Philosophy of Cognitive Science

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Problem Set 2

Due: 14:15 May 13, 2014

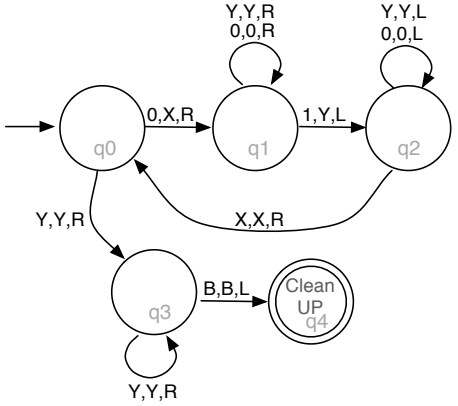
1. Consider the following Context Free Grammar (CFG):

$$S \to S + A \mid A$$
$$A \to A * B \mid B$$
$$B \to (S) \mid 1$$

   (a) Say whether the grammar is ambiguous or unambiguous.
   (b) Identify the set of terminal symbols.
   (c) Give parse trees for each string.
      i. 1
      ii. $1 + 1$
      iii. $1 + 1 + 1$
      iv. $((1))$

2. Give a CFG for "any number m of zeros followed by an equal number n of ones and zeros", i.e., $\{0^m 1^n 0^n \mid m, n \geq 1\}$.
   Note: We exclude the empty string from the set of acceptable strings.

3. Answer the following questions about this Turing Machine (TM):



   (a) Does the TM accept the string 0011?
   (b) Give the sequence of machine configurations for the string 0011.
   (c) Is your sequence in (3b) a valid computation?

(d) Does the TM accept the string 00B11?
(e) Give the sequence of machine configurations for the string 00B11.
(f) Is your sequence in (3e) a valid computation?

4. Modify/complete the following TM to accept the set of strings $\{0^n, 1^n, 0^n \mid n \geq 1\}$.