AIFA TUTORIALS: August 22 2022

1. Consider the COIN SELECTION problem defined as follows: Given a set S of n possible coins of value s1, s2, …, respectively. Given a total value C, find the minimum number of coins whose total value is exactly C. Solve this problem using state space heuristic search as follows:

    a. Give a state space definition of problem with definition of state, state transformation rules, start and goal states and lower bound heuristic estimate. Give examples to explain your definition clearly.

    b. Show the execution of algorithm A* on the example of S = {1,8,6,7,4,2) and C = 13 clearly highlighting the state of OPEN and CLOSED lists along with g, h and f values and parent pointers at every stage.

2. For a minimization problem being solved using algorithm A* for state space graphs with positive edge costs and non-negative heuristic estimates - answer the following questions with True or False. Give a justification for each case either by a proof or a counter-example:
    a. The optimal cost solution may sometimes NOT be found when the heuristic estimates at every node are underestimates.
    b. The optimal cost solution is guaranteed NOT to be found when the heuristic estimates at only one non-goal node is an overestimate.
    c. The optimal cost solution is NOT guaranteed to be found when the heuristic estimates at only one non-goal node is an overestimate.