

In both cases (depth 4, breadth 40 and depth 7, breadth 10) PSSS* performed superior to "Parallel staged SSS", as proposed by Campbell (1981). In comparison to PVS PSSS* behaved better for depth 4 and worse for depth 7.

From the viewpoint of computer-chess practice it is regrettable that Kraas did not implement PSSS* in a tournament computer-chess program. So we can not judge how well it would compete with other chess tree-search algorithms. However, Hans-Joachim Kraas is aware of this point. In the last paragraph of his thesis he states self-critically (roughly translated):

"All these considerations let me expect that the speedup of PSSS* will decrease (considerably) if instead of 'theoretical game trees' real chess trees, as generated by chess computers, are to be analysed. Investigations for the comparable PVS-algorithm underline this assessment: Only for small numbers of processors PVS achieves a satisfactory speedup. It will cost further efforts – for PVS as well as for PSSS* – to improve the performance of parallel systems in the analysis of chess trees."

The thesis of Kraas is well organized and easy to read (in German). The ideas and also the technical parts are explained in detail. Previous work of other scientists is mentioned adequately and – as far as I can judge this – without gaps. I have profited from reading the thesis.

REFERENCES

- Campbell, M.S. (1981). *Algorithms for the Parallel Search of Game Trees*. Technical Report TR 81-8, Department of Computing Science, University of Alberta, Edmonton, Canada.
- Kumar, V. and Kanal, L.N. (1984). Parallel Branch-and-Bound Formulations for AND/OR Tree Search. *IEEE PAMI*, Vol. 6, pp. 768-778.
- Roizen, I. and Pearl, J. (1983). A Minimax Algorithm Better than Alpha-Beta? Yes and No. *Artificial Intelligence*, Vol. 21, pp. 199-220.
- Stockman, G.C. (1979). A Minimax Algorithm Better than Alpha-Beta? *Artificial Intelligence*, Vol. 12, pp. 179-196.
- Vornberger, O. and Monien, B. (1987). *Parallel Alpha-Beta versus Parallel SSS**. IFIP Conference on Distributed Processing, North Holland, pp. 613-625.

LITERATURE RECEIVED

HOW COMPUTERS PLAY CHESS

David Levy
Monty Newborn

Computer Science Press, W.H. Freeman and Company, Oxford, England
256 pp., 101 ill., ISBN 0-7167-8239-1, 0-7167-8121-2
price: Board £ 16.95, Paper £ 7.95

We quote from the back cover:

" In international circles, it is accepted that Gary Kasparov may well be the last human World Chess Champion. Today computer programs are becoming more and more sophisticated, and they now pose a new challenge to chess masters and grandmasters worldwide."

The book assesses the current state of the art and offers expert insight into just when computers will beat the world's best humans.

A review will be published in a forthcoming issue.