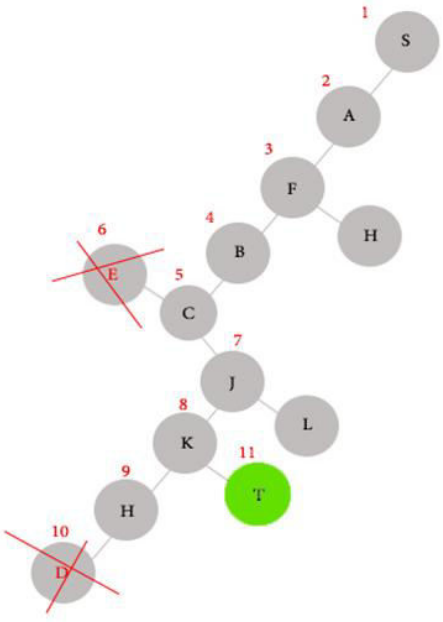
AI – MS Homework 1 Solution

March 17, 2016

Part A:

1. S => S removed, (SA, SB) computed and added
2. SA, SB => SA removed, (SAF, SAS) computed and (SAF) added
3. SAF, SB => SAF removed, (SAFB, SAFH, SAFA) computed and (SAFB, SAFH) added
4. SAFB, SAFH, SB => SAFB removed, (SAFBS, SAFBF, SAFBC) computed and (SAFBC) added
5. SAFBC, SAFH, SB => SAFBC removed, (SAFBCB, SAFBCJ, SAFBCE) computed and (SAFBCJ, SAFBCE) added
6. SAFBCE, SAFBCJ, SAFH, SB => SAFBCE removed, (SAFBCEC) computed and nothing added
7. SAFBCJ, SAFH, SB => SAFBCJ removed, (SAFBCJL, SAFBCJK, SAFBCJC) computed and (SAFBCJL, SAFBCJK) added
8. SAFBCJK, SAFBCJL, SAFH, SB => SAFBCJK removed, (SAFBCJKH, SAFBCJKJ, SAFBCJKT) computed and (SAFBCJKH, SAFBCJKT) added
9. SAFBCJKH, SAFBCJKT, SAFBCJL, SAFH, SB => SAFBCJKH removed, (SAFBCJKHD, SAFBCJKHF, SAFBCJKHK) computed and (SAFBCJKHD) added
10. SAFBCJKHD, SAFBCJKT, SAFBCJL, SAFH, SB => SAFBCJKHD removed, (SAFBCJKHDH) computed and nothing added
11. SAFBCJKT, SAFBCJL, SAFH, SB => goal is reached. Final Path: SAFBCJKT



