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 Schröfer'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 Schröfer'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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