

Algorithm Engineering

11 January 2010

Exercises [ranks 10 each]

1. Define the notion of Universal Hashing, provide an example of family of universal hash functions, and prove that for this class the “universal”-property holds.
2. Given the string $S=abraabra$,
 - a. Compute its Burrows-Wheeler Transform
 - b. Apply on the result of item a: first, the compressor MTF, and then the Gamma-encoder. (Assume that the initial MTF-list is $\{a,b,r\}$ and that MTF returns numbers greater than 0).
3. Describe the algorithm MultiKey-Quicksort, specify its time and space complexities, and finally show its behavior on the following array of 8 strings $S=[zoo, house, horse, bath, abacus, bar, aargh, zulu]$.

[In case you wrote notes on one of the above exercises then substitute it with the following one].

Consider the two problems: sorting and permuting. Specify the algorithms to solve them I/O-optimally, and then comment on the implications of their bounds in terms of “*difficulty*” of moving objects on disk.