Corey Kipp

Student ID: 57723335

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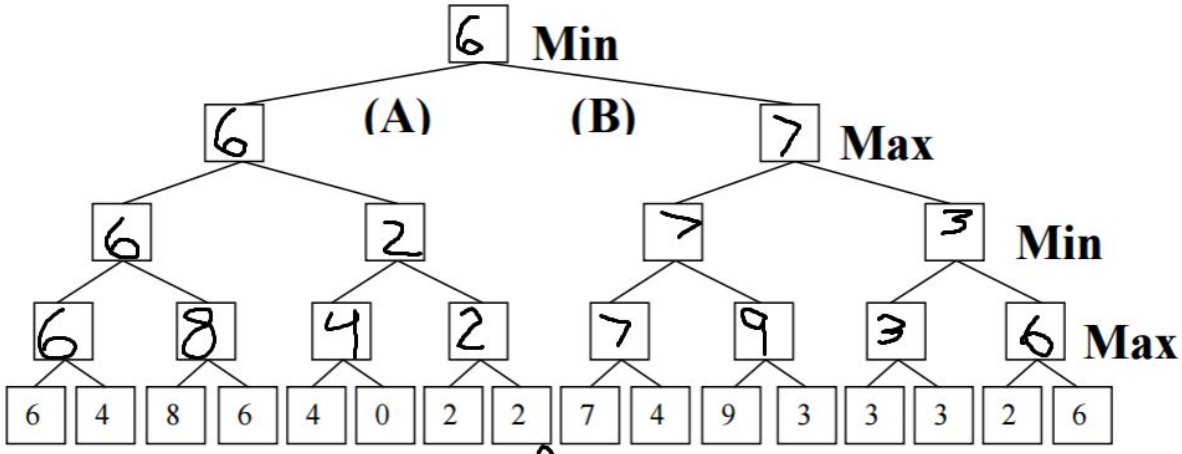
CS 171: Homework 3

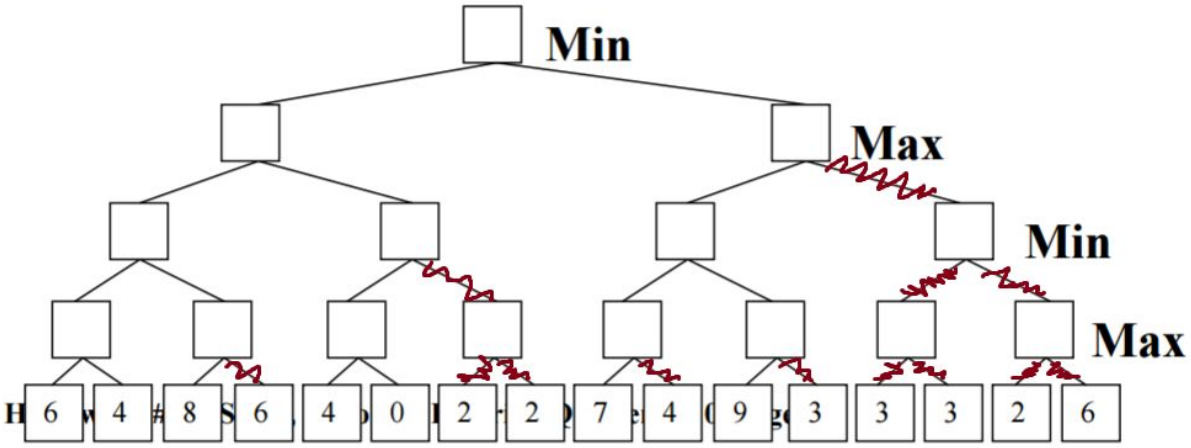
1. (25 pts total, 5 pts off each wrong answer, but not negative)MINI-MAX SEARCH IN GAME TREES.

1.a. The game tree below illustrates a position reached in the game. It is MIN's turn to move. Inside each leaf node is the estimated score of that resulting position returned by the heuristic static evaluator. FILL IN EACH BLANK SQUARE WITH THE PROPER VALUE ACCORDING TO MINI-MAX SEARCH.

