Documentation – Practical Work no. 5
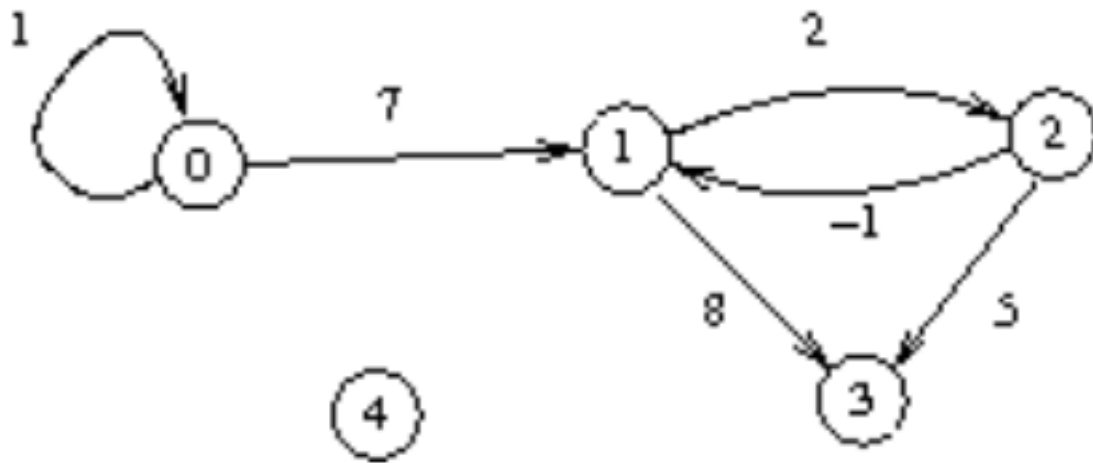

Let's compute the distance from 0 to 3 with max length = 2 * nrVertices = 10

initMap = {0: 0}
dist = [{0: 0}]
k = 1
dist = [{0: 0}]
k = 2
dist = [{0: 0}, {0: 1, 1: 7}]
k = 3
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}]
k = 4
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}, {0: 3, 1: 8, 2: 10, 3: 14}]
k = 5
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}, {0: 3, 1: 8, 2: 10, 3: 14}, {0: 4, 1: 9, 2: 10, 3: 15}]
k = 6
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}, {0: 3, 1: 8, 2: 10, 3: 14}, {0: 4, 1: 9, 2: 10, 3: 15}, {0: 5, 1: 9, 2: 11, 3: 15}]
k = 7
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}, {0: 3, 1: 8, 2: 10, 3: 14}, {0: 4, 1: 9, 2: 10, 3: 15}, {0: 5, 1: 9, 2: 11, 3: 15}, {0: 6, 1: 10, 2: 11, 3: 16}]
k = 8
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}, {0: 3, 1: 8, 2: 10, 3: 14}, {0: 4, 1: 9, 2: 10, 3: 15}, {0: 5, 1: 9, 2: 11, 3: 15}, {0: 6, 1: 10, 2: 11, 3: 16}, {0: 7, 1: 10, 2: 12, 3: 16}]
k = 9
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}, {0: 3, 1: 8, 2: 10, 3: 14}, {0: 4, 1: 9, 2: 10, 3: 15}, {0: 5, 1: 9, 2: 11, 3: 15}, {0: 6, 1: 10, 2: 11, 3: 16}, {0: 7, 1: 10, 2: 12, 3: 16}, {0: 8, 1: 11, 2: 12, 3: 17}]
k = 10
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 9, 3: 15}, {0: 3, 1: 8, 2: 10, 3: 14}, {0: 4, 1: 9, 2: 10, 3: 15}, {0: 5, 1: 9, 2: 11, 3: 15}, {0: 6, 1: 10, 2: 11, 3: 16}, {0: 7, 1: 10, 2: 12, 3: 16}, {0: 8, 1: 11, 2: 12, 3: 17}, {0: 9, 1: 11, 2: 13, 3: 17}]

Now we generate the path:
Length = 2
currentLength = 2
walk = [3]
currentLength = 1
walk = [1, 3]
currentLength = 0
walk = [0, 1, 3]
Distance of length 2 + 1 from 0 to 3: dist[2][3] = 15

Length = 3
currentLength = 3
walk = [3]
currentLength = 2
walk = [2, 3]
currentLength = 1
walk = [1, 2, 3]
currentLength = 0
walk = [0, 1, 2, 3]
Distance of length 3 + 1 from 0 to 3: dist[3][3] = 14

<u>Now change the edge (1, 2) to have the cost -2</u>
k = 1
dist = [{0: 0}]
k = 2
dist = [{0: 0}, {0: 1, 1: 7}]
k = 3
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}]
k = 4
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}, {0: 3, 1: 4, 2: 6, 3: 10}]
k = 5
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}, {0: 3, 1: 4, 2: 6, 3: 10}, {0: 4, 1: 5, 2: 2, 3: 11}]
k = 6
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}, {0: 3, 1: 4, 2: 6, 3: 10}, {0: 4, 1: 5, 2: 2, 3: 11}, {0: 5, 1: 1, 2: 3, 3: 7}]
k = 7
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}, {0: 3, 1: 4, 2: 6, 3: 10}, {0: 4, 1: 5, 2: 2, 3: 11}, {0: 5, 1: 1, 2: 3, 3: 7}, {0: 6, 1: 2, 2: -1, 3: 8}]
k = 8
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}, {0: 3, 1: 4, 2: 6, 3: 10}, {0: 4, 1: 5, 2: 2, 3: 11}, {0: 5, 1: 1, 2: 3, 3: 7}, {0: 6, 1: 2, 2: -1, 3: 8}, {0: 7, 1: -2, 2: 0, 3: 4}]
k = 9
dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}, {0: 3, 1: 4, 2: 6, 3: 10}, {0: 4, 1: 5, 2: 2, 3: 11}, {0: 5, 1: 1, 2: 3, 3: 7}, {0: 6, 1: 2, 2: -1, 3: 8}, {0: 7, 1: -2, 2: 0, 3: 4}, {0: 8, 1: -1, 2: -4, 3: 5}]
k = 10

dist = [{0: 0}, {0: 1, 1: 7}, {0: 2, 1: 8, 2: 5, 3: 15}, {0: 3, 1: 4, 2: 6, 3: 10}, {0: 4, 1: 5, 2: 2, 3: 11}, {0: 5, 1: 1, 2: 3, 3: 7}, {0: 6, 1: 2, 2: -1, 3: 8}, {0: 7, 1: -2, 2: 0, 3: 4}, {0: 8, 1: -1, 2: -4, 3: 5}, {0: 9, 1: -5, 2: -3, 3: 1}]

Distance from 0 to 2 is d[2][2] = 5, and we add cost(2, 1), then it would be 4, smaller than d[1][1] so there is a negative cycle since if we come back the cost decreases => <u>negative cycle</u>