but not for the one described in question 2.

b)



3 Associativity and Precedence Episode 2

a) All operators are left-associative.

b) None of the operators are right-associative.

c) ! and @ has the highest precedence.

d) # and % has the lowest precedence.

4 Parser Tools

a) yacc: LALR(1) with "disambiguating rules" (default and user-defined) that handle conflicts.

b) ANTLR: "Adaptive" LL(*).

c) javacc: LL(k).

d) Cup: LALR(1).

e) JS/CC: LALR(1).

5 Parsing Expression Grammars

a) PEGs cannot be ambiguous.

b) Can be done with the Packrat algorithm in linear time.

c) Dynamic programming. Memoization to be specific.

6 Parser Relations

a) True.

b) True.

c) True.

d) True.

e) True.

f) False.

7 LALR(1) Generator

a) Depends on the implementation because grammar may be ambiguous.

b) Depends on the implementation. Parser may have own rules for dealing with ambiguity, and may not bother checking for ambiguity in cases where languages can be parsed successfully with ambiguous grammars.

c) Shift advances input stream by one symbol.

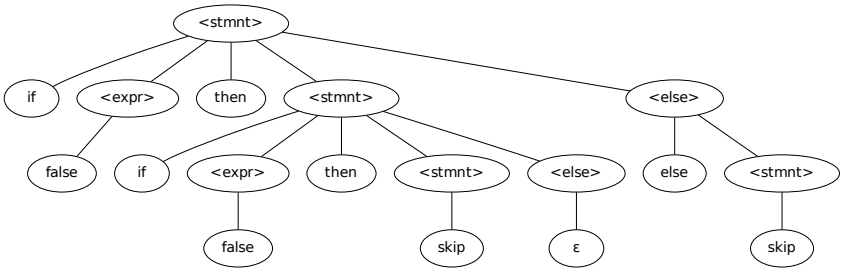
d) Reduce applies a rule to a child parse tree, replacing child parse tree with new root.

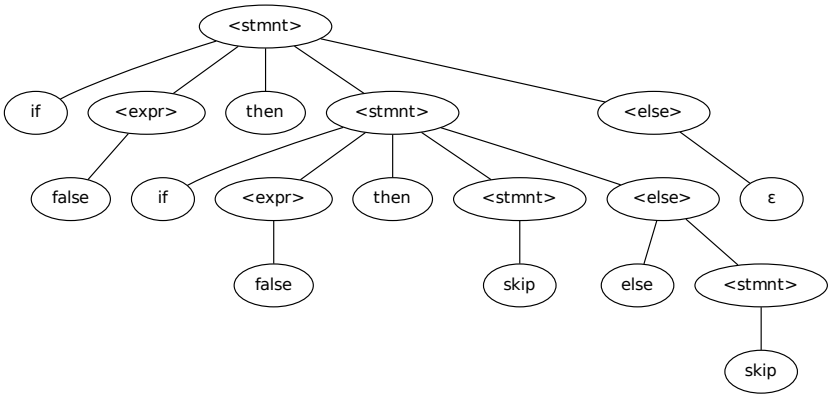
e) A reduce-reduce conflict is when there is more than one rule that matches the input. I.e. It's when a reduce could be performed to satisfy multiple rules.

f) A shift-reduce conflict is when both a shift and reduce could be performed to change state.

8 Ambiguous Grammar

a)





b)

First+(<stmnt> ::= if <expr> then <stmnt> <else>) = {if}

First+(<stmnt> ::= skip) = {skip}

First+(<else> ::= else <stmnt>) = {else}

First+(<else> ::= ε) = {ε,else,eof}

First+(<expr> ::= true) = {true}

First+(<expr> ::= false) = {false}

c) First+(<else> ::= ε) $\cap$ First+(<else> ::= else <stmnt>) = {else}