CS 1622: Introduction to Compiler Design

Homework #2

Due Time: March 30th, 2016

1. (8 points) Regarding widely used C programming language,

   a) Is C programming language a context free langugage?

   b) Is C's syntax structure context free?

   c) Is C's syntax structure ambiguous or not? If yes, give an example.

   d) In case if your answer to (c) is "yes", explain if it is possible to rewrite the grammar, or redesign the language to remove the ambiguity.

2. (15 points) Regarding LR parsing algorithm.

   a) Explain the reason why a handle always on top of the stack.

   b) Explain the reason why LR may see more input and thus become more powerful than LL.

   c) Compare the power and efficiency in detecting syntax errors for SLR, LALR and Canonical LR parsers.

3. (7 points) Assume in the construction of an item for a LALR parser, you merge two states S_m and S_n from an LR construction, and get the following states:

   $$S_{mn} = \{[A \rightarrow \bullet aB, c/d], [B \rightarrow c\bullet, a/f]\}$$

   What can you say about this state, is there anything that you can deduce about either of the states S_m or S_n in the original LR parser?

5. (20 points) Construct the DFA and build the LR parsing table for the following grammar. Is it LR(1)? Here Σ={id, *, =}.

   $\mathbf{S} \rightarrow \mathbf{A}$
   $\mathbf{A} \rightarrow \mathbf{L} = \mathbf{R}$
   $\mathbf{A} \rightarrow \mathbf{R}$
   $\mathbf{L} \rightarrow * \mathbf{R}$
   $\mathbf{L} \rightarrow id$
   $\mathbf{R} \rightarrow \mathbf{L}$