

CIS*3700 (Winter 2007) Assignment Two Solutions

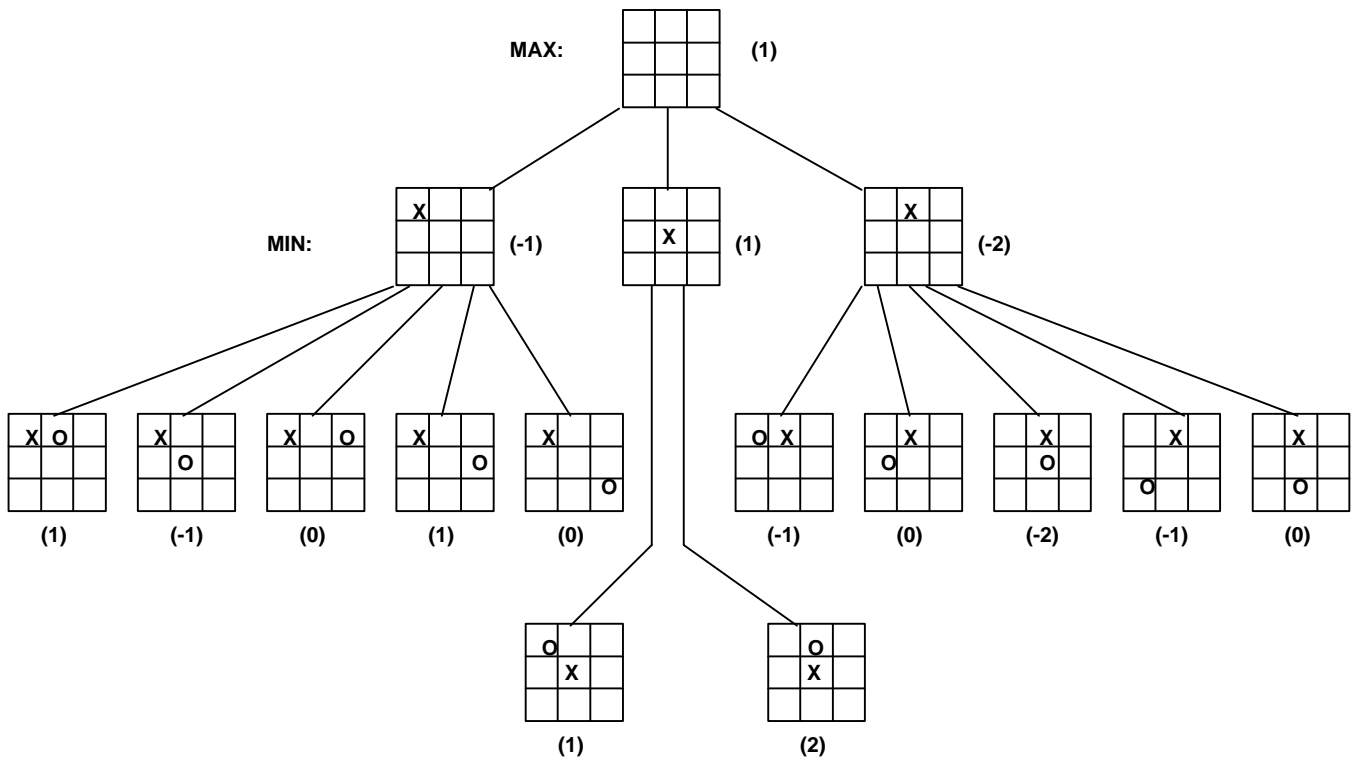
Instructor: F. Song

Part I: Paper-and-Pencil Questions (30 marks)

1. (a) A very rough approximation to the number of possible games for Tic-Tac-Toe is $9! = 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 362,880$. The reason is that initially we can put one marker in any of the nine positions, and then put another marker in one of the eight remaining positions, and so on.

A tighter approximation is to take the symmetry and rotation into consideration and expand the game tree for the first two levels. As illustrated in the following sub-questions, there are a total of 12 possible branches. So all together, we have roughly $12 \times 7! = 60,480$ possible games. Thus, the deeper we expand the game tree, the better the approximation.

- (b)-(d): Note that the evaluated and backed-up values are in parentheses and the best move is indicated by an arrowed link.



2. The results of alpha-beta pruning:

