

# Homework 3 : Bottom-up parsing And Attribute Grammar (25pts)

Due Oct 5, 2011

Suppose we have the following context-free grammar which accepts a set of binary numbers.

$A ::= B C$

$B ::= B D \mid D$

$D ::= 0 \mid 1 \mid 10$

$C ::= 1 \mid 0 \mid \epsilon$

- (10pts) Construct the canonical collection of LR(1) items and then build a LR(1) parse table for the above grammar. Is the given grammar LR(1) parsable?
- (15pts) Add translation schemes to the above BNF to compute the following information for each input binary number. For each non-terminal, specify what attributes are required for the symbol, and whether each attribute is synthesized or inherited.
  - Count the number of digits of each accepted binary number. For example, the number of binary digits of 10011 is 5, and the number of digits of 101 is 3.
  - Compute the integer value of each accepted binary number. For example, the value of 10011 is 19, and the value of 101 is 5.
  - Compute the number of digits before the last occurrence of 1. For example, the number of digits before the last 1 is 3 in 10010, is 2 in 10100, and is 4 in 10101.