Task

- Does update-Backward work?
- Explain
- Show work

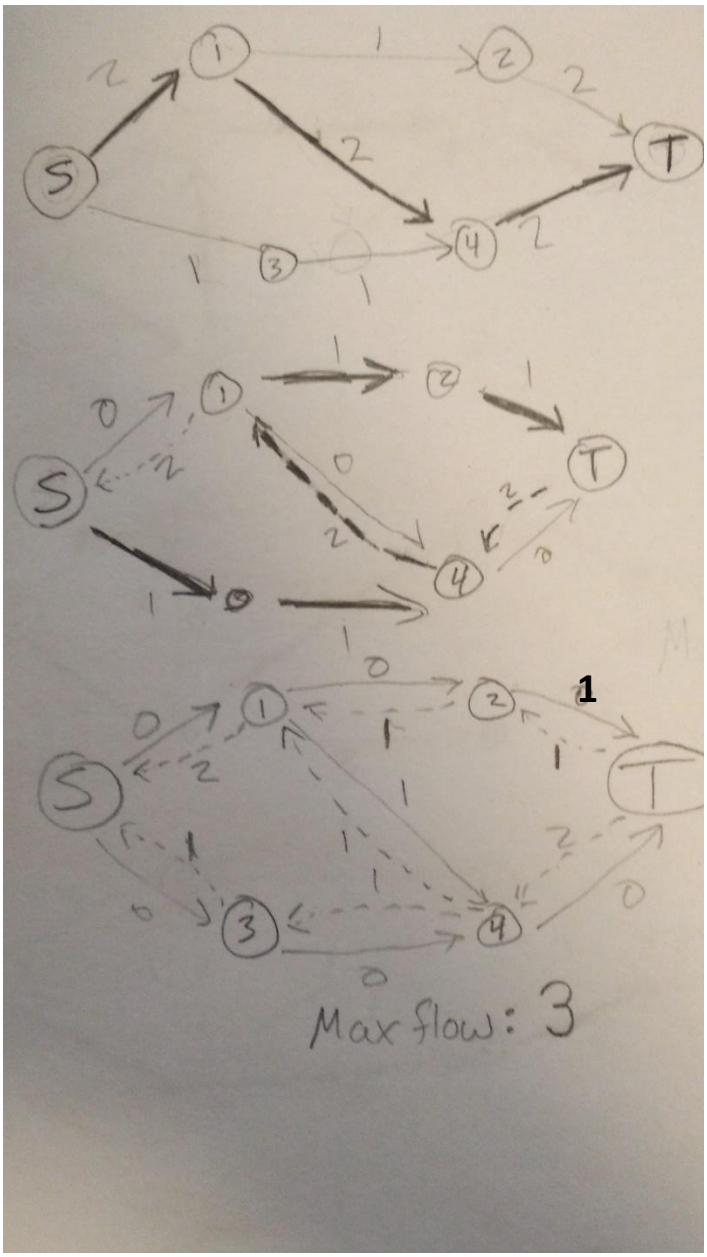
Example One

Step

1

2

3



Update backward does work.

Take for example step one on the left. Given that graph, if that augmented path is found (The darker colored path), then the max flow would be 2. There would be no additional augmented paths. However by updating every edge with a backward flow equal to the amount being pushed through, creates a path for step 2 to be possible.

In step two we see an augmented path reveled via the backward follow between node 1 and 4. This allows an additional flow unit through.

In step three we see there are no additional augmented paths. Thus we arrive to the true answer of the max flow being 3.

1

Update backward walk through example

Take for example step 1.The augmented path found is from S-> 1, 1->4, 4->T. Update backward begins by looking at each edge in that set and checking if a backward flow exists (by checking if the current edge's target is the same node as the source of an incoming edge to the source of the current edge). If the backward flow doesn't exist, then it creates that directed edge and updates it with the amount being pushed else if the backward flow does exist, then update it with the amount being pushed. The amount being pushed is obviously the augmented paths minimum weight.

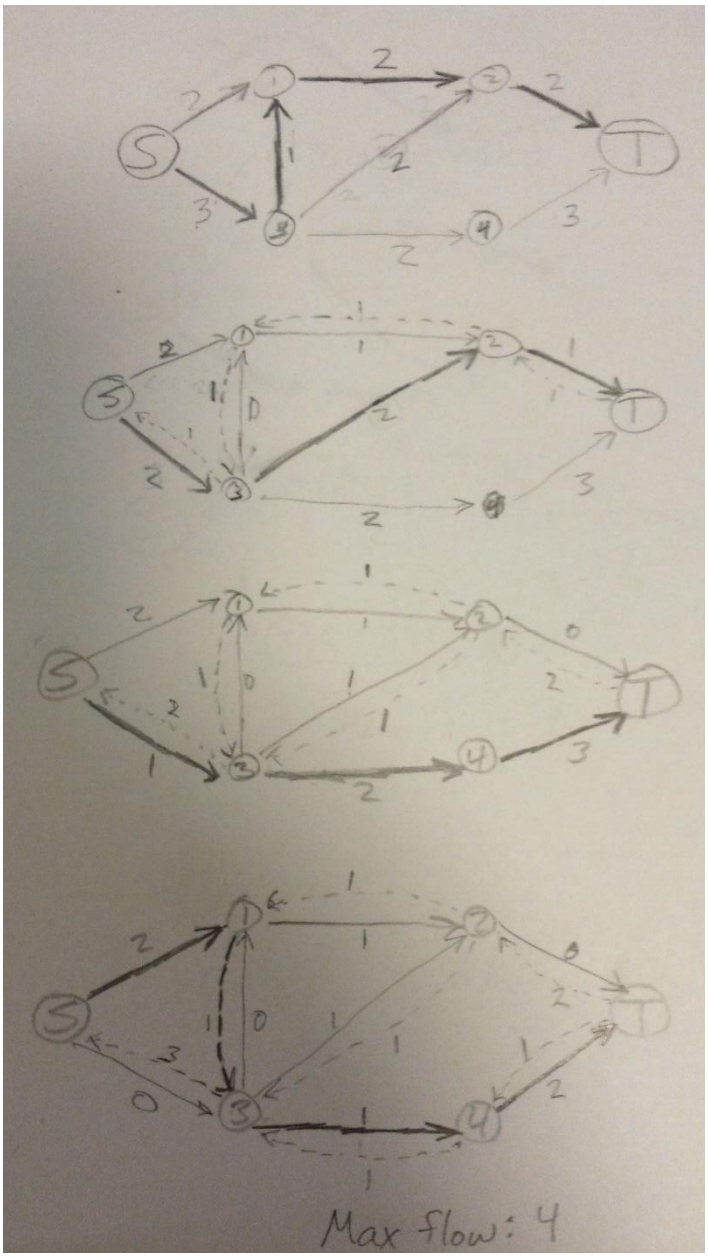
Example Two

Step 1

2

3

4



Given the graph on the left, steps one through three find augmenting paths without using backflow paths.

Given this set of paths, without backflow the max flow is assumed to be 3. However by updating each edge with a backward flow equal to the amount being pushed through to the end, we find an additional path in step 4 that allows us to push through an additional flow unit.

We then come to conclude the correct answer of the max flow being 4.

Closing thoughts:

Backward pushing in a sense allows us to undo a path we found for a more efficient path found. This guarantees to find the correct answer.