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ASSIGNMENT-5

TITLE : DIJKSTRA'S ALGORITHM

PROBLEM STATEMENT : Write a program to solve Dijkstra's algorithm for shortest path

THEORY :

- DIJKSTRA'S ALGORITHM :

- It is an example of single source shortest path algorithm, i.e., given a source vertex it finds shortest path from source to all other vertices.
- We can also use it for finding all pair shortest paths by running it for every vertex.
- Time complexity = $O(V \cdot E \cdot \log V)$ which can be $O(V^3 \log V)$ in worst case.

- ALGORITHM :

Create a $|V| \times |V|$ matrix

for each cell (i, j) in M do

if $i = j$
 $M[i][j] = 0$

if (i, j) is an edge in E
 $M[i][j] = \text{weight}(i, j)$

else

$M[i][j] = \infty$

for k from 1 to $|V|$

for i from 1 to $|V|$

for j from 1 to $|V|$

if $M[i][j] > M[i][k] + M[k][j]$

$M[i][j] = M[i][k] + M[k][j]$

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Time complexity = $O(n^2)$

Example:

graph [v][v] = {

0, 4, 0, 0, 0, 0, 0, 8, 0
4, 0, 8, 0, 0, 0, 0, 11, 0
0, 8, 0, 7, 0, 4, 0, 0, 2
0, 0, 7, 0, 9, 14, 0, 0, 0
0, 0, 0, 9, 0, 10, 0, 0, 0
0, 0, 4, 14, 10, 0, 2, 0, 0
0, 0, 0, 0, 0, 2, 0, 0, 1, 6
8, 11, 0, 0, 0, 0, 0, 1, 0, 7
0, 0, 2, 0, 0, 0, 0, 0, 6, 7, 0 }

o/p :

Vertex	Dist. from source
0	0
1	4
2	12
3	19
4	21
5	11
6	9
7	8
8	14

CONCLUSION :

Thus we have successfully implemented Dijkstra's in C++