Algo PSet5 Q2

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Fall 2019

Question 2

False. The "Max-Value-Forward-Edge-Only" is not guaranteed to find a flow of value at least 1/2 of maximum flow value. This is evident in this graph:

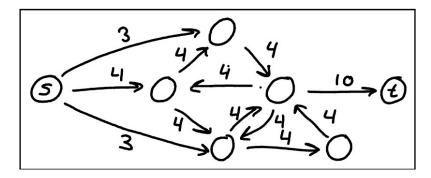


Figure 1: Directed Graph G.

Where the algorithm chooses flow path:

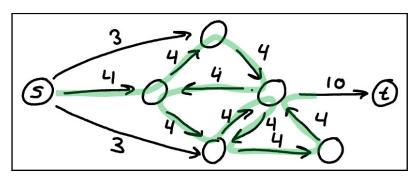


Figure 2: Forward-Edge-Only Path

This is a possible path of the algorithm, because the path chosen is the max augmenting path, allowing for the most flow to be pushed along the graph. However, this path leaves the residual graph with no other s-t paths, meaning that this graph terminates with flow value 4.

However, the max flow that can be pushed on this graph has value 10, as is seen here on the next page.

In this max flow, we push 4 units along middle path, 3 units along bottom path, and 3 units along top path, leaving us with a max flow of value 10. Thus, the max flow returned by the algorithm returns a flow under 1/2 of the true max flow.

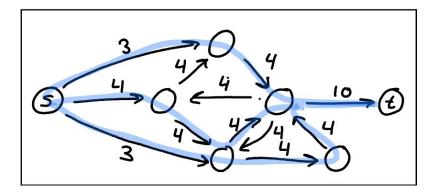


Figure 3: Max Flow on Graph ${\cal G}$