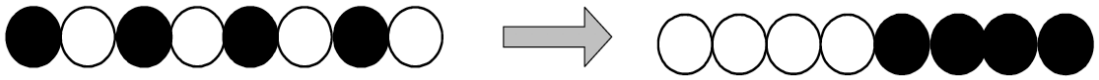
Assignment 5

Question 1
Consider a variation of sequential search that scans a list to return the number of occurrences of a given search key in the list. Will its efficiency differ from the efficiency of classic sequential search?

Question 2
a. Glove selection There are 22 gloves in a drawer: 5 pairs of red gloves, 4 pairs of yellow, and 2 pairs of green. You select the gloves in the dark and can check them only after a selection has been made. What is the smallest number of gloves you need to select to have at least one matching pair in the best case? in the worst case? (after [Mos01], #18)

b. Missing socks Imagine that after washing 5 distinct pairs of socks, you discover that two socks are missing. Of course, you would like to have the largest number of complete pairs remaining. Thus, you are left with 4 complete pairs in the best-case scenario and with 3 complete pairs in the worst case. Assuming that the probability of disappearance for each

Question 3
Alternating disks You have a row of 2n disks of two colors, n dark and n light. They alternate: dark, light, dark, light, and so on. You want to get all the dark disks to the right-hand end, and all the light disks to the left-hand end. The only moves you are allowed to make are those which interchange the positions of two neighboring disks. Design an algorithm for solving this puzzle and determine the number of moves it makes.



Question 4
Determine the number of character comparisons made by the brute-force algorithm in searching for the pattern GANDHI in the text:

THERE_IS_MORE_TO_LIFE_THAN_INCREASING_ITS_SPEED

(Assume that the length of the text–it is 47 characters long–is known before the search starts.)

Question 5
Ferrying soldiers A detachment of n soldiers must cross a wide and deep river with no bridge in sight. They notice two 12-year-old boys playing in a rowboat by the shore. The boat is so tiny, however, that it can only hold two boys or one soldier. How can the soldiers get across the river and leave the boys in joint possession of the boat? How many times need the boat pass from shore to shore?

Question 6
Design an efficient algorithm for finding all sets of anagrams in a large file such as a dictionary of English words. For example, eat, ate, and tea belong to one such a set.

Question 7
Is it possible for Horspool's algorithm to make more character comparisons than the brute-force algorithm would make in searching for the same pattern in the same text?

Question 8
If Horspool's algorithm discovers a matching substring, how large a shift should it make to search for a next possible match?

Question 9
For the input 30, 20, 56, 75, 31, 19 and hash function h(K) = K mod 11

a. construct the open 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.

Question 10
Design a greedy algorithm for the assignment problem (Textbook see Section 3.4). Does your greedy algorithm always yield an optimal solution?