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Expt no : 5

Aim : Implement floyd-warshall algorithm using openMP programming interface to find the lengths of the shortest paths between all pairs of vertices of the given directed graph.

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Implement floyd-warshall algorithm using openMP programming interface to find the lengths of the shortest paths between all pairs of vertices of the given directed graph.

Objectives:

- Understand floyd warshall algorithm.
- Find parallelism in the algorithm and implement using C++ and openMP.

Theory:

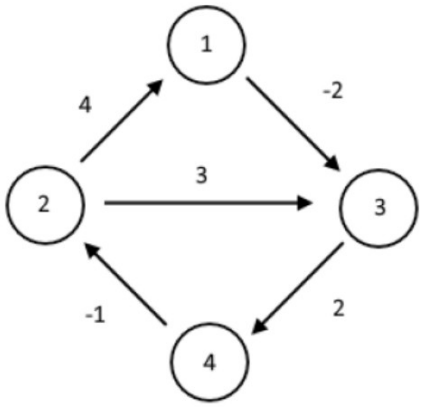
The Floyd Warshall Algorithm is for solving the All Pairs Shortest Path problem. The problem is to

find shortest distances between every pair of vertices in a given edge weighted directed Graph.

Problem Statement:

- (Your code may assume that the input has already been checked for loops, parallel edges and negative cycles.)
- Print the pairwise distances as output.

Input Graph :



Methodology:

Parallelism in Flyod-warshall :

- Graph is represented in the form of cost adjacency matrix. (0 cost if no edge.)
- dist[ ][ ] is a 2D array representing graph. And dist[i][j] represents the length of an edge or a path.
- We can see that for every k where k is an intermediate node between node i and j we can achieve parallelism by independently computing distances.
- Hence for every k (for loop with k), we feed parallel i,j values to for loops i and j resp.by
- Using #pragma omp parallel for private(i,j)

Results:

```
File  Edit  View  Search  Terminal  Help
HPC-LAB@Zorin:~/Floyd_Warshall$ gcc -o Floyd_Warshall -fopenmp Floyd_Warshall.c
HPC-LAB@Zorin:~/Floyd_Warshall$ ./Floyd_Warshall
Distance Matrix
         A     B     C     D
   A     0     0    -2     0
   B     4     0     3     0
   C     0     0     0     2
   D     0    -1     0     0

Shortest-Path Matrix
         A     B     C     D
   A     0     0    -2     0
   B     4     0     2     4
   C     5     1     0     2
   D     3    -1     1     0
```

Conclusion:

Here we can conclude that, we have successfully study and analyzed serial floyd warshalls' algorithm and achieved parallelism using openMP programming interface.