CS188 – Introduction to Artificial Intelligence

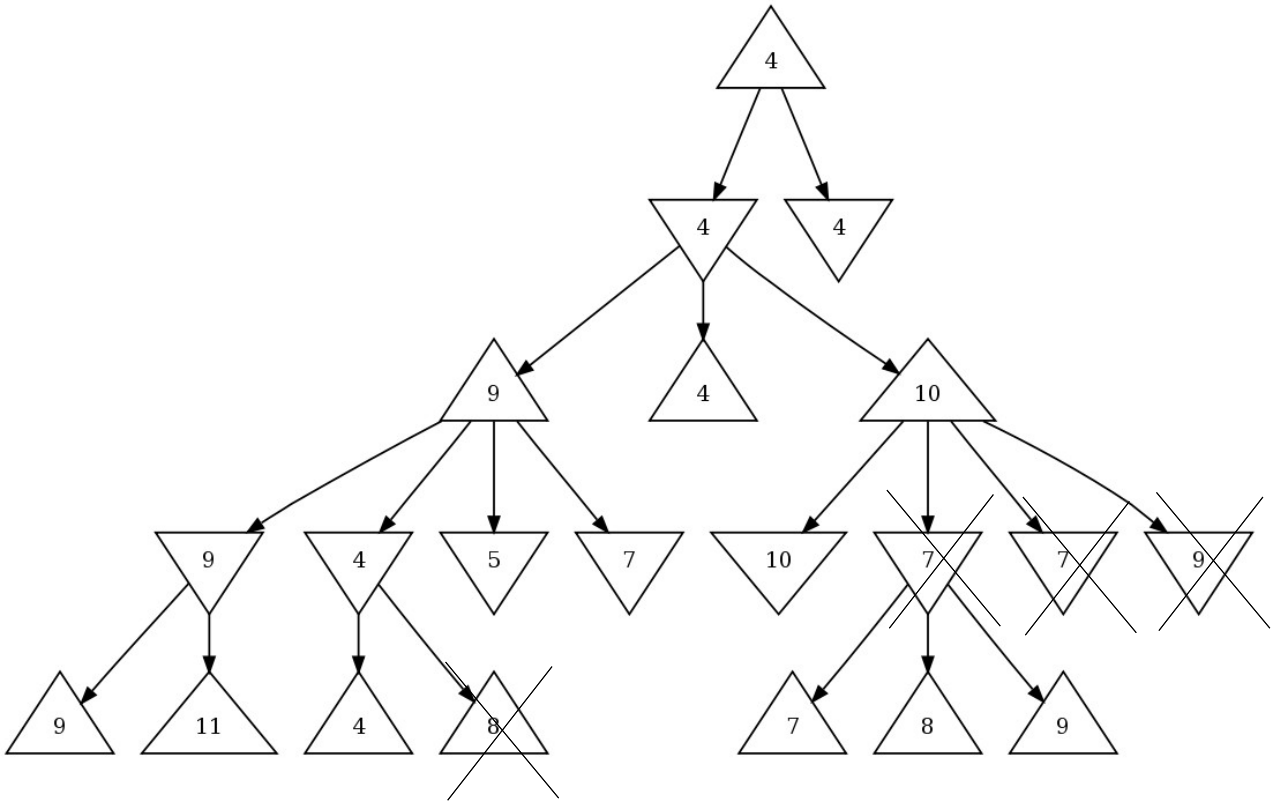
Section Handout #2, FORMULATING AND SOLVING CSPS

Klein, Fall 2007

Question 1 (Class)

Othello (slightly modified)

a. and b. See below



c. Propose an evaluation function for this game. Compare the results of your function with the values of the known board positions.

Up for discussion. I think the key thing to realize is that the number of white tiles on the board is *not* a good evaluation function. It seems like a good evaluation function should take into account who has the corners, and possibly also who has non-corner wall positions.Known board positions.

