DSA

28221

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Assignment No. 08

## Shortest path finding

**Aim:** To implement shortest path using Dijikstra's algorithm

**Problem statement:** Represent a graph of city using adjacency matrix / list Nodes should represent the various land marks & link should represent the distance beth them find the shortest path using Dij-ikstra algo from single source to all destination

**Theory:**

- **Shortest path**

In graph theory the shortest path is the path beth 2 vertices such that the sum of the weights of its edges is minimized

The problem of finding the shortest path in graph from one vertex to another shortest can be least number of edges, least total weights etc

- various algorithm to find shortest path:

1) Dijikstra algorithm
2) Bellman ford algorithm
3) Floyd warshall algorithm
4) johnson's algorithm
5) viterbi algorithm

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## Greedy Approch:

An algorithm is designed to achieve optimum solution for a given problem. In greedy algorithm approch decission are made from given solution that seems to provide an optimum solution chosen

Greedy algo buiks by solution piece by piece, always chossing the next piece that offers the most obvious and immediate benefits

## Dijikstra's algorithm:

It is an algorithm for finding the shortest paths betn nodes in graph.

The algorithm creates a tree of shortest path from the starting vertex (source) to all other points in graph. Dijkstra's algorithm finds a shortest path tree from a single source node by builds a set of nodes that have minimum distance from source

## Real time uses of Dijiktras algorithm:

1) Social Networking Applications.
2) Telephone network
3) Digital mapping services
4) Ip routing
5) Flighting agenda

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Validations:

No of vertex and edges should be positive

Test cases:

i) Directed graph with no loops and parallel edges
ii) Undirected graph with no loops and parallel edges

Conclusion:

Time complexicity for matrix - $O(V^2)$
using list - $O(E \log V)$