

IIT Ropar

CSL201 Data Structures

Semester 1, AY 2018/19

Lab Assignment 6 - 40 marks

Due on November 22, 11:59 PM

Objective

To understand and implement graph data structure and do some basic operations on the graph.

Instructions

1. You are to use C++ programming language to complete the assignment.
2. Provide a Makefile to compile your final code.
3. All function and class declarations should be in “.hpp” files while the definitions should be in “.cpp” files. It is recommended that you have one header file and one cpp file for each class. If the class is templated, declare it in the hpp file itself.
4. This is an individual assignment. You can have high level discussions with other students, though.
5. Include a “Readme.txt” file on how to compile and run the code.
6. Upload your submission to moodle by the due date and time.
7. Late submission is not allowed. No assignment will be accepted through email after submission system closes. I suggest you to upload the assignment at least 1 hour in advance.
8. No doubts will be entertained on the last two days of submission, i.e. November 4 and November 5.

Program Description

In this assignment you need to implement a graph data structure and store road network of indian state capitals. The input data is given in file capitals.txt. You have the distance (by road) between capitals of nearby states. Your vertices will be the state

capitals and the distance will be stored in the edges. Each line in the file represent an edge of the graph. Following is the format of the input file:

Capital1 Capital2 XX

Capital1 Capital10 YY

Capital2 Capital4 ZZ

This means there are two neighbouring states of state1, state2 and state 10.

Your program should support the following tasks:

- Implement classes for both vertex and edge.
- Read the data from the file and build a graph using adjacency matrix implementation.
- You should implement a shortest path method that takes two capital city names as input and gives the shortest path (1) in terms of distance (2) in terms of number of hops. You need to display the path.
- Your program should tell the state with largest border area. We assume that the capital with largest number of neighbouring states has largest area.

Program Interface

=> ./citymap capitals.txt

=> Please choose an operation

1. Shortest route between two capitals in terms of distance
2. Shortest route between two capitals in terms of number of hops (intermediate cities)
3. City with largest area