Karlsruher Institut für Technologie
Institut für Theoretische Informatik

Dr. Simon Gog

3. Project in Text Indexing (WS 2016/17)

http://algo2.iti.kit.edu/3175.php
gog@kit.edu

Exercise 1 (*Count leading zeros*)

The $O(n \log^2 n)$ bits space and $O(1)$ query time solution for range minimum queries (RMQs) is dependent on the calculation of $k = \max\{\ell \mid 2^\ell \leq j - i + 1\}$, where $[i, j]$ is the query interval. Show how k can be determined in constant time for $0 \leq i \leq j < n$ by using a data structure which only takes $o(n)$ bits of extra space. We are working in the word RAM model.

Exercise 2 (*GREEDY*)

What is the worst case time complexity of the GREEDY algorithm for top-k document retrieval for single-term frequency ranking?

Exercise 3 (*Suffix sorting*)

Execute the induced sorting algorithm step by step for string S=`ananasbanana$` (cf. slides 24-26 of Lecture 5).

Exercise 4 (*Range Median Queries*)

Given an array of integers A size n. A range median query returns for a subarray $A[i, j]$ the $\lceil \frac{j-i+1}{2} \rceil$-th smallest integer in $A[i, j]$.

- Show how range median queries can be solved in $O(\log n)$ time using a $O(n \log n)$ bit data structure.
- Implement your solution.