Artificial Intelligence for Robotics Homework 10

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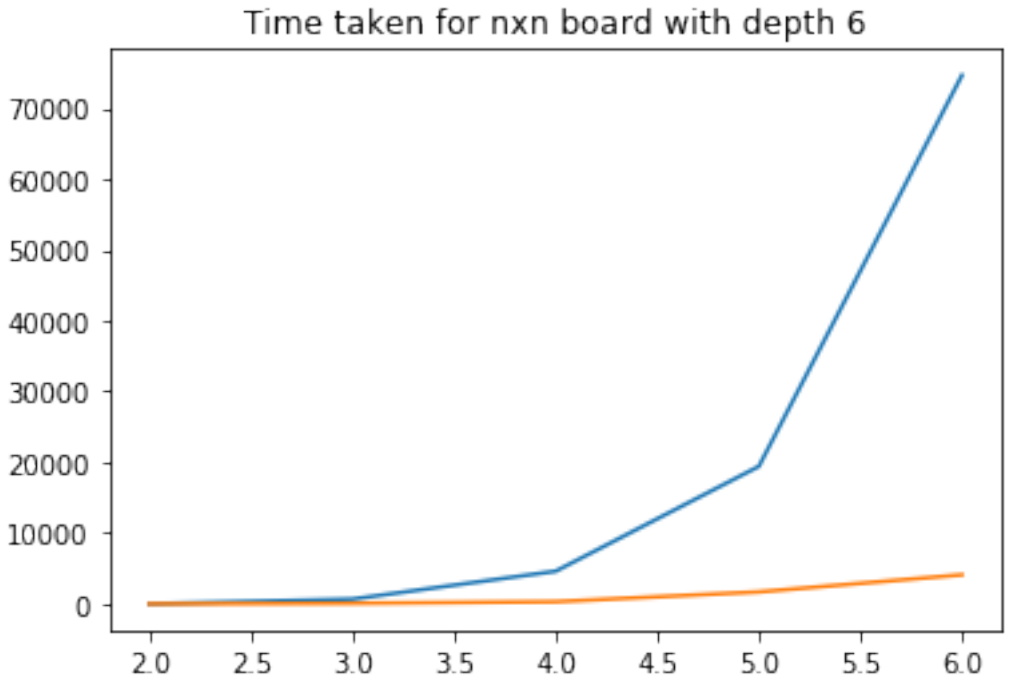
Regarding Minimax method to create a Create 4 AI, because minimax is an exhaustive search, the AI will traverse through all the nodes in the game tree up to the specified depth. For example, for a 6x6 board the number of nodes searched in each move will be 7, 43, 259, etc. for the depth of 1, 2, 3, etc. The number of searched nodes increases in tandem with the number of columns power the depth. About alpha-beta-pruning method, as suggested the number of nodes searched is reduced to about half that of minimax, sometimes less. For example, when minimax searched 1555 nodes, alpha-beta-pruning only searched around 350 nodes (6x6 board, depth 4). In the way the program is created, the search of both methods when there is an imminent winning moves is significant less than the previous turns.

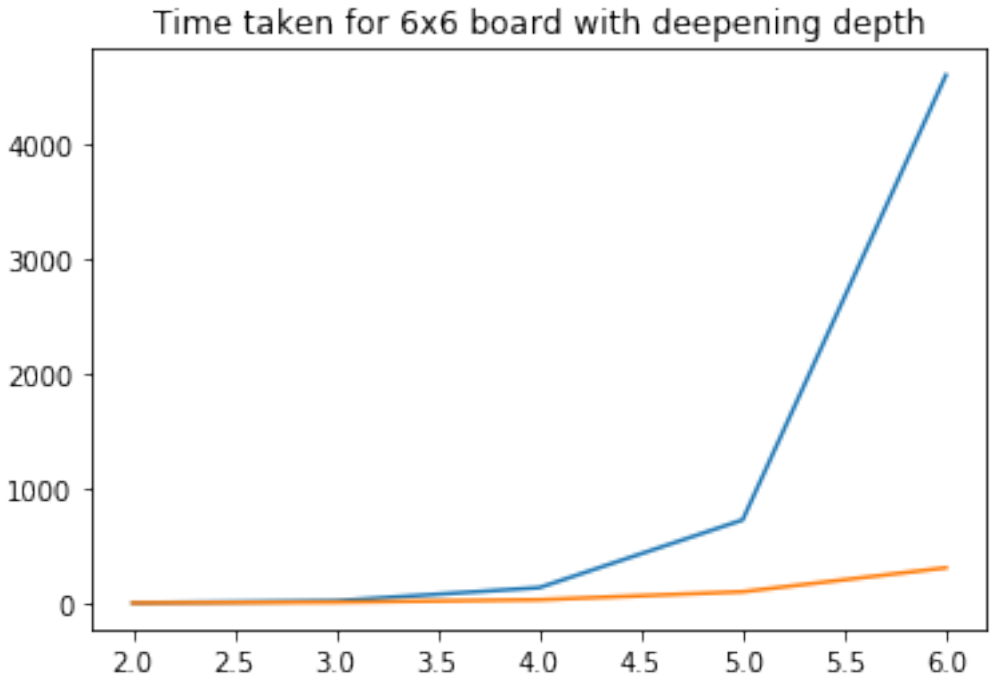
The figure and table shows the average time taken in ms with increasing board size (blue for minimax and red for alpha-beta-pruning). As can be seen the time grows exponentially but alpha-beta-pruning takes significantly less time.

n	Minimax	ABP
4	5.87	6
5	674	82
6	4610	310
7	19415	1690
8	74647	4108



The figure and table shows the average time taken with increasing depth. The trend is very similar.

d	Minimax	ABP
2	4.3	2.89
3	21.48	9.9
4	136.72	31
5	728	101
6	4610	310



References