DSA
Assignment 01

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Assignment on Dijkstra Algorithm to find shortest path

Dijkstra's algorithm is used to find the length of an optimal path between two nodes in a graph. The term optimal can mean anything, shortest, cheapest, or fastest. If we start the algorithm with an initial node, then the distance of a node Y can be given as the distance from the initial node to that node.

Algorithm for Dijkstra's algorithm:

Step 1: Select the source node also called the initial node
Step 2: Define an empty set N that will be used to hold nodes to which a shortest path has been found.
Step 3: Label the initial node with, and insert it into N.
Step 4: Repeat Steps 5 to 7 until the destination node is in N or there are no more labelled nodes in N.
Step 5: Consider each node that is not in N and is connected by an edge from the newly inserted node.
Step 6: (a) If the node that is not in N has no label then SET the label of the node = the label of the newly inserted node + the length of the edge.
(b) Else if the node that is not in N was already labelled, then SET its new label = minimum (label of newly inserted vertex + length of edge, old label)
Step 7: Pick a node not in N that has the smallest label assigned to it and add it to N.

Example:

Consider the graph G given alongside. Taking D as the initial node, we execute the Dijkstra's algorithm.
Step 1: Set the label of D = 0 and N = {D}.
Step 2: Label of D = 0, B = 15, G = 23, and F = 5.
Therefore, N = {D, F}.
Step 3: Label of D = 0, B = 15, G has been relabelled 18 because minimum (5 + 13, 23) = 18, C has been relabeled 14 (5 + 9). Therefore, N = {D, F, C}.
Step 4: Label of D = 0, B = 15, G = 18. Therefore, N = {D, F, C, B}.
Step 5: Label of D = 0, B = 15, G = 18 and A = 19 (15 + 4). Therefore, N = {D, F, C, B, G}.
Step 6: Label of D = 0 and A = 19. Therefore, N = {D, F, C, B, G, A}