

Experiment 15-16

Objective: To implement Dynamic Programming based algorithms for solving the Single Source Shortest Path Problem and the Multi-Stage Graph Problem.

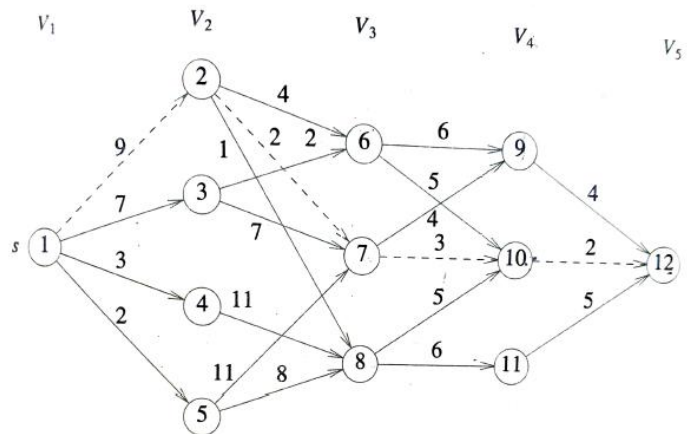
Brief Theory:

Single Source Shortest Path Problem: Given a directed and weighted graph, find the shortest paths from a single source vertex to all other vertices using Bellman Ford algorithm.

Multi-Stage Graph Problem: A multi-stage graph is directed graph in which vertices are partitioned into $k \geq 2$ disjoint sets V_1, V_2, \dots, V_k such that

- 1) $|V_1| = |V_k| = 1$
- 2) If there exists an edge $\langle u, v \rangle$ then if $u \in V_i$ then v must belong to V_{i+1} where V_1 : source (s) and V_k : sink (t)

An example is shown in the following figure:



Problem Statement: To determine a minimum-cost path from s to t.

Note: For the details of Multi-Stage Graph Problem, Pl. refer to “Fundamentals of Computer Algorithms” by *Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran*.

Task: 1) Write a program to solve the Single Source Shortest Path Problem using Bellman-Ford Algorithm.

Task: 2) Write a program to find the shortest path from a source to the destination in a given Multi-Stage Graph.

Apparatus and components required: Computer with C or C++ Compiler and Linux platform.

Experimental/numerical procedure: Coding, compilation, editing, run and debugging.

Observation table and calculations based on observations: Not Applicable.