OPTIMISATION REPORT

Algorithm before optimisation :

- Use djikstra algorithm for every node to compute the shortest distance of that particular node from all the nodes

Time complexity :

Suppose, there are v nodes in the given graph. The time complexity for one run of djikstra is O(v^2). Therefore, the time complexity for the above algorithm is O(v^3).

Algorithm after optimisation :

- Use the dijkstra algorithm for the nodes which are newly added. So, by using this we can get the shortest paths from newly added nodes to all the other nodes.
- For every pair of vertices and one of the newly added vertex, compare the distance between the pair of vertices and the sum of distances of the two vertices from the newly added vertex. If the sum is less than the existing distance between these vertices, then update the path between these vertices such that the new shortest path between these vertices passes through the newly added vertex
- Repeat the above step for all the newly added nodes

Time complexity :

Suppose, there are v nodes in the given graph. Let k nodes be newly added to the graph. In the above algorithm,

- The time complexity for the first step is O(k*(v+k)^2).
- The time complexity for the second step is O(v^2).
- The time complexity for the third step is O(k*v^2).

Therefore the final time complexity of the optimized algorithm O(k*(v+k)^2)