Names: December 3rd, 2018

Computer Science 241

In-Class Exercises

You have been given a copy of the implementation of Prim's algorithm developed in class on Friday. Analyze the average-case runtime of each of the following methods, in terms of v, the number of vertices in the graph and e, the number of edges using the following procedure:

1. For each line of code that is not a loop header, determine how long it takes to run and write this next to the line. You can do this at the big-O level (e.g., O(1), O(e), O(log v)), but be prepared to justify your answer.
2. For any line that is repeated, determine how many times it is repeated in terms of v and e.
3. Multiply the runtime of each line by its number of repetitions.
4. Total the operations over the whole method.
5. Drop constants and lower-order terms to reduce the operation count to the big-O runtime class of the whole algorithm.

Assume that in the average-case, hash table operations happen in O(1), and for all other operations the average case is the same as the worst case.

1. `public Graph()`

2. `public void addNode(int nodeId)`

3. `public Edge getEdge(int node1, int node2)`

4. `public LinkedList<Edge> getEdges(int nodeId)`

5. `public int numNodes()`

6. `public Graph prim(int startNode)`