**Moses Ike**

**CS 6364**

**Assignment 2**

For practical purposes, the maximum search depth my program was able to play normally was search depth of 6, which averages about 3 to 17 seconds between plays.

A search depth of 7 averages about 70 to 190 seconds between plays.

A search depth of 8 averages about 5 - 7 minutes between plays, etc.

The above evaluation takes MOVE ORDERING into consideration.

My Implementation of Move Ordering was basically sorting the first 5 best moves and making them the first 5 children of the parent, so as to enable the fast pruning of the worst children.

Without MOVE ORDERING, a search depth of 4 takes about 2 seconds, and a search depth of 5 takes about 10 seconds

Below is a tabular depiction of how my program reacted to **Move Ordering** and increasing **search depth** with regards to the execution/computational time in seconds between plays

|  |  |  |
| --- | --- | --- |
| **SEARCH DEPTH** | **Average Time (seconds) with Move Ordering** | **Average Time (seconds) without Move Ordering** |
| 2 | 0.03 | 0.05 |
| 3 | 0.14 | 0.2 |
| 4 | 0.7 | 2 |
| 5 | 3.46 | 10 |
| 6 | 13.5 | 80 |
| 7 | 180 | 350 |
| 8 | 400 | Too long, Not practical |

My evaluation function was a rating I got from

http://chessprogramming.wikispaces.com/Simplified+evaluation+function

Improving evaluation function helped to reduce the time I took to play, because it could prune better with good evaluation function.

I employed the below **evaluation functions**/engine parameters

Rate\_Attack – This evaluation function puts more weight on moves without a potential next opponent move that will have its king under ‘check’. This checks if an opponent’s next move might put my king under attack. So the AI does not choose that move under evaluation, unless it is the only move.

Rate\_Material – This assigns value to each piece of the game in order to decide which one can be sacrificed against the other.

Rate\_Moveability – This checks if the king has room to move around or not following a move. This rating helps to prefer moves where the King has more room to move without being attacked.

Rate\_Positional - This looks up positional preference based on a rating I got from chess wiki, and selects the best score rating of a position when several moves have the same heuristic.