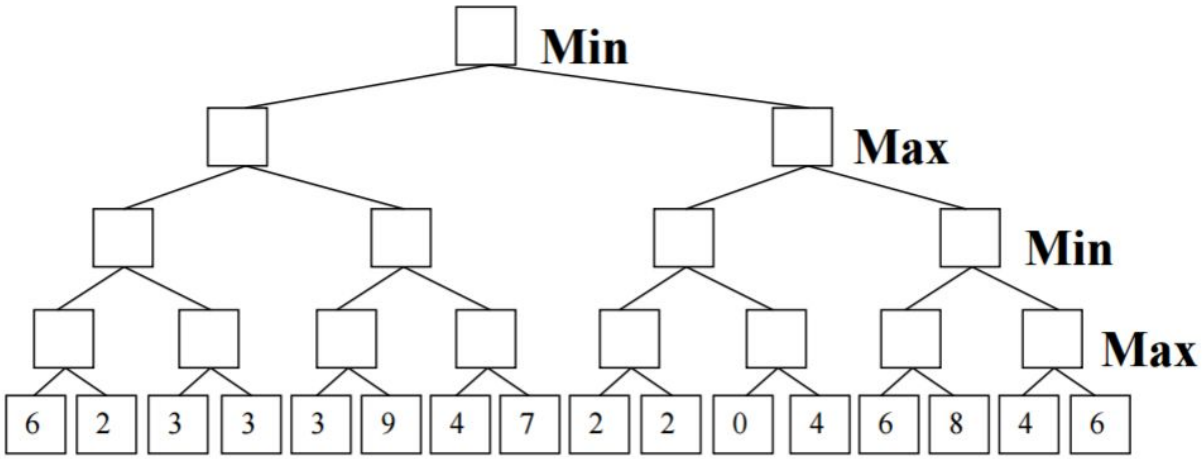


1.b. What is MIN's best move (write A or B) A

2. (25 pts max, -5 for each error, but not negative) ALPHA-BETA PRUNING.
This is the same tree and conditions as above. CROSS OUT EACH LEAF NODE THAT WILL NOT BE EXAMINED BECAUSE IT IS PRUNED BY ALPHA-BETA PRUNING.
You do not need to indicate the branch node values again.

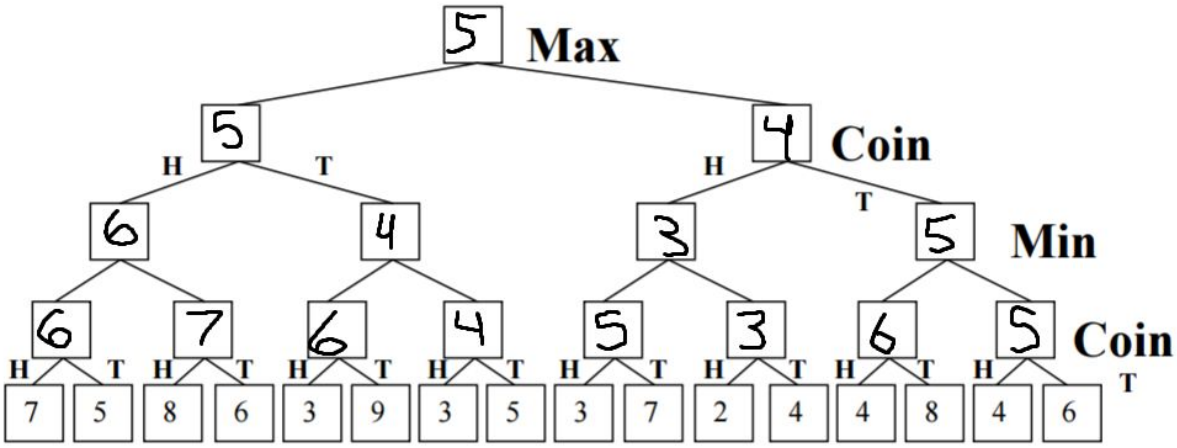


3. (25 pts max, -5 for each error, but not negative) ALPHA-BETA PRUNING.
This is the same conditions as above, except the tree is now the mirror image. CROSS OUT EACH LEAF NODE THAT WILL NOT BE EXAMINED BECAUSE IT IS PRUNED BY ALPHA-BETA PRUNING. You are not obliged to indicate the branch node values, though you will probably find it helpful to do so.



Nothing needs to get pruned so there is no change to the tree for problem 3.

4. (25 pts max, -5 for each error, but not negative) The following problem asks about MINIMAX search in game trees with chance (also called EXPECTI-MAX search). This is just like MINI-MAX, but there is a coin flip ("COIN") between each player's move. If the coin turns up heads, the path labeled "H" is taken; if it turns up tails, the path labeled "T" is taken. The value passed upward from the COIN level is the probabilistic weighted average (the expected value) of the two paths "H" and "T". Assume a fair coin, i.e., P(H)=P(T)=0.5. Please think carefully about how to pass values upwards from the COIN level before working this problem. The game tree below illustrates one position reached in the game. It is MAX's turn to move. Below the leaf nodes are the estimated score of each resulting position returned by the heuristic static evaluator. FILL IN ALL BRANCH NODES WITH THE VALUES PASSED UPWARDS FROM THE LEAF NODES.



5.

a. Rectilinear floorplanning-

The possible variables for the small rectangle are two sets of coordinates for the bottom right and upper left corners. The possible domain for each variable is this set of coordinates that will properly fit inside the large rectangle. As far as constraints go, there needs to be no overlapping rectangles so as soon as a smaller rectangle has a particular location no other rectangle can take on the same location.

b. Class scheduling-

The possible variables are teachers, subjects, classrooms, and time slots. The domains of the variables are the set of teachers and subjects in particular classrooms taking place during certain time slots. The constraints would be to not allow a teacher to be assigned to more than one class at a time.

c. Hamiltonian tour-

Possible variables for this scenario are to make every stop on the tour a unique variable. The possible domains would be set of cities that are connected to each other. There could be a constraint that says that the neighboring cities need to be connected in some way via road/freeway.

6.
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  T W O
+ T W O
_________
F O U R
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O + O = R + 10 * X1

X1 + W + W = U + 10 * X2

X2 + T + T = O + 10 * X3

X3 = F

Choose the X3 variable. Its domain is {0,1}. Choose the value 1 for X3. Choose the value 1 for F. Choose 0 for X2. Choose 0 for X1. Choose O to have value 4.

Choose the value 8 for R. Choose value 7 for T. Choose value 6 for U. Choose value 3 for W.

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  7 3 4
+ 7 3 4
_______
1 4 6 8
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7. You could change the revise function in the AC-3 function to return the number of remaining values of Xi that are consistent with each value of Xk. Therefore arc consistency can be enforced in total time $O(n^2d^2)$.