

In []:

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1  #Bellman-Ford Algorithm (Single Source Shortest Path)
2  #The Bellman-Ford algorithm is used to find the shortest path from a single source vertex to all other vertices in a weighted directed graph.
3  #It works even for graphs with negative weight edges (unlike Dijkstra's algorithm) and can detect negative weight cycles
4
5  import java.util.*;
6
7  class BellmanFord
8  {
9      public static void bellmanFord(int v,List<int[]> edges){
10         int[] dist=new int[v];
11         Arrays.fill(dist,Integer.MAX_VALUE);
12         dist[0]=0;# start source as node 0
13
14         for(int i=0;i<v-1;i++){ # Loop through v-1 times(This is where it varies from Dijkstra's)
15             for(int[] e:edges){
16                 int src=e[0];
17                 int dstn=e[1];
18                 int cost=e[2];
19
20                 # Relaxation same as Dijkstra
21                 if(dist[src]!=Integer.MAX_VALUE && dist[src]+cost<dist[dstn]){
22                     dist[dstn]=dist[src]+cost;
23                 }
24             }
25         }
26
27         #Print the result, and experiment with negative weights.
28         System.out.println("Shortest distances are as follows");
29         for(int i=1;i<v;i++){
30             System.out.println("Distance between "+0+" and "+i+" is -> "+dist[i]);
31         }
32     }
33     public static void main (String[] args)
34     {
35
36         int nodes=4;
37         int edges=5;
38
39         List<int[]> edgeList=new ArrayList<>();
40
41
42         edgeList.add(new int[]{0,1,4});
43         edgeList.add(new int[]{0,2,3});
44         edgeList.add(new int[]{1,2,1});
45         edgeList.add(new int[]{1,3,1});
46         edgeList.add(new int[]{2,3,3});
47
48         bellamanFord(nodes,edgeList);
49
50         #BellamanFord is same as Dijkstra's Algorithm.
51         #BF is costly than Dijkstra due to its TC being  $O(V * E)$  whereas Dijkstra's has  $O((V+E) \log V)$ 
52         #Relaxation happens for every node, and BF doesn't work with Negative edges. So
53         # Floyd warshall / other algorithms can be implemented over dijk/BF for negative weights.
54     }
55 }
```