Assignment 11

Post Date: 16 Jan 2013  Due Date: 23 Jan 2013, 14:30
You are permitted and encouraged to work in groups of two.

Problem 1: Cyclic Rotation 4 Points
Show how to determine in linear time whether a pattern $s$ is a cyclic rotation of a pattern $s'$. (For example “arc” and “car” are cyclic rotations of each other.)

Problem 2: Simultaneous Search 6 Points
Construct a deterministic finite automaton that reads any text once and is in an accepting state whenever it just finishes reading the occurrence of one of the patterns

$01011, 00101,$ or $10$

over the alphabet $\Sigma = \{0, 1\}$. Your automaton may have more than one accepting state.

Problem 3: Period 6 Points
Show that a prefix $u$ of a pattern $w$ is a period of $w$ if and only if there is a prefix $v$ of $w$ such that $w = uv$.

Problem 4: Weak Good Suffix Rule 4 Points
Consider the algorithm of Boyer and Moore with the weak good suffix rule in which we do not require that the mismatched character should differ, i.e. for a pattern $s[0, \ldots, m-1]$ and for $0 \leq j < m$ we set

$$S[j] = \min \{ \begin{array}{l} 0 < \sigma \leq j \ ; \ s[j+1-\sigma, \ldots, m-1-\sigma] = s[j+1, \ldots, m-1] \\ \{ \sigma > j \ ; \ s[0, \ldots, m-1-\sigma] = s[\sigma, \ldots, m-1] \} \end{array} \} \cup \{ \sigma > j \ ; \ s[0, \ldots, m-1-\sigma] = s[\sigma, \ldots, m-1] \} \}$$

as the array of shortest admissible shifts. Show that in this case the worst-case run-time of the algorithm of Boyer and Moore is not linear even if the pattern does not occur in the text.