CSCI 311 Data Structures & Algorithms

LAB 4 Assignment

PROJECT DESIGN:- The project is designed using 2 primary classes namely class Graph and class Vertex. The project implements BFS, DFS and Prim's algorithms taking input from the text file.

The file graph.h/.cpp contains declarations/definitions of the members used to represent the graph and carry out the functionality. The design is as follows:-

Class Graph:- Includes the following:-

- Vertex * getVertex(string &) :- function to create a new vertex, if not present already and insert into map.
- void minHeapify(int i,int heapsize):- implements minimum priority queue for execution of prims algorithm.
- void addEdge(string &,string &,int &):- Function to represent graph by adjacency list.
- void BFS(Vertex*):- function to implement BFS algorithm.
- void DFS(vmap &):- function to implement DFS algorithm.
- void Prims(Vertex*):- function to implement Prim's algorithm.

Class Vertex:- Includes the following:-

- vector<pair<int,Vertex *> > adj:- data member to represent adjacency list.
- void reset(map<string,Vertex *>):- function to re-initialize the values of vertices.
- Data members:-wt,color,path to store the edge weights, vertex color and predecessor respectively.

Class FileReader:- Includes the following:-

- **Void readFile(char*):-** Function to read file.

Graph representation:- In the project, the graph is represented using a map and vector . Map contains list of all the vertices in the graph, while the vector pair stores the adjacent vertices along with the weight associated. While creating graph, the project uses map::find function which runs in logarithmic time. It also uses vector::push_back function which runs in constant time. So the overall complexity for graph representation is log of size of the map.