

**Part 1:**MinMaxOpening:

## Case1:

Input: xxxxxxxxxxxWxxWxxxxBxB  
Output: xxxxxxxxxxxWxxWxxxxBWB  
Depth: 5  
Positions Evaluated: 1219368  
Static Estimate: 1

## Case2:

Input: xxxxxxxxxxxWxWxxxBxB  
Output: xxxxxxxxxxxWWWxxxxxB  
Depth: 5  
Positions Evaluated: 1399404  
Static Estimate: 2

MinMaxMidgameEndgame:

## Case1:

Input: WBWxBxBWWWBxBxxBWBWxx  
Output: WBxWBxBWWWBxBxxBWBWxx  
Depth: 5  
Positions Evaluated: 13553  
Static Estimate: -6

## Case2:

Input: BBxWBxBWWBWxBxxWWBWxx  
Output: BBWxBxBWWBWxBxxWWxWxx  
Depth: 5  
Positions Evaluated: 45577  
Static Estimate: 1994

**Part 2:**ABOpening:

## Case1:

Input: xxxxxxxxxxxWxxWxxxxBxB

Output: xxxxxxxxxxxWxxWxxxxBWB

Depth: 5

Positions Evaluated: 133590 (90% savings over MinMaxOpening)

Static Estimate: 1

## Case2:

Input: xxxxxxxxxxxWxWxxxBxB

Output: xxxxxxxxxxxWWxxxxxB

Depth: 5

Positions Evaluated: 135597 (90% savings over MinMaxOpening)

Static Estimate: 2

ABMidgameEndgame:

## Case1:

Input: WBWxBxBWwwBxBxxBWBWxx

Output: WBxWBxBWwwBxBxxBWBWxx

Depth: 5

Positions Evaluated: 1374 (90% savings over MinMaxMidgameEndgame)

Static Estimate: -6

## Case2:

Input: BBxWBxBWwBwxBxxWWBWxx

Output: BBWxBxBWwBwxBxxWWxWxx

Depth: 5

Positions Evaluated: 1509 (95% savings over MinMaxMidgameEndgame)

Static Estimate: 1994

**Part 3:**MinMaxOpeningBlack:

## Case1:

Input: xxxxxxxxxxxBxxBxxxxWxW  
Output: xxxxxxxxxxxBxxBxxxxWBW  
Depth: 5  
Positions Evaluated: 1219368  
Static Estimate: 1

## Case2:

Input: xxxxxxxxxxxxBxBxxxWxW  
Output: xxxxxxxxxxxBBBxxxxxW  
Depth: 5  
Positions Evaluated: 1399404  
Static Estimate: 2

MinMaxMidgameEndgameBlack:

## Case1:

Input: BWBxWxWBBBWxWxxWBWBxx  
Output: BWxBWxWBBBWxWxxWBWBxx  
Depth: 5  
Positions Evaluated: 13553  
Static Estimate: -6

## Case2:

Input: WWxBWxWBBWBxWxxBBWBxx  
Output: WWBxWxWBBWBxWxxBBxBxx  
Depth: 5  
Positions Evaluated: 45577  
Static Estimate: 1994

## Part 4:

### MinMaxOpeningImproved:

#### Case1:

Input: BxWBxBWxBxxxxBBxWxxBW

Improved Static Output: BxWBxBWxBWxxxBBxWxxBW

Normal Static Output: BxWBxBWxBxxxWBBxWxxBW

Depth: 5

Positions Evaluated: 248720

Static Estimate: 296

With Normal Static:

```
Positions Evaluated: 248720
Static Estimate:-3
BxWBxBWxBxxxxBBxWxxBW
x-----B-----W
|         |         |
| x-----W-----x |
|         |         | |
| | W--B--B |         |
|         |         |
W--x--B | x--x--x
|         |         |
|         | x-----B |
|         | /         |
| W-----B |         |
| /         |         |
B-----x
```

With Improved Static:

```
Positions Evaluated: 248720
Static Estimate:296
BxWBxBWxBWxxxBBxWxxBW
x-----B-----W
|         |         |
| x-----W-----x |
|         |         | |
| | x--B--B |         |
|         |         |
W--x--B | W--x--x
|         |         |
|         | x-----B |
|         | /         |
| W-----B |         |
| /         |         |
B-----x
```

Normal static output, in this example could not close the mill for a potential mill.

Normal static function is at times missing the closing of the black mill, as it only directly compares (White-Black) without making sense of where the pieces are.

But with improvised static, we have successfully stopped a Black mill from forming, by assigning credits for stopping a mill from closing and for finding out potential mills which can be formed using millCount(), potentialMill(), potentialCloseMill() functions.

MinMaxMidgameEndgameImproved:

Case1:

Input: WBxBxWxWWWBBxxxxxxxxxB

Improved Static Output: xBxxxWWWWBBxxxxxxxxxB

Normal Static Output: WBxBWxxWWWBBxxxxxxxxxB

Depth: 5

Positions Evaluated: 23860

Static Estimate: 1960

With Normal Static:

```

WBxBWxxWWWBBxxxxxxxxxB
x-----x-----B
|         |         |
| x-----x-----x |
|         |         | |
| | x--x--x |         |
|         |         |
| x--W--W   W--B--B |
|         |         | |
| | W-----x |         |
| | /         |         |
| x-----B   |         |
| /         |         |
W-----B
Positons: 23860
Res. Estimate: 994

```

With Improved Static:

```

xBxxxWWWWBBxxxxxxxxxB
x-----x-----B
|         |         |
| x-----x-----x |
|         |         | |
| | x--x--x |         |
|         |         |
| W--W--W   W--B--B |
|         |         | |
| | x-----W |         |
| | /         |         |
| x-----x   |         |
| /         |         |
x-----B
Positons: 23860
Res. Estimate: 1960

```

In the above example, we can see that the Normal MiniMax Midgame Endgame is not closing the mill, instead it is moving the 'W' piece from '5' to '4' location, where a mill can be formed but it needs another move to form the mill. But it is not evaluating the case, where there are already 2 W's waiting to form a mill.

Now with the new improved static, we are closing the mill and removing a black piece.