Project Report
Artificial Intelligence
CS6364 – Summer 2020
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Comparing Mini Max and Alpha Beta Pruning

Opening

Input : xxxWxxxBxWxxxxxxBxxxxxW
　　　ply = 3

MinimaxOpeningOutput:
Board: xxxWxxxxxWxxxxxxBWxxxxW
Positions evaluated by static estimate: 6880
MINIMAX estimate: 3

ABOpeningOutput:
Board: xxxWxxxxxWxxxxxxBWxxxxW
Positions evaluated by static estimate: 1334
MINIMAX estimate: 3

Input : xxxWxxxBxWxxxxxxBxxxBWW
　　　ply = 2

MinimaxOpening Output:
Board: xxxWxxxxxWxxxxxxBWxxBWW
Positions evaluated by static estimate: 330
MINIMAX estimate: 2
ABOpeningOutput:
Board: xxxWxxxxxWxxxxxxBWxxBWW
Positions evaluated by static estimate: 114
MINIMAX estimate: 2

Input: xxxxxxxxxWxxxxxxBxxxxxx
　　　ply = 4

MiniMaxOpening Output:
Board: WxxxxxxxxWxxxxxxBxxxxxx
Positions evaluated by static estimate: 149216
MINIMAX estimate: 0

ABOpeningOutput:
Board: WxxxxxxxxWxxxxxxBxxxxxx
Positions evaluated by static estimate: 2748
MINIMAX estimate: 0

Game

Input: xxxxxxxxWWWxWWxBBBBxxxx
      ply = 3
MinimaxGameOutput:
Board: xxxxxxxxWWWxxWxBBBBWxxx
Positions evaluated by static estimate: 1199
MINIMAX estimate -4

ABGameOutput:
Board: xxxxxxxxWWWxxWxBBBBWxxx
Positions evaluated by static estimate: 331
MINIMAX estimate: -4

Input: WWWxBxxxxBxxWxxxxBBBxxx
      ply = 4
MinimaxGameOutput:
Board: xWWWBxxxxBxxWxxxxBBBxxx
Positions evaluated by static estimate: 14908
MINIMAX estimate -13

ABGameOutput:
Board: xWWWBxxxxBxxWxxxxBBBxxx
Positions evaluated by static estimate: 861
MINIMAX estimate: -13

Input: WxxWxxWxWxxxxxxWBxBBxBB
ply = 2

MinimaxGameOutput:
Board: WxxWxxWxxxxxxxxWBxBBBWBB
Positions evaluated by static estimate: 42
MINIMAX estimate -12

ABGameOutput:
Board: WxxWxxWxxxxxxxxWBxBBBWBB
Positions evaluated by static estimate: 28
MINIMAX estimate: -12

For all the inputs in Opening and Midgame,Endgame we can observe that Alpha Beta algorithm gives same results by evaluating lesser positions. So it saves time and space.

Explanation of Improved Static Estimated

The given static estimate gives very good output board so I think not too much change is needed. But I think one improvement could be for the static estimate should favour increase in white pieces. So I multiplied the factor of white count by 2. It gives same board results but higher MINIMAX estimate result.

Comparison for Improved and Given Static Estimate:

Opening

Input: xxxxxxxxxWxxxxxxBxxxxxB
ply = 3

MinimaxOpening Output:
Board: xxxxxxxxxWxxxxxxBxxWxxB
Positions evaluated by static estimate: 7356
MINIMAX estimate: 0

MinimaxOpeningImproved Output:

Board: xxxxxxxxxWxxxxxxBxxWxxB
Positions evaluated by static estimate: 7356
MINIMAX estimate: 3

Input: WWWxxxxxxxxxWxxxxBBBxBx
    ply = 4

MinimaxOpening Output:
Board: WWWWxxxxxxxxWxxxxBBBxBx
Positions evaluated by static estimate: 43856
MINIMAX estimate: -1

MinimaxOpeningImproved Output:

Board: WWWWxxxxxxxxWxxxxBBBxBx
Positions evaluated by static estimate: 43856
MINIMAX estimate: 4

Game

Input: WWWxBxxxxBxxWxxxxBBBxxx
    ply = 2

MinimaxGame Output:
Board: xWWWBxxxxBxxWxxxxBBBxxx
Positions evaluated by static estimate: 84
MINIMAX estimate -1018

MinimaxGameImproved Output:
Board: xWWWBxxxxBxxWxxxxBBBxxx
Positions evaluated by static estimate: 84
MINIMAX estimate 2982

Input: WxxWxxWxWxxxxxWxBxBBxBB
    ply = 3

MinimaxGame Output:
Board: WxxWxxWxWxxxxxWBxBBxBB
Positions evaluated by static estimate: 1163
MINIMAX estimate -12

MinimaxGameImproved Output:
Board: WxxWxxWxWxxxxxWBxBBxBB
Positions evaluated by static estimate: 1163
MINIMAX estimate 4988

MiniMaxOpeningBlack

Input: xxxWxxxBxWxxxxxxBxxxxxW
      ply: 3

Output:

Board: xxxxxxxBxWxBxxxxBxxxxxW
Positions evaluated by static estimate: 7050
MINIMAX estimate: 1

Input:xxxxxxxxxWxxxxxxBxxxxxB
      ply = 4

Output:
Board: xxBxxxxxxWxxxxxxBxxxxxB
Positions evaluated by static estimate: 129708
MINIMAX estimate: 2

MiniMaxGameBlack

Input: WxxWxxWxWxxxxxWxBxBBxBB
      ply = 4
Output:
Board: WxxWxxWxWxxxxxWxBBxBxBB
Positions evaluated by static estimate: 14210
MINIMAX estimate 988

Input: WxxxWWxxxBxxWxxxxBBBxxx
　　ply = 3
Output:
Board: WxxBWWxxxxxxWxxxxBBBxxx
Positions evaluated by static estimate: 2227
MINIMAX estimate -12