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Research review: Game Tree Searching by Min/Max Approximation*

Traditionally, minimax search strategies with alpha-beta pruning have been used in Game Playing area. This article presents the method of selecting the next node to expand in min/max game tree, which use generalized mean-value operators to approximate the best leaf the root node depend on. They also show experiments with two conditions in game playing. One is time constraint. Second is limitation of number of moves for each player. In case of number of moves. min/max approximation outperform minimax search with alpha-beta pruning. Whereas, In case of time bound. minimax search strategies with alpha-beta pruning perform better, since the min/max approximate requires more computation time in computing generalized mean-value.

min/max approximation strategy utilize the penalty-based iterative search method. It assign a weight to each edge between parent and child nodes. The low weight score is assigned to selected edge, whereas the higher score for unselected edges. The lowest sum from bottom node to root is selected as a tip node to expand.

The challenge for implementing searching by Min/Max approximation is computationally expensive comparable to traditional min/max calculation. The experiment is to compare between penalty-based and minimax with alpha-beta pruning strategies. It take Connect-Four game as well as resource bounds (time constraints and moves) as rule scenarios in the game. As a result, In case of time limitation. the latter strategy outperform the former due to computation overhead. In move-based rule, the penalty-based is better than alpha-beta pruning strategies, since each move take more information into account.

In conclusion, game tree searching by min/max approximation which utilized generalized mean-value functions outplay alpha-beta pruning strategies when the game scenario limited on a number of move.