Kruskal implementation

Algo:

1)Sort the edges based on their weights

2) Start adding edges to the MST from the edge with the smallest weight

3) Only add edges which doesn't form a cycle , edges which connect only disconnected components.

#include <iostream>

#include <vector>

#include <utility>

#include <algorithm>

using namespace std;

const int MAX = 1e4 + 5;

int id[MAX], nodes, edges;

pair <long long, pair<int, int> > p[MAX];

void initialize()

{

for(int i = 0;i < MAX;++i)

id[i] = i;

}

int root(int x)

{

while(id[x] != x)

{

id[x] = id[id[x]];

x = id[x];

}

return x;

}

void union1(int x, int y)

{

int p = root(x);

int q = root(y);

id[p] = id[q];

}

long long kruskal(pair<long long, pair<int, int> > p[])

{

int x, y;

long long cost, minimumCost = 0;

for(int i = 0;i < edges;++i)

{

// Selecting edges one by one in increasing order from the beginning

x = p[i].second.first;

y = p[i].second.second;

cost = p[i].first;

// Check if the selected edge is creating a cycle or not

if(root(x) != root(y))

{

minimumCost += cost;

union1(x, y);

}

}

return minimumCost;

}

int main()

{

int x, y;

long long weight, cost, minimumCost;

initialize();

cin >> nodes >> edges;

for(int i = 0;i < edges;++i)

{

cin >> x >> y >> weight;

p[i] = make\_pair(weight, make\_pair(x, y));

}

// Sort the edges in the ascending order

sort(p, p + edges);

minimumCost = kruskal(p);

cout << minimumCost << endl;

return 0;

}

**Prim’s Algorithm**

Prim’s Algorithm also use Greedy approach to find the minimum spanning tree. In Prim’s Algorithm we grow the spanning tree from a starting position. Unlike an **edge** in Kruskal's, we add **vertex** to the growing spanning tree in Prim's.

**Algorithm Steps:**

* Maintain two disjoint sets of vertices. One containing vertices that are in the growing spanning tree and other that are not in the growing spanning tree.
* Select the cheapest vertex that is connected to the growing spanning tree and is not in the growing spanning tree and add it into the growing spanning tree. This can be done using Priority Queues. Insert the vertices, that are connected to growing spanning tree, into the Priority Queue.
* Check for cycles. To do that, mark the nodes which have been already selected and insert only those nodes in the Priority Queue that are not marked.

Consider the example below:

#include <iostream>

#include <vector>

#include <queue>

#include <functional>

#include <utility>

using namespace std;

const int MAX = 1e4 + 5;

typedef pair<long long, int> PII;

bool marked[MAX];

vector <PII> adj[MAX];

long long prim(int x)

{

priority\_queue<PII, vector<PII>, greater<PII> > Q;

int y;

long long minimumCost = 0;

PII p;

Q.push(make\_pair(0, x));

while(!Q.empty())

{

// Select the edge with minimum weight

p = Q.top();

Q.pop();

x = p.second;

// Checking for cycle

if(marked[x] == true)

continue;

minimumCost += p.first;

marked[x] = true;

for(int i = 0;i < adj[x].size();++i)

{

y = adj[x][i].second;

if(marked[y] == false)

Q.push(adj[x][i]);

}

}

return minimumCost;

}

int main()

{

int nodes, edges, x, y;

long long weight, minimumCost;

cin >> nodes >> edges;

for(int i = 0;i < edges;++i)

{

cin >> x >> y >> weight;

adj[x].push\_back(make\_pair(weight, y));

adj[y].push\_back(make\_pair(weight, x));

}

// Selecting 1 as the starting node

minimumCost = prim(1);

cout << minimumCost << endl;

return 0;

}