ECE-250 – Algorithms and Data Structures (Winter 2012)

Tutorial 8 (2012-03-22)

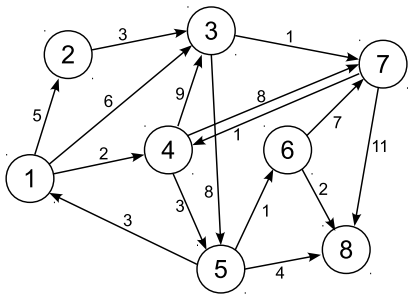
1 – Given the following directed acyclic graph $G = (V, E)$, with $V = \{1, 2, 3, 4, 5, 6, 7, 8\}$ and $E = \{(1, 2),\ (1, 3),\ (2, 3),\ (3, 8),\ (4, 3),\ (4, 5),\ (5, 3),\ (5, 6),\ (7, 3),\ (7, 8)\}$, execute a topological sort of the vertices. You'll want to show:

- The $\Theta(|V| + |E|)$ procedure to obtain the array of in-degrees.
- The contents of the queue and the in-degrees array at each step.

2 – For the same graph given in question 1, assume we have the following weights for the edges (values given in the order corresponding to the order in which the edges were given): 2, 5, 3, 6, 1, 1, 5, 4, 5, 2.

Run Dijkstra's shortest path algorithm to show that there is no path from vertex 1 to vertex 6. What is the condition that determines that no such path exists?

3 – Given the following directed graph:



Use Dijkstra's algorithm to find the shortest path from 1 to 8.

4 – Assuming the graph from question 3 is undirected, and considering only the edge from 4 to 7 with weight 8 (thus, eliminating the edge from 7 to 4 of weight 1), find the minimum spanning tree, using Prim's algorithm starting from vertex 1.

5 – If enough time, use Kruskal's algorithm to find the minimum spanning tree of the graph from question 4.