Algorithmics - Tutorial Sheet 4

Strings and text algorithms

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1. **[Work in pairs]** Construct the border table B for the `KMP` algorithm for the string:

   `agcagacagcacg`

2. **[Work in pairs]** Trace the `KMP` algorithm for the string/pattern $s =$ `abacab` and the text $t =$ `abacaabaccabacabaabb`

3. Given two character strings $s = s_1 s_2 \dots s_n$ and $t = t_1 t_2 \dots t_n$, design an $\mathcal{O}(n)$ time algorithm to determine whether t is a cyclic shift of s.

   In other words, the algorithm should determine whether there exists an index k where $1 \leq k \leq n$ such that $s_i = t_{k+i \pmod n}$ for all $1 \leq i \leq n$.

4. **[Work in pairs]** Indicate precisely which character comparisons would be made if the Boyer-Moore algorithm were used to locate the first occurrence of the string $s =$ `agcga` in the text $t =$ `agcgcctgatagcgacagt`.

5. Give a pseudocode description of a linear-time implementation of the *setUp* method that creates the last-occurrence table for a string s for use by the Boyer-Moore algorithm.

6. Given the pseudocode for the Boyer-Moore algorithm in the lecture notes, update it to ensure the algorithm scans the entire string t and returns a list of all occurrences, if any.