Research review

Game Tree Searching by Min / Max Approximation

paper's goals:

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.

Techniques such as alpha-beta pruning and its successors [6, 2] have been essential in reducing the computational burden of exploring a game tree. Still, new techniques are needed. Nau et al. [10], after much expermentation with existing methods, assert that "A method is needed which will always expand the node that is expected to have the largest effect on the value." This paper suggests such a method.

The key idea is to approximate the "min" and "max" operators with generalized mean-value operators. These are good approximations to the rain/max operators, but have continuous derivatives with respect to all arguments. This allows us to define the "expandable tip upon whose value the backed-up value at the root most heavily depends" in a nontrivial manner. This tip is the next one to be expanded, using our heuristic.

paper's results:

In order to compare the min/max approximation method with the minimax with alpha-beta pruning method, the authors of the paper let these two methods compete with each other.

There are two resource bound type: time bound per turn and moves count bound in total.

In short, there are 490 games were played for each resource bound, 980 games were played in total.

With the time usage bound, the alpha-beta seems to work better that the min/max approximation. But under move-based resource limits, min/max approximation is denitely superior. Such a result gives us a sight that the min/max approximation is good at reducing the number of calls to the move operator, in different purposed cases, the min/max approach can work better. Overall, the results are encouraging.