University of Konstanz
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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

$$01011, 00101, \text{ or } 10$$

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

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

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.