Review of Game Tree Searching by Min/Max Approximation

This paper introduces a new technique for searching in game trees, based on the idea of approximating the min and max operators with generalized mean-value operators.

The paper introduces the technique mainly by explaining the ideas of min/max(alpha-beta) search algorithm and penalty-based schemes and compares their advantages and disadvantages.

The min/max search assumes that each player chooses the best available move that forms a search tree. In most cases, there is no enough time or resource to search the whole tree and so that heuristic approximations are needed.

A heuristic method is usually based on a " static evaluation function" that gives an estimate of the backed-up value for a nonterminal node. This estimate is based on " static" features of the current configuration that can be evaluated without further look-ahead.

A popular approach to handling very large game trees is to select a suitable depth bound d, to estimate the values of nodes at depth d using the static evaluator, and then to compute the backed-up minimax value from the nodes at depth d using alpha-beta pruning.

Based on time usage alone, alpha-beta is superior to the min/max approximation approach while based on move-based resource limits, min/max approximation is definitely superior.

The penalty-based schemes spend a lot of time traversing back and forth between the root and the leaves of the tree, whereas a depth-first approach will spend most of its time near the leaves