Lab 2 Report

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Answer to question 6:

I have used following evaluation function for alpha-beta pruning:

$$State = 10*numWhite+20*numWhiteKing-10*numBlack-20*numBlackKing$$

Here, numWhite, numBlack is number of white game pieces and black game pieces. numWhiteKing and numBlackKing is the number of white kings and black kings respectively.

This function returns positive value if white dominates the current board state, otherwise it returns negative value. Kings are given twice the weight than normal pieces, because they can move either direction.

To evaluate the effect of allowing deeper search and utilizing this informed evaluation function, I have experimented the game at depth 1, 7, and 10. The observation is summarized into following table:

Depth	Avg time taken by Computer Player	Number of turns to end the game
1	~0.1ms	41
7	~25ms	51
10	~1551ms	77

Also, I have included the snapshot of end result for all three game below:

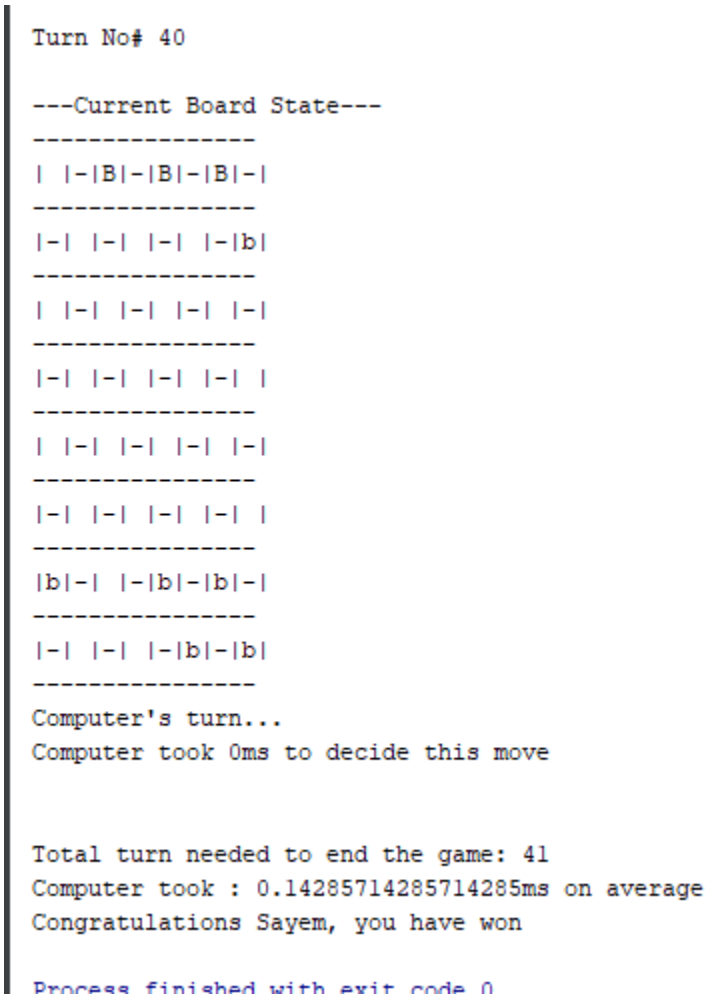

Figure A: Search with depth 1

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Turn No# 50

---Current Board State---
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| |-|B|-| |-|B|-|
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|-|b|-| |-| |-| |
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|b|-| |-| |-| |-|
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|-| |-| |-| |-| |
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|b|-| |-|b|-| |-|
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|-| |-| |-| |-|b|
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| |-| |-| |-|b|-|
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|-| |-| |-|b|-|b|
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Computer's turn...
Computer took 0ms to decide this move


Total turn needed to end the game: 51
Computer took : 25.115384615384617ms on average
Congratulations Sayem, you have won
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Figure B: Search with depth 7

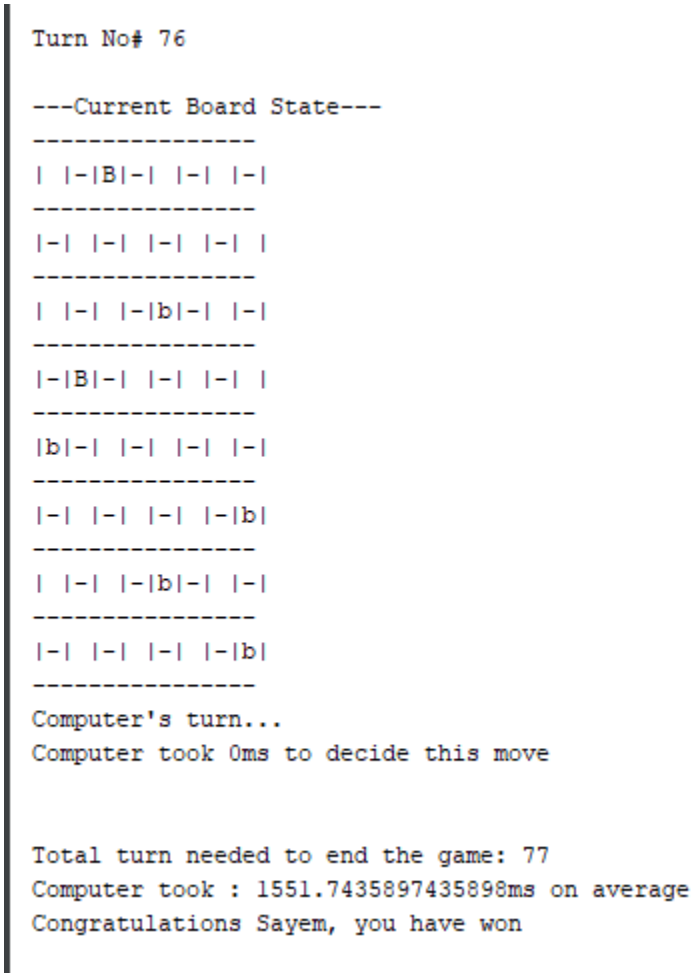

Figure C: Search with depth 10

With the increase in depth, we can see that computer takes more time to decide next move which is obvious as it needs to explore more branches of the tree. But it took increasingly more turns for me to win the game. I was able to beat computer in 41 turns in total (accumulating all turns made by human and computer together) when depth is 1 only. But it became a long game when computer was able to see more into the game with deeper search. For instance, it took 51 and 77 turns to beat the computer in depth 7 and 10 respectively.