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Midterm exam

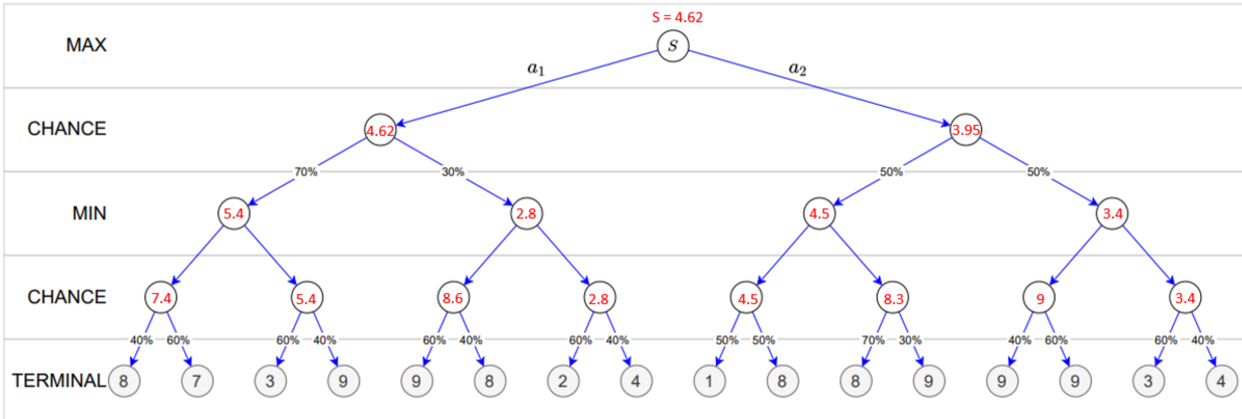
1. (a)

- Hill climbing cannot reach the optimal/best state (global maximum) if it enters any of the following regions:
    - Local maximum: At a local maximum all neighboring states have a value that is worse than the current state. Since hill-climbing uses a greedy approach, it will not move to the worse state and terminate itself. The process will end even though a better solution may exist.
    - Plateau: On the plateau, all neighbors have the same value. Hence, it is not possible to select the best direction.
    - Ridge: Any point on a ridge can look like a peak because movement in all possible directions is downward. Hence the algorithm stops when it reaches this state.

(b)

- No, they are prone to get stuck in local maxima, unless the whole search space is investigated.
- A simple algorithm will only ever move upwards; if you imagine you're in a mountain range, this will not get you very far, as you will need to go down before going up higher. You can see that going down a bit will have a net benefit, but the search algorithm will not be able to see that.
- Imagine you have ten people that you parachute over your mountain range, but they can only go upwards. Now you've got a better chance of finding a higher peak, but there's still no guarantee that any of them will reach the highest one.
- Stochastic hill climbing: No. It can be stuck at local maximum at completeness and this algorithm moves stochastic at optimality.
- First-choice hill climbing: No. It can be stuck at local maximum at completeness and this algorithm moves stochastic at optimality.
- Random-restart hill climbing:
    - Completeness: Yes. If infinite tries are allowed. If this algorithm has more and more time, it can generate a goal state as the initial state.
    - Optimality: Yes. If it can reach all the peaks.
- Local Beam Search:
    - Completeness: No. If this algorithm keeps tracking of just a few states and the heuristic function is bad, it can go the wrong way.
    - Optimality: No. If this algorithm keeps tracking of just a few states and an inaccurate heuristic function may cause the algorithm to miss expanding the shortest path.

2. (a)



(b)

- a1 is the best action for MAX.