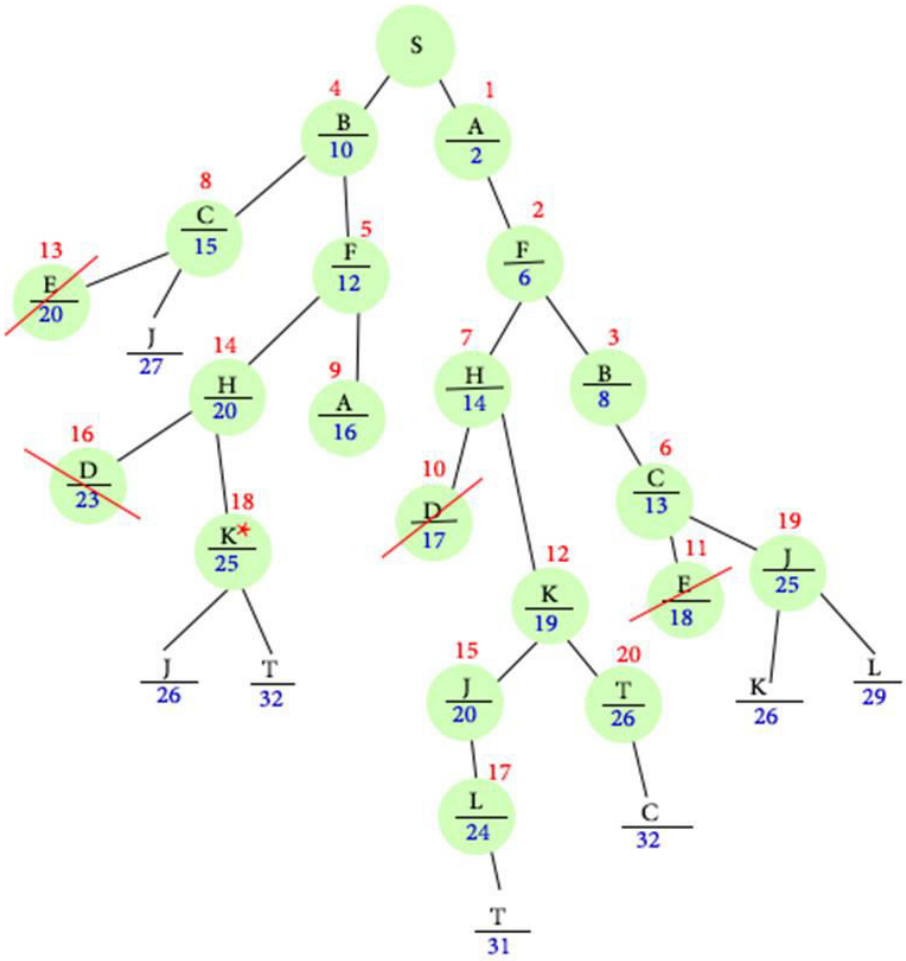
Back Track: D, E

Part B:

1. 0S
2. 2SA, 10SB
3. 6SAF, 10SB
4. 8SAFB, 10SB, 14SAFH
5. 10SB, 13SAFBC, 14SAFH
6. 12SBF, 13SAFBC, 14SAFH, 15SBC
7. 13SAFBC, 14SAFH, 15SBC, 16SBFA, 20SBFH
8. 14SAFH, 15SBC, 16SBFA, 18SAFBCE, 20SBFH, 25SAFBCJ
9. 15SBC, 16SBFA, 17SAFHD,18SAFBCE, 19SAFHK,20SBFH, 25SAFBCJ
10. 16SBFA, 17SAFHD,18SAFBCE, 19SAFHK, 20SBCE,20SBFH, 25SAFBCJ, 27SBCJ
11. 17SAFHD,18SAFBCE, 19SAFHK, 20SBCE,20SBFH, 25SAFBCJ, 27SBCJ
12. 18SAFBCE, 19SAFHK, 20SBCE,20SBFH, 25SAFBCJ, 27SBCJ
13. 19SAFHK, 20SBCE,20SBFH, 25SAFBCJ, 27SBCJ
14. 20SBCE, 20SAFHKJ,20SBFH, 25SAFBCJ, 26SAFHKT,27SBCJ
15. 20SBFH ,20SAFHKJ, 25SAFBCJ, 26SAFHKT,27SBCJ
16. 20SAFHKJ, 23SBFHD,25SAFBCJ, 25SBFHK, 26SAFHKT,27SBCJ
17. 23SBFHD, 24SAFHKJL,25SAFBCJ, 25SBFHK, 26SAFHKT,27SBCJ, 32SAFHKJC
18. 24SAFHKJL,25SAFBCJ, 25SBFHK, 26SAFHKT,27SBCJ, 32SAFHKJC
19. 25SAFBCJ, 25SBFHK, 26SAFHKT,27SBCJ, 29SAFHKJLT,32SAFHKJC
20. 25SBFHK, 26SAFBCJK,26SAFHKT,27SBCJ,
    29SAFBCJL,29SAFHKJLT,32SAFHKJC
21. 26SBFHKJ ,26SAFBCJK,26SAFHKT,27SBCJ,
    29SAFBCJL,29SAFHKJLT,32SAFHKJC, 32SBFHKT
22. 26SAFBCJK,26SAFHKT,27SBCJ, 29SAFBCJL,29SAFHKJLT,
    30SBFHKJL,32SAFHKJC, 32SBFHKT, 38SBFHKJC
23. 26SAFHKT,27SBCJ, 29SAFBCJL,29SAFHKJLT, 30SBFHKJL,
    31SAFBCJKH,32SAFHKJC, 32SBFHKT, 26SAFBCJKT, 38SBFHKJC

- Final Path: 26SAFHKT

- We don't have to expand any node after first T shown, because it has the lowest value path and there is no way to get value less than 26 from any other nodes.



Part C:

1. 10S
2. 8SA, 15SB
3. 15SB, 106SAF
4. 17SBC, 106SAF, 112SBF => Delete (112SBF) because there is 106SAF with lowest (f) to the same node (F)
5. 17SBC, 106SAF
6. 21SBCE, 30SABCJ, 106SAF => Delete (21SBCE) because there is no children assign to it.
7. 30SABCJ, 106SAF
8. 35SABCJL, 128SABCJK, 106SAF
9. 36SABCJLT, 128SABCJK, 106SAF => goal is reached

- Final Path: 36SABCJLT

- The path in A* algorithm is SABCJLT and the cost is 36 but in branch & bound algorithm (Part B) the path is SAFHKT and the cost is 26. This shows that the branch & bound generates a path

that is less than the path of A*. This has happened since the estimated distances in A* are over estimated which makes the algorithm give a non-optimal path.