

# Distances in Directed Graps

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1 #include <stdio.h>
2 // Number of Vertices
3 #define N 6
4 // Infinite (No Connection)
5 #define X 30000
6
7 // Adjacency Matrix of Graph
8 int w[N][N] = {{0, 4, X, X, X, 2},
9               {1, 0, 3, 4, X, X},
10              {6, 3, 0, 7, X, X},
11              {6, X, X, 0, 2, X},
12              {X, X, X, 5, 0, X},
13              {X, X, X, 2, 3, 0}};
14
15 // Distances
16 int d[N][N];
17
18 // calculate distances Array from Adjacency Array
19 void calculateDistances() {
20     for (int i = 0; i < N; i++) {
21         for (int j = 0; j < N; j++) {
22             d[i][j] = w[i][j]; // k = 0
23         }
24     }
25     for (int k = 0; k < N; k++) {
26         for (int i = 0; i < N; i++) {
27             for (int j = 0; j < N; j++) {
28                 // if the distance passing through k'th Vertice is shorter than direct edge
29                 if (d[i][j] > d[i][k] + d[k][j]) {
30                     // change distance

```

**Floyd-Sarshall Algorithm :**  
**Calculate Distance in  $O(n^3)$**

```

31         d[i][j] = d[i][k] + d[k][j];
32     }
33 }
34 }
35 }
36 }
37
38 void printAdjacencies() {
39     printf("Adjacency Array\n");
40     for(int i=0; i<N; i++) {
41         for(int j=0; j<N; j++) {
42             int val = w[i][j];
43             if(val>=X) {
44                 printf("X\t");
45             } else {
46                 printf("%d\t", val);
47             }
48         }
49         printf("\n");
50     }
51     printf("\n");
52 }
53
54 void printDistances() {
55     printf("Distances Array\n");
56     for(int i=0; i<N; i++) {
57         for(int j=0; j<N; j++) {
58             int val = d[i][j];
59             if(val>=X) {
60                 printf("X\t");

```

```

61         } else {
62             printf("%d\t", val);
63         }
64     }
65     printf("\n");
66 }
67 printf("\n");
68 }
69
70 int main() {
71     printAdjacencies();
72     calculateDistances();
73     printDistances();
74 }
75

```

75,0-1

Result :

\$ ./main

Adjacency Array

0	4	X	X	X	2
1	0	3	4	X	X
6	3	0	7	X	X
6	X	X	0	2	X
X	X	X	5	0	X
X	X	X	2	3	0

Distances Array

0	4	7	4	5	2
1	0	3	4	6	3
4	3	0	7	9	6
6	10	13	0	2	8
11	15	18	5	0	13
8	12	15	2	3	0