CS21003 - Tutorial 7

October 6th, 2017

1. You are given keys 10, 22, 31, 4, 15, 28, 17, 88, 59. You need to insert these keys into a hash table of length $s = 11$ using open addressing with the auxiliary hash function $h(k, 0) =$ k rem s. Illustrate the result of inserting these keys using linear probing, using quadratic probing with $a = 1$ and $b = 3$, and using double hashing with $h_1(k) =$ k rem s and $h_2(k) = 1 +$ (k rem (s-1)).

2. You are given an array A of n distinct integers $a_0, a_1, \ldots, a_{n-1}$. You are also given an integer x. Your task is to find out if there exist two distinct indices $i, j (0 \leq i < j \leq n-1)$ such that $x = a_i + a_j$. Propose an algorithm to solve this problem with an expected running time of $O(n)$.

3. You are given two arrays A and B of integers of sizes m and n. Your task is to check whether A and B are equal as sets. The arrays A and B need not be sorted, and may contain repeated occurrences of the same values. When we treat them as sets, all repetitions should be discarded (only one occurrence counts). For example, if $A = (5, 1, 2, 5, 1, 8, 1, 3)$ and $B = (2, 1, 8, 2, 5, 3)$, the answer is *Yes*, since both the arrays are equal to $\{1, 2, 3, 5, 8\}$ as sets. Design an algorithm to solve this problem in expected $O(m + n)$ time.

4. You are given an array A of n integers. Your task is to find the number of sub-arrays such that $\sum_{k=1}^{j} a[k] = 0$ in expected $O(n)$.