Homework 4 Test Cases: Pt 1

We will release our test cases incrementally to help the development of your solutions to HW 4. In this document, the first two test cases are shown. In order to carry out these test cases, your graph class should be able to construct an empty graph G and be able to add/remove vertices and edges to G. In additon, it should have a show function which will output a dot file for the underlying graph.

Part 1 Test Cases for building undirected and directed graphs:

In these group of test cases, the experiments start with an empty graph. Since we have to handle both directed graphs and undirected graphs, we will denote the empty directed graph by D_e and the empty undirected graph by U_e.

Test Case 1 (For undirected graph)

Carry out the following steps in the order specified:

1. Starting from U_e, insert the vertices `1, ..., 20`, *in random order*, to U_e. Show the graph (output the dot file of the graph) after ten vertices have been added to the graph.

2. Insert the edges

   `(1,2), .., (i,i+1),  ... , (19,20), (20, 1)`

   to the graph. Show the resulting graph (output the dot file of the graph).

3. Insert the edges

   `(1,3), .., (i,i+2),  ... , (18,20), (19, 1), (20, 2)`

   to the graph. Show the resulting graph (output the dot file of the graph).

4. Remove 10 (possible) edges from the graphs. There should be 70% chance that the edge is from

   $$\{(1,2),..,(\texttt{i},\texttt{i}+1),...,(19,20),(20,1)\}\cup\{(1,3),..,(\texttt{i},\texttt{i}+3),...,(18,20),(19,1),(20,2)\}$$

   and 30% chance that the edge is from $\{(1,4),..,(\texttt{i},\texttt{i}+3),...,(20,3)\}\}$

5. Show the resulting graph (output the dot file of the graph).

Test Case 2 (For directed graph)

Carry out the following steps in the order specified:

1. Starting from D_e, insert the vertices `1, ..., 20`, *in random order*, to U_e. Show the graph (output the dot file of the graph) after ten vertices have been added to the graph.

2. Insert the edges in E to the graph, where E is

   $$E = \{(1,2),..,(\texttt{i},\texttt{i}+1),...,(19,20),(20,1)\}$$

   Show the resulting graph (output the dot file of the graph).

3. Insert ten edges randomly chosen from $E_1 = \{(\mathtt{i},\mathtt{j}) : \mathtt{j} \neq \mathtt{i}, \mathtt{j} \neq \mathtt{i} + \mathtt{1}(\mathtt{1} \leq \mathtt{i}, \mathtt{j} \leq \mathtt{20})\}$ to the graph. Show the resulting graph (output the dot file of the graph).

4. Remove 10 (possible) edges from the graphs. There should be 70% chance that the edge is from E and 30% chance that the edge is from E_1.

5. Show the resulting graph (output the dot file of the graph).