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CS311 HW4

22.2-2.)

R: d=4 π=S
S: d=3 π=W
T: d=1 π=u
U: d=0 π=NIL
V: d=5 π=R
W: d=2 π=T
X: d=1 π=U
Y: d=1 π=U

1. From source node U, nodes T,X,Y get enqueued first, and d=1 π=U. U is marked black.
2. T is dequeued, node W is the only white node in ADJ(T) and so its d=2 π=T and it is enqueued. T is marked black
3. X is dequeued, all nodes in ADJ(X) have been marked grey or black, X is marked black.
4. Y is dequeued, all nodes in ADJ(Y) have been marked grey or black, Y is marked black
5. W is dequeued, node S is the only node in ADJ(W) that is white, its d=3 π=w and is enqueued. W is marked black.
6. S is dequeued, node R is the only node in ADJ(S) that is white, its d=4 π=S and is enqueued. S is marked black.
7. R is dequeued, node V is the only node in ADJ(R) that is white, its d=4 π=S and is enqueued. R is marked black.
8. V is dequeued, it has no nodes in ADJ(R) that is white, it is marked black and the search is completed.

22.2-3.)

The BFS algorithm as provided in the book does not contain any check for the color black, so removing line 18 has no impact on the finishing of the BFS. All nodes that have been visited would be gray and no longer be enqueued since the enqueueing of adjacent nodes is conditioned on the node being white(unvisited). This means that it is extraneous to have two colors represent “visited/finished” and three colors total, when the algorithm only distinguishes white from not-white, proving that two colors is enough to ensure proper outputs.