Analysis of Algorithms

Homework IV

Due on 10/04/2017

1. Implement using C, the RB-Trees insert operations. Then, test using
   (a) Random uniform samples of indexes in a certain range $U\,(0, LargeNumber)$

   Answer if the theoretical complexities are correct
2. Implement in C language from Disjoint Set Representation.
   (a) The representation using the Weighted Union by Rank
   (b) The representation using the Union by Rank and Path compression

   Test to see if the complexities calculated in class where correct.
3. Use the Disjoint Set Representation to implement in C language the minimum spanning tree algorithm by Kruskal.
   (a) Determine if the calculated complexities are correct.
4. Implement the Dijkstra Algorithm:
   (a) Using the C language.
   (b) The Min-Heap data structure to implement the priority queue.
   (c) Test against a randomly created graph with respect to the edges and weights
      i. I expect to see the following code for the randomization
         1. for each every pair $\{u, v\}$ in V
         2. Randomly get $\alpha \in rand\,(0, 1)$
         3. if $\alpha > \epsilon_T$ // α is chosen by the user
         4. $(u, v) \in E$ and $w(u, v) = rand\,(0, M)$
   (d) Then, increase the size of the graph with respect to the nodes to see if the complexity is correct.