Mohdi Habibi
Artificial Intelligence Nano Degree
March 10, 2018
Summary of Game Tree Searching by Min / Max Approximation

In this paper, an iterative method for min/max game trees with applying mean valued operator for approximating max and min was proposed. “A method is needed which will always expand the node that is expected to have the largest effect on the value which this paper suggest such method”. Even though Alpha Beta pruning and its successors have been played a crucial role in reducing the computational steps but there is still room for improvement and more technics needed.

Using generalized mean in theory is picking the best move out of all moves that have the biggest effect down the decision tree. This was also possible using penalty based iterative search method that was described in this paper. The idea behind this method is to expand that tip node that have least penalty. Using this method each edge had a weight attached to it to penalize bad moves more than good moves. When the algorithm terminates in the final step, there is a path from the root to the leaf that represent the best expandable tip. Then searching by min/max approximation heuristic function was introduced which is a special case of penalty based search method.

After implementation, some experimental results were discussed which showed that the searching by min/max approximation method produced better results than Minmax search with alpha-beta pruning for the same number move operator. However its showed that Minmax search with alpha-beta pruning had better results when the CPU time was in consideration rather than the move operator. In their experiment, Connect-Four game was used with two way resource

bounds which were elapsed CPU time (calculated per second) and call to move operator (measured 1000 of calls).

In Minmax search with alpha-beta pruning no information is carried from one search to the next search. This is a big issue with this method which is why the Minmax approximation method performed better when the move was in consideration. For each starting position two games were played with every search have the opportunity to start first. The Minmax search with alpha beta pruning called the moved operator 3500 per second but the Minmax heuristic search called approximately 800 times.