Student Research Scheme 2019

Application of Graph Theory in Real Life

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Abstract: Here, in this research Project we are studying Graph Theory and it's applications in real life. We are developing the model of Sangamner City's all educational institutions.we found minimum distance to travel from any college to any college of Sangamner with minimum time and cost.

Key words : Graph Theory, minimum distance.

Aim: To Study Applications of Graph Theory in Real Life

Objectives : 1) To study graphs

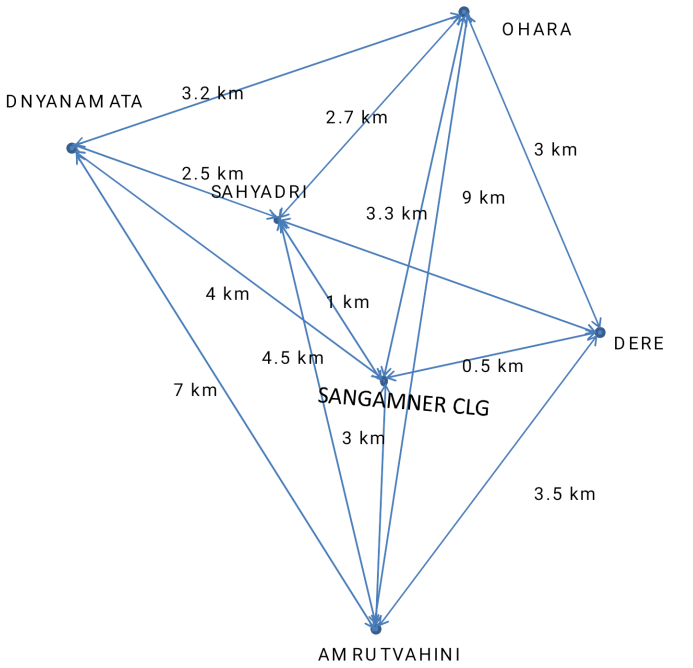
2) To study trees

3) To study Minimal Path algorithms

Introduction :

Definition:- A graph is an ordered pair $G = (V, E)$ a set V of *vertices* or *nodes* or *points* together with a set E of *edges* or *arcs* or *lines*, which are 2-element subsets of V.

A **minimum spanning tree** (**MST**) or **minimum weight spanning tree** is a subset of the edges of a connected, edge-weighted undirected graph that connects all the vertices together, without any cycles and with the minimum possible total edge weight. That is, it is a spanning tree whose sum of edge weights is as small as possible. More generally, any edge-weighted undirected graph (not necessarily connected) has a **minimum spanning forest**, which is a union of the minimum spanning trees for its connected components.



INTERCONNECTED PATH OF COLLEGES IN SANGAMNER

Prim's algorithm

In computer science, **Prim's** (also known as **Jarník's**) **algorithm** is a greedy algorithm that finds a minimum spanning tree for a weighted undirected graph. This means it finds a subset of the edges that forms a tree that includes every vertex, where the total weight of all the edges in the tree is minimized. The algorithm operates by building this tree one vertex at a time, from an arbitrary starting vertex, at each step adding the cheapest possible connection from the tree to another vertex.

The algorithm may informally be described as performing the following steps:

1. Initialize a tree with a single vertex, chosen arbitrarily from the graph.
2. Grow the tree by one edge: of the edges that connect the tree to vertices not yet in the tree, find the minimum-weight edge, and transfer it to the tree.
3. Repeat step 2 (until all vertices are in the tree).

In more detail, it may be implemented following:

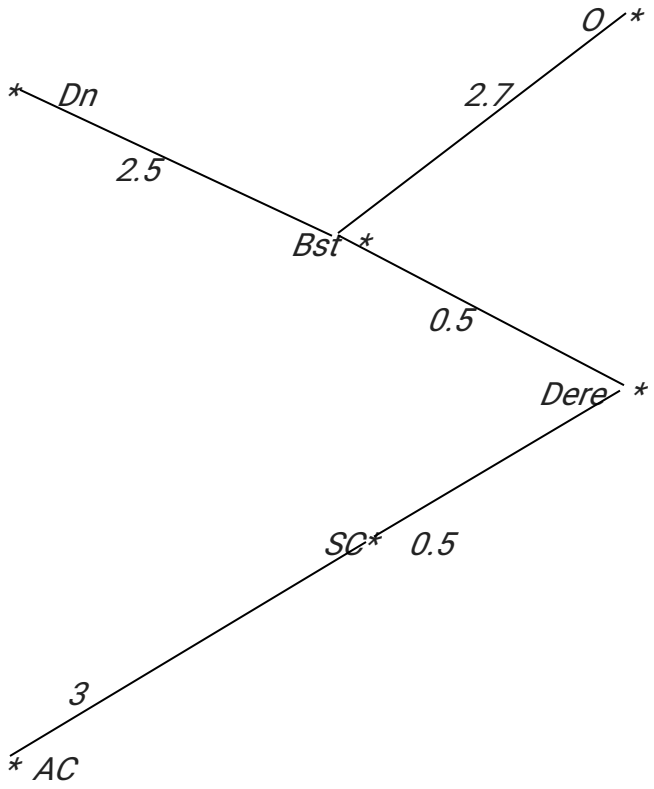
Associate with each vertex v of the graph a number $C[v]$ (the cheapest cost of a connection to v) and an edge $E[v]$ (the edge providing that cheapest connection). Initialize an empty forest F and a set Q of vertices that have not yet been included in F (initially, all vertices).

1. Repeat the following steps until Q is empty:

a. Find and remove a vertex v from Q having the minimum possible value of $C[v]$

b. Add v to F and, if $E[v]$ is not the special flag value, also add $E[v]$ to F

By prims algorithm minimum spanning tree is



Sr. No	*From*	*To*	*Distance in KM*
1	*AC*	*SC*	*3*
2	*SC*	*DERE*	*0.5*
3	*AC*	*DERE*	*3.5*

4	*AC*	*BST*	*4*
5	*AC*	*DN*	*6.5*
6	*AC*	*O*	*6.7*
7	*SC*	*BST*	*1*
8	*SC*	*DN*	*3.5*
9	*SC*	*O*	*3.7*
10	*SC*	*Dere*	*0.5*

APPLICATION

- THIS CAN BE DON FOR ANY CITY AND ANY STATE OR COUNTRY.

- THIS METHOD CONSUMES A LOT OF TIME.
- THIS METHOD AVOID A LOT OF UNNECESSARY DISTANCE DURING TRAVEL FROM ONE PLACE TO ANOTHER PLACE.
- THIS METHOD SAVE A LOT OF MONEY FOR TRAVELLING.

C.

References:

1) https://en.wikipedia.org/wiki/Graph_theory
2) John Clark, Derek Allan Holton, "**A First Look at Graph Theory**", **world scientific , 1991**