
CS29003 Algorithms Laboratory

Assignment 10: Shortest Path

General instruction to be followed strictly

1. Do not use any global or static variable unless you are explicitly instructed so.
2. Do not use Standard Template Library (STL) of C++.
3. Use proper indentation in your code and comment.
4. Name your file as <roll_no>_<assignment_no>. For example, if your roll number is 14CS10001 and you are submitting assignment 3, then name your file as 14CS10001_3.c or 14CS10001_3.cpp as applicable.
5. Write your name, roll number, and assignment number at the beginning of your program.
6. Make your program as efficient as possible. Follow best practices of programming.
7. Submit your program on Moodle before deadline. Submissions by email or any other means will NOT be considered for evaluation.

You are free to use any code from Internet/book/friend for part I of today's assignment. Standard penalty of plagiarism does not apply for part I. However, you must write the other parts without any external help. Hence, needless to say that standard penalty for plagiarism applies there. In this assignment, assume all weights are positive integers only. However, you are free to use float/double variables if you want.

Part I

Write a function which implements the Dijkstra's algorithm for the single-source shortest path problem for **directed** graphs.

Part II

Consider an **undirected** graph with both vertex and edge weights. In this graph, the cost of a path is the sum of the weights of the edges and vertices in the path. For example, the cost of a path x_0, x_1, \dots, x_k is $\sum_{i=0}^{k-1} w(x_i, x_{i+1}) + \sum_{i=0}^k w'(x_i)$. Use your function from part I to find a single-source shortest path lengths in this undirected graph.

Submit one single C/C++ code.

Sample Output

Write the number of vertices in the undirected graph: 5

Write -1 to indicate the end of neighbors

Write neighbors of vertex 1: 2 5 -1

Write neighbors of vertex 2: 1 3 4 5 -1
Write neighbors of vertex 3: 2 4 5 -1
Write neighbors of vertex 4: 2 3 -1
Write neighbors of vertex 5: 1 2 3 -1
Weight of the edge {1,2}: 6
Weight of the edge {1,5}: 2
Weight of the edge {2,3}: 5
Weight of the edge {2,4}: 9
Weight of the edge {2,5}: 3
Weight of the edge {3,4}: 2
Weight of the edge {3,5}: 6
Weight of the vertex 1: 1
Weight of the vertex 2: 2
Weight of the vertex 3: 3
Weight of the vertex 4: 1
Weight of the vertex 5: 2
Write source vertex: 1
Distance of vertex 2 from vertex 1: 9
Distance of vertex 3 from vertex 1: 14
Distance of vertex 4 from vertex 1: 17
Distance of vertex 5 from vertex 1: 5