MATHEMATISCHE METHODEN DER KÜNSTLICHEN INTELLIGENZ: ZUR QUIESCENCE-SUCHE IN SPIELBÄUMEN

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Diplom thesis (in German), 199, 124 pages
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(Reviewed by Ingo Althöfer)

One key feature of a typical computer-chess program is the design and extent of its quiescence search. In a simplified model the game-tree-search algorithm is characterized by only two parameters t_1 and t_2. t_1 is the depth of the brute-force search, and t_2 is the maximal depth of the subsequent quiescence search. We define an algorithm $B = (t_1, t_2)$ to be *better* than another algorithm $C = (t_1', t_2')$, if the following two conditions hold:

- the average search time of B is smaller than that of C, and
- B has smaller probability than C to return a wrong value for the root.

An algorithm A is called *good*, if no other algorithm is better than A.

Based on extensions of Schrüfer's models of random game trees, Perrey has carried out a mathematical analysis of the algorithms (t_1, t_2). His main result is that in many cases of Schrüfer's models there exists a global upper bound T_2, such that in any *good* algorithm (t_1, t_2) the maximal depth t_2 of the quiescence search is not larger than T_2, independently of the brute-force depth t_1. This coincides well with experiences in computer-chess practice.

The proofs in this thesis are rather sophisticated. Some of the results are proved for models with erroneous heuristic leaf values, others for models in which heuristic information at a leaf is either correct or not available. These last models with "partial non-knowledge" instead of "partially wrong knowledge" turned out to be a very helpful tool in the theoretical analysis of game-tree-search algorithms.

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