CS 473: Fundamental Algorithms, Fall 2014

Discussion 7

October 14 / 15, 2014

7.1 IMPROVED MST. Consider Borůvka's algorithm for MST as seen in the previous discussion. Consider a modified algorithms for MST that works as follows. It runs Borůvka's algorithm for some number of iterations and then switches to Prim's algorithm (with Fibonacci's heaps). Show that by appropriately choosing the switching point, one can obtain an algorithm for MST with running time $O((m + n) \log \log n)$.

7.2 CHOOSING BALLS.

Given n balls and k special balls, consider a random permutation of the n balls. What is the probability that the first ball in this permutation is one of the k special balls? What is the probability that the ith ball in this permutation is a special ball?

7.3 FLIPPING COINS.

You flip a coin n times, where the probability for a head is p. Assume that $p < 1/2n$. Prove that the probability of getting 2 or more heads in these n coin flips is at most $2n^2p^2$.

7.4 HOW MANY COINS TO GET THE FIRST HEAD?

You have a coin that comes up heads with probability p. What is the expected number of times you have to flip the coin till you get a heads?