

CS360 – Homework #8

Genetic Algorithms

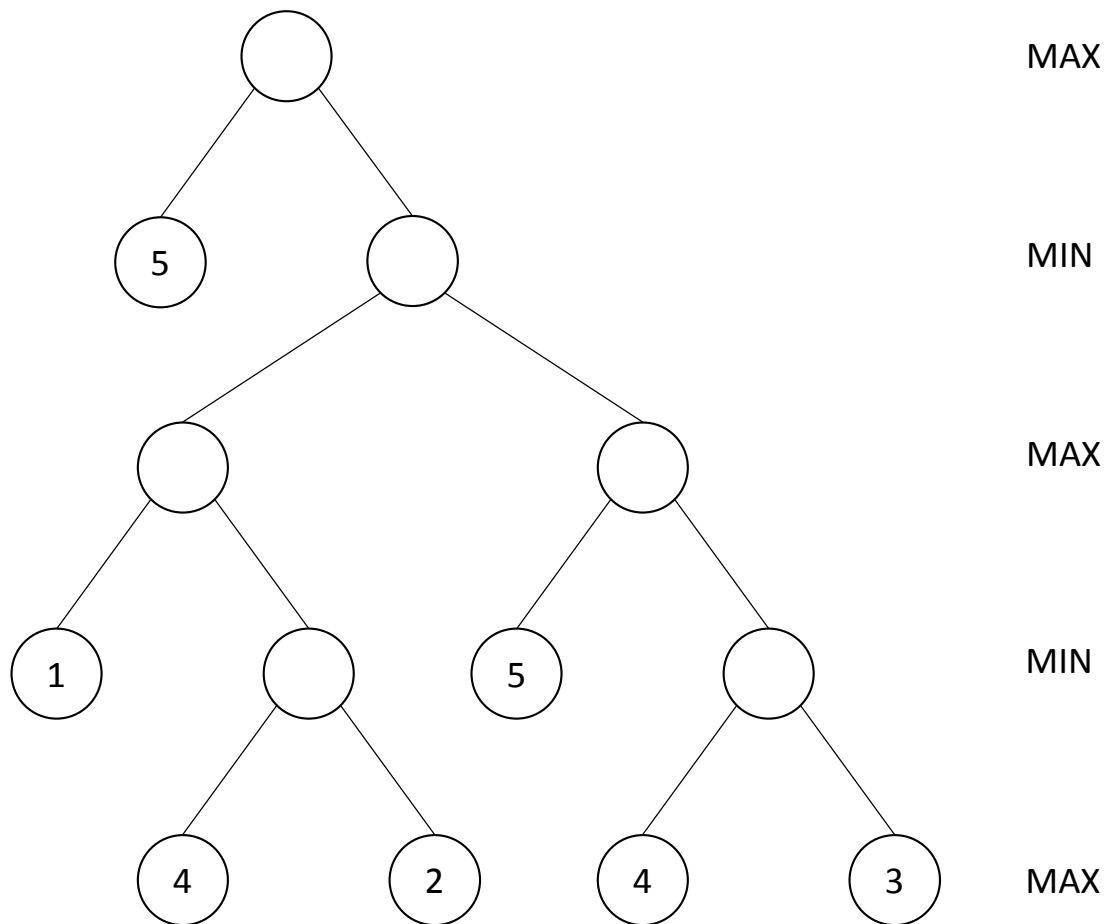
- 1) What are the advantages and disadvantages of carrying over the fittest two individuals to the next generation?
- 2) What are the advantages and disadvantages of running genetic algorithms with only mutations and no crossovers? How about only crossovers and no mutations?
- 3) How would you encode a state if you were using a genetic algorithm to solve the Traveling Salesman Problem but only wanted to use a straightforward crossover operation that switches prefixes of both parents' encodings (that is, we randomly pick a cutoff point in the encoding, use the encoding of the first parent up to that cutoff point, and use the encoding of the second parent after that cutoff point)?

SAT-based Planning

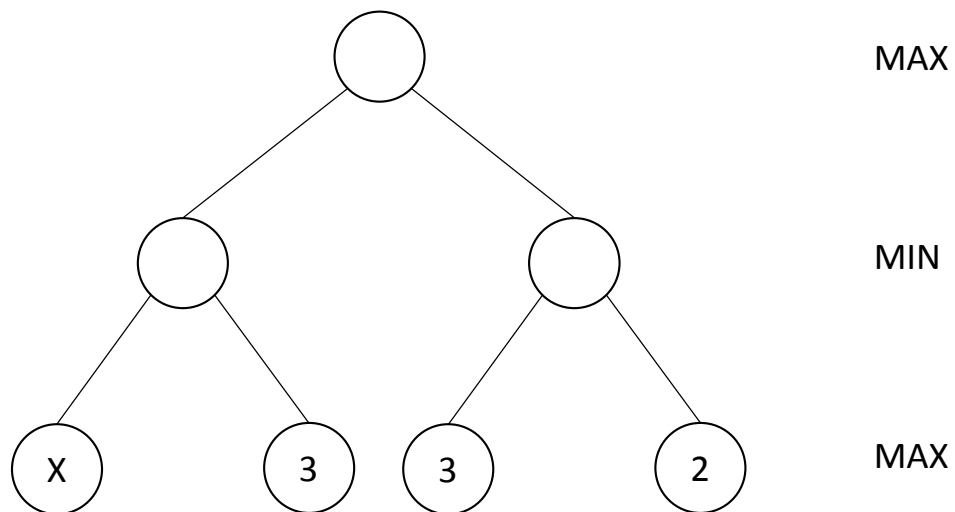
- 4) In class, we have seen how to formulate a planning problem as a SAT (= satisfiability) problem. The formulation allows the SAT solver to find plans that can execute actions in parallel, as long as all ways of sequentializing these parallel actions result in valid plans. How would you modify the formulation a) if we want to find plans that cannot execute actions in parallel? b) if we want to find plans that execute actions in parallel as long as there exists at least one way of sequentializing these parallel actions that results in a valid plan?

Game Tree Search

- 5) What is the minimax value of the root node for the game tree below? Cross out the node(s) whose value(s) the alpha-beta method never determines, assuming that it performs a depth-first search that always generates the leftmost child node first. Determine the alpha and beta values of the remaining node(s).



- 6) Assume that you are given a version of the alpha-beta method that is able to take advantage of the information that all node values are integers that are at least 1 and at most 6. Determine ALL values for X that require the algorithm to determine the values of ALL nodes of the following game tree, assuming that the alpha-beta method performs a depth-first search that always generates the leftmost child node first.



- 7) The minimax algorithm returns the best move for MAX under the assumption that MIN plays optimally. What happens if MIN plays suboptimally? Is it still a good idea to use the minimax algorithm?