

School of Computing and Information Systems
COMP90038 Algorithms and Complexity Tutorial Week 10

12–16 October 2020

Plan

This week your priority is probably Assignment 2, but don't ignore the following exercises.

The exercises

65. Construct a 2–3 tree from the empty tree by inserting the following keys in the given order:
A, L, G, O, R, I, T, H, M.
66. Construct a 2–3 tree by inserting keys 1, 2, 3, 4, 5, in that order. Repeat the exercise, but this time insert the keys in this order: 2, 3, 4, 5, 1. Are the trees identical? Considering all possible orderings of the set $\{1, 2, 3, 4, 5\}$, how many different 2–3 trees can be produced?
67. Use Horspool's algorithm to search for the pattern GORE in the string ALGORITHM.
68. How many character comparisons does it take Horspool's algorithm to decide that CAB is not found in ABRACADABRA? How many to find that DRAC is not there?
69. How many character comparisons will be made by Horspool's algorithm in searching for each of the following patterns in the binary text of one million zeros?
 - (a) 01001
 - (b) 00010
 - (c) 01111
70. Using Horspool's method to search in a text of length n for a pattern of length m , what does a worst-case example look like?
71. (Optional, only for those who got interested in this non-examinable algorithm.) Draw the finite-state machine that corresponds to the table built by the Knuth-Morris-Pratt method to enable fast search of the string 0011. Trace it as it processes the text 01001000110.
72. For the input 40, 60, 37, 84, 42, 18, 30, and hash function $h(K) = k \bmod 11$,
 - (a) construct the open hash table (separate chaining).
 - (b) find the largest number of key comparisons in a successful search in this table.
 - (c) find the average number of key comparisons in a successful search in this table.
73. For the input 40, 60, 37, 84, 42, 18, 30, and hash function $h(K) = k \bmod 11$,
 - (a) construct the closed hash table.
 - (b) find the largest number of key comparisons in a successful search in this table.
 - (c) find the average number of key comparisons in a successful search in this table.