EECS340 - Algorithms - HW#10

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24.3-8

To modify Dijkstra's algorithm to run in $O(VW + E)$ time we need to store the values in an array instead of a min-priority queue. The algorithm loads source vertex s into $A[0]$ then performs a breadth first search on all connected edges. Each vertex it finds will be put in to the array in spot $A[d.\pi + d.w]$. This means that each vertex will be placed its weight away from the previous vertex. By using this method the lookup time is reduced from $O(V^2)$ to $O(WV)$ for an overall $O(WV + E)$

24.1

a) If there was a connection from any child V to any parent V then we would have a cyclic graph however this graph only contains forward edges so this is not possible. The same is true with a reverse argument for G_b.

b) Bellman-Ford normally starts with 1/V and loops through to V/V. This will average to V/2 passes over all edges. Because of 2 separate graphs G_f and G_b some beginning edges will be relaxed many times while edges toward the middle will only be relaxed a few times. This will average to max V/2 passes.

c) No, the run time has not changed. While the number of passes is decreased the algoithm still runs in $O(VE)$.