Problem 11.1

This kind of algorithm is not always possible to find a shortest path. As an example,

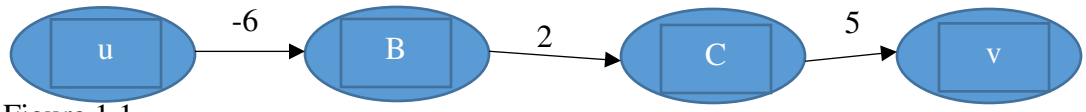

Figure 1.1

Total weight of Figure 1 : 1

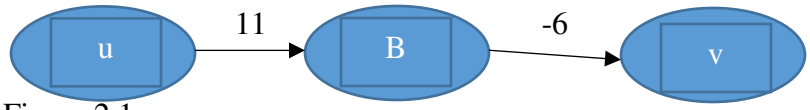

Figure 2.1

Total weight of Figure 2.1: 5

Figure 1.1 has a shorter total weight between u and v than in Figure 2.1.

After adding constant = 50,

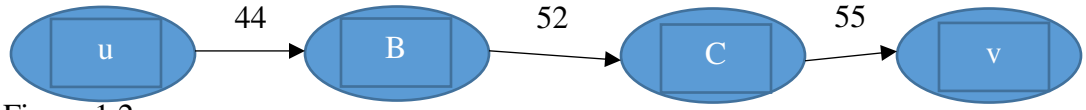

Figure 1.2

Total weight of figure 1.2: 151

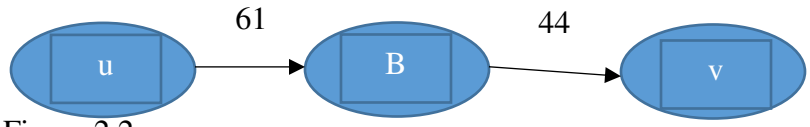

Figure 2.2

Total weight of figure 2.2: 105

Hence, Figure 2.2 has a shorter to between u and v than in Figure 1.2.

We expected Figure 1.2's total weight between u and v to be less than that in Figure 2.2 after adding a large positive constant to run Dijkstra's algorithm. However, the shorter path option has been changed after adding the constant as total weight in Figure 2.2 is relatively less. Hence, we cannot find the shortest path with the given algorithm.

Problem 11.2

The implementation is in P2.cpp.

Problem 11.3

a) Let N be the set of nodes (nodes will represent each field on the board) containing {0,1, .. n^2-1}. Let B[i,j] be an entry on the board B with n*n dimension. Let a function g(i,j) = in+j where g: n*n → N to return the position of the node. Then, each node k∈N, where g(i,j) = k, will have neighboring edges with nodes M={g(i+B[i,j],j), g(i-B[i,j],j), g(i,j+B[i,j]), g(i,j-B[i,j])}, and all nodes in M are in the interval of [0, n^2-1]. We will check the possibility of edges formation with the neighboring nodes for each field. Mathematically, N = {0,1, .. n^2-1}, E = (k * M) where k∈N and M = [0, n^2-1].

b) The implementation is in P3.cpp.

c) The implementation is in P3.cpp.

References

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(I used this website to get some ideas for Problem 11.3b.)

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(I used this website to get some ideas for Problem 11.3b.)