

Name _____

CSC-477/677: Algorithm Analysis
Fall 2014
Homework #7
Due on: December 4, 2014

Programming assignment T2SP Traveling Salesmen Problem

The standard Traveling Salesman Problem (TSP) is to find the least cost Hamiltonian Cycle in a weighted graph. It is known that TSP is NP-hard. In fact, even the existence of a Hamiltonian cycle in a graph is NP-complete. If, on the other hand, the graph is directed and acyclic, it is impossible to find a cycle/ But the existence of a path which visits all edges is an almost trivial problem, since there can be at most one such path, there is no issue about minimizing weight of the path.

On the other hand, what if there are two salesmen, and the rule is that at least one of them has to visit each node?

Definition of the Problem

Let $G = (V, E)$ be an acyclic directed graph, with a weighting W . Let s, t be designated vertices.

The T2SP problem is to find two paths, both from s to t , in G such that every node is on at least one of the paths, and such that the cost, i.e., the sum of the edge weights used, is minimum. There may be no solution at all.

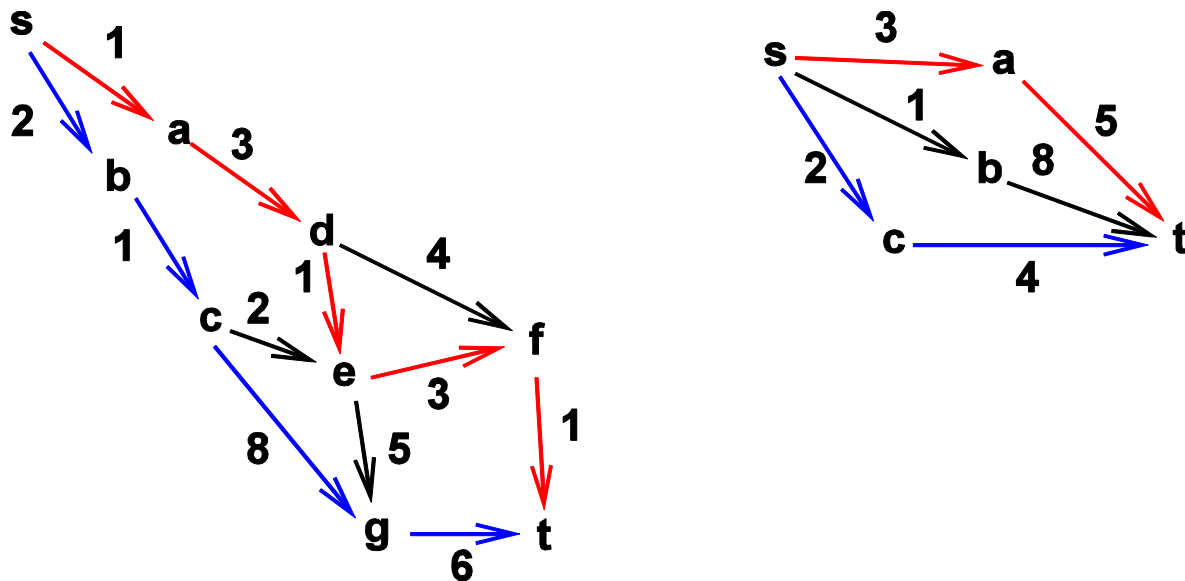


Figure 1 shows two examples of weighted directed acyclic graphs. In G1, a pair of paths is indicated, one red, the other blue. The cost of that solution is 30. Is that the minimum cost solution? There is no solution for G2.

Show that T2SP is in the class P-time, meaning that there is a polynomial time algorithm for the problem, by designing and implementing such an algorithm.

Hint: Use dynamic programming.