CS 5343 Algorithm Analysis and Data Structures

Assignment #4

Submitted by

Naga Mutya Kumar Kumtsam

(nxk210028)

Implementation of Dijkstra's algorithm

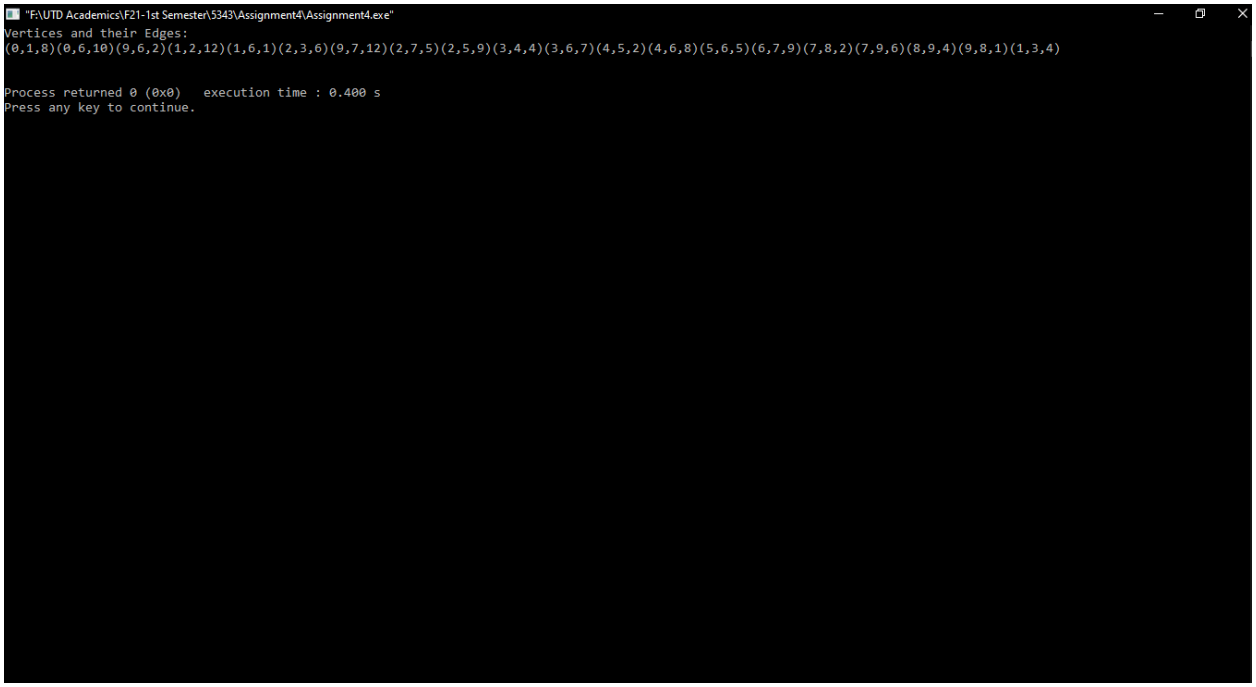
Program :

```
// Naga Mutya Kumar Kumtsam(nxk210028)
#include<iostream>
#include<bits/stdc++.h>
#define INF 0x3f3f3f3f
using namespace std;
typedef pair<int, int> twin;
void Edges(vector <pair<int, int> > sides[], int i, int j, int distance)
{
   sides[i].push_back(make_pair(j, distance));
   sides[j].push_back(make_pair(i, distance));
   cout<<"("<<i<<","<<j<<","<<distance<<")";
}
void display(int parent[],int i)
{
   if (parent[i]==-1)
   {
      return;
   }
   display(parent, parent[i]);
   printf("%d ", i);
}
void mindistance(vector<pair<int,int> > sides[], int k, int source)
{
   priority_queue< twin, vector <twin> , greater<twin> > prior_q;
   vector<int> distance(k, INF);
   int parent[k],i;
   for(int i=0;i<k;i++)
   parent[i]=-1;
   prior_q.push(make_pair(0, source));
   distance[source] = 0;
   while (!prior_q.empty())
   {
      int u = prior_q.top().second;
      prior_q.pop();
      for (auto x : sides[u])
      {
         int v = x.first;
         int dist = x.second;
         if (distance[v] > distance[u] + dist)
         {
            distance[v] = distance[u] + dist;
            parent[v]=u;
```

```
                prior_q.push(make_pair(distance[v], v));
            }
        }
    }
    cout<<"Source\t\tDestination\t\tmin_distance\t\tPath";
    for ( i = 0; i < k; ++i)
    {
        printf("\n%d\t\t%d\t\t\t\t%d\t\t\t",source, i, distance[i]);
        display(parent, i);
    }
}
int main()
{
    int vertices = 10;
    vector<twin> sides[vertices];
    cout <<"Vertices and their Edges:\n" ;
    Edges(sides, 0, 1, 8);
    Edges(sides, 0, 6, 10);
    Edges(sides, 9, 6, 2);
    Edges(sides, 1, 2, 12);
    Edges(sides, 1, 6, 1);
    Edges(sides, 2, 3, 6);
    Edges(sides, 9, 7, 12);
    Edges(sides, 2, 7, 5);
    Edges(sides, 2, 5, 9);
    Edges(sides, 3, 4, 4);
    Edges(sides, 3, 6, 7);
    Edges(sides, 4, 5, 2);
    Edges(sides, 4, 6, 8);
    Edges(sides, 5, 6, 5);
    Edges(sides, 6, 7, 9);
    Edges(sides, 7, 8, 2);
    Edges(sides, 7, 9, 6);
    Edges(sides, 8, 9, 4);
    Edges(sides, 9, 8, 1);
    Edges(sides, 1, 3, 4);
    cout<<"\n\n" ;
    cout<<"After Running Dijkstra's Algorithm : \n";
    mindistance(sides,vertices, 0);
    return 0;
}
```

Executions

List of vertices and edges(pair of vertices)



After Running dijkstra's algorithm