CS6364 - Artificial Intelligence
Programming Project

Author: Veenu Bishnoi
Net ID : VXB200000

- ABOpening

Example 1:

Input : WWxxxxxWxWWBBBBWWxxxxx, Depth = 2
With Pruning Output :
Board Position: WWWxxxxWxWWxBBBWWxxxxx.
Positions evaluated by Static estimation: 24.
MINIMAX estimate: 4.
Without Pruning Result :
Board Position: WWWxxxxWxWWxBBBWWxxxxx.
Positions evaluated by Static estimation: 144.
MINIMAX estimate: 4.

Example 2:

Input : WWxxxxxWWWBBBxBxxBWBBB, Depth = 2
With Pruning Output :
Board Position: WWWxxxxWWWBBBxBxxBWBBB.
Positions evaluated by Static estimation: 14.
MINIMAX estimate: -2.
Without Pruning Result :
Board Position: WWWxxxxWWWBBBxBxxBWBBB.
Positions evaluated by Static estimation: 98.
MINIMAX estimate: -2.

- ABGame

Example 1:

Input : WWxxxxxWxWWBBBBWWxxxxx, Depth = 2
With Pruning Output :
Board Position: WxWxxxxWxWWBBBBWWxxxxx.
Positions evaluated by Static estimation: 24.
MINIMAX estimate: 2993.
Without Pruning Output:
Board Position: WxWxxxxWxWWBBBBWWxxxxx.
Positions evaluated by Static estimation: 62.
MINIMAX estimate: 2993.

Example 2:

Input : WWxxxxxWWWBBBxBxxBWBBB, Depth = 2
With Pruning Output :
Board Position: WxWxxxxWWWBBBxBxxBWBBB.
Positions evaluated by Static estimation: 31.
MINIMAX estimate: -2018.
Without Pruning Output:
Board Position: WxWxxxxWWWBBBxBxxBWBBB.
Positions evaluated by Static estimation: 69.
MINIMAX estimate: -2018.

- Improved Static Functions:

After thorougly examining the game and the board,
For MiniMaxOpeningImproved, by intuition I marked down the best possible moves to start off the game and added those positions in an array and I am checking if the piece is on one of those positions, if yes then I am rewarding the number of positions on that multiplied by 9 (could be a random number but put 9 because of number of pieces)

For the MiniMaxGameImproved, I am counting the number of possible mills according to a move and then using that value to reward the player.

The results are as below:

- MiniMaxOpeningImproved

Example 1:

Input : WWxxxxxWxWWBBBBWWxxxxx, Depth = 2
Output :
Board Position: WWWxxxxWxWWBBxBWWxxxxx.
Positions evaluated by Static estimation: 144.
MINIMAX estimate: 31.

Normal MiniMaxOpening Output :

Board Position: WWWxxxxWxWWxBBBWWxxxxx.
Positions evaluated by Static estimation: 144.
MINIMAX estimate: 4.

Example 2:

Input : WWxxxxxWWWWBBBBxxBWBxB, Depth = 2
Output :
Board Position: WWWxxxxWWWWBBxBxxBWBxB.
Positions evaluated by Static estimation: 444.
MINIMAX estimate: 9.

Normal MiniMaxOpening Output :

Board Position: WWWxxxxWWWWxBBBxxBWBxB.
Positions evaluated by Static estimation: 444.
MINIMAX estimate: 0.

In both the examples, we can see that the Black piece that was earlier removed was not a smart move as a mill could not be formed near it (or in next move) but after the improved, the Black piece that was removed was the one near will a mill could be formed in the future.

- MiniMaxGameImproved

Example 1:

Input : WWxxxxxWxWWBBBBWWxxxxx, Depth = 2
Output :
Board Position: WWxxxxxWxWWBBBBxWxWxxx.
Positions evaluated by Static estimation: 62.
MINIMAX estimate: 2994.

Normal MiniMaxGame Output :

Board Position: WxWxxxxWxWWBBBBWWxxxxx.
Positions evaluated by Static estimation: 62.
MINIMAX estimate: 2993.

Here we can see that the white piece was moved away from a mill and that is not a smart move. In the improved function another white piece is moved in the row to make a mill in the next move hence correctly implementing the intuition of future mills checking.

Example 2:

Input : WWxxWxxWWWWBBBBxWxWBWB, Depth = 2
Output :
Board Position: WWxxWxxWWWWxBBBxWWWBxB.
Positions evaluated by Static estimation: 155.
MINIMAX estimate: 6989.

Normal MiniMaxGame Output :

Board Position: WWxWxxxWWWWxBBBxWxWBWB.
Positions evaluated by Static estimation: 155.
MINIMAX estimate: 4995.

Here we see that there were two options to make white mills but the one that could have been stopped by black move in the next move was made in the improved function rather than the one made in the earlier version. This shows significant improvement and also that the improved function is working better than before.