Question 2 (Class)

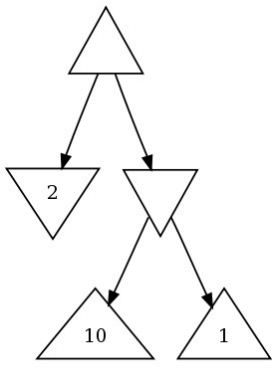
Suppose that you (MAX) are playing a game against your friend (MIN). Fortunately for you, your friend is very tired from working on Project #1, and as such, she is not playing optimally today.

a. *Suppose that you decide to use minimax decisions in playing against your friend. Can the fact that she is playing suboptimally hurt the performance of minimax? In other words, can the utility obtained by using minimax decisions against a suboptimal player be lower than that obtained against an optimal player? If so, provide a game tree that demonstrates this behaviour. If not, provide a proof.*

Proof: MIN playing suboptimally means, by definition, that MIN selects a move with minimax utility greater than or equal to the move predicted by minimax. Since MAX maxes over these decisions, then the minimax utility against a suboptimal is greater than or equal to the minimax utility against an optimal min.

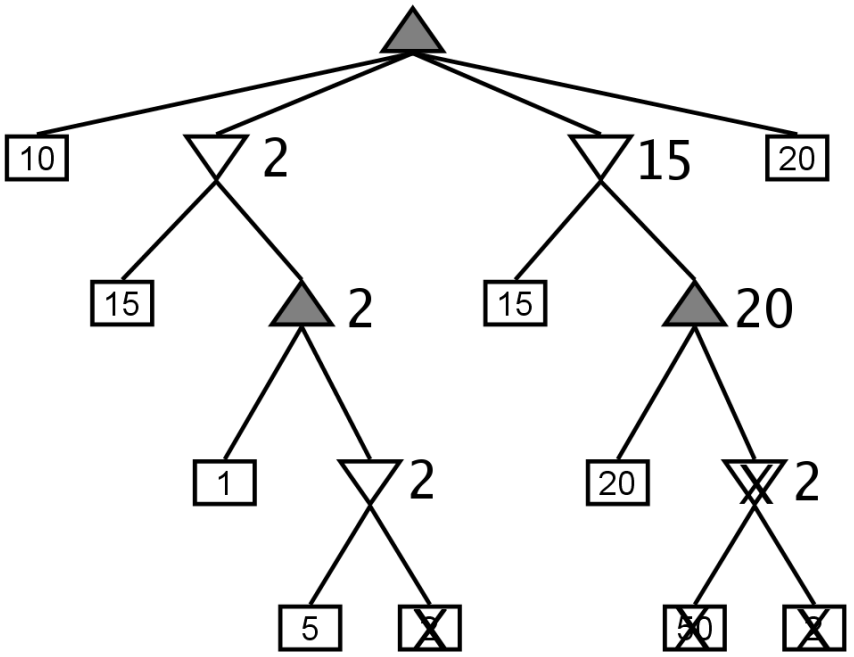
b. *Now suppose that you are aware when your friend will make a suboptimal move, and which move she will make. Can you take advantage of this? In other words, can a suboptimal strategy on your part achieve higher utility than a minimax strategy? If so, provide a game tree that demonstrates this behaviour. If not, provide a proof that this is not possible.*

Here, the optimal move for MAX is to select the move that leads to the leaf with utility 2. But if MAX knows MIN will play suboptimally, MAX can select the other option, which would get him utility 1 against an optimal MIN, but will get him utility 10 against a suboptimal MIN.z



Question 1 (Homework)

Consider the following minimax tree.



a. What is the minimax value for the root?

20

b. Draw an X through any nodes which will not be visited by alpha-beta pruning, assuming children are visited in left-to-right order.

See picture

c. Is there another ordering for the children of the root for which more pruning would result? If so, state the order.

Yes, if we order children 20, 15, 10 ,2

d. Propose a general, practical method for ordering children of nodes which will tend to increase the opportunities for pruning. You should be concise, but clearly state both what to do about min nodes and max nodes. Use evaluation function.