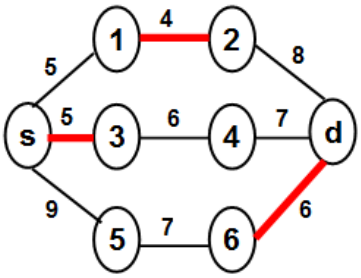
CSC 323 Algorithm Design and Analysis
Spring 2016
Project 7: A Modified Version of the Dijkstra Algorithm for the Maximum Bottleneck Path Problem
Due: April 21, 2016 (1 PM)

The Dijkstra algorithm discussed in class computes the shortest path tree from a source vertex 's' to every other vertex in the graph (i.e., it finds the paths with the minimum sum of the edge weights from 's' to every other vertex in the graph).

In this project, you will modify the Dijkstra algorithm to determine the maximum bottleneck tree. We will define the bottleneck weight of a path as the minimum of its edge weights. For any two vertices 's' and 'd', the maximum bottleneck path is the path with the largest bottleneck weight.

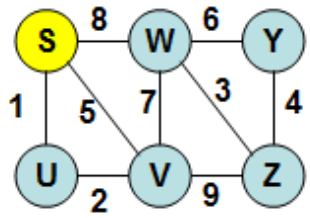
For example, in the figure below, there are three paths from 's' to 'd'. The bottleneck weights of these paths are 4 (edge 1-2 in the path s - 1 - 2 - d), 5 (edge s - 3 in the path s - 3- 4 - d) and 6 (edge 6-d in the path s - 5 - 6 - d); hence, the maximum bottleneck path is the path s - 5 - 6 - d with bottleneck weight 6.



(a) You need to show a modified pseudo code of the Dijkstra algorithm to determine a maximum bottleneck tree from a source vertex to every other vertex in the graph (i.e., the maximum bottleneck paths from a source vertex to every other vertex in the graph).

(b) Prove the correctness of your algorithm to show that it indeed finds maximum bottleneck paths from a source vertex to every other vertex in the graph.

(c) Explain the working of your algorithm on the following example: Find the maximum bottleneck paths from vertex S to every other vertex in the graph. Show all the iterations.



Submission:
(1) A written report for (a), (b) and (c)
(2) A desktop-recorded video (emailed to the instructor) of your explanations for (a), (b) and (c). The video should run for at least 10 minutes covering all of the above.