Chess Bibliography: Chess skill in man and machine

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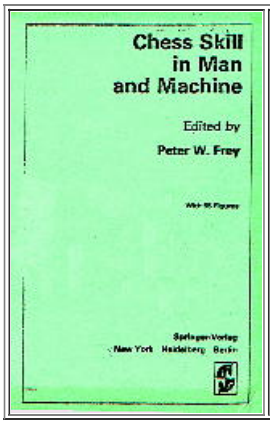
Chess skill in man and machine



Title: Chess skill in man and machine
Author: Various. Edited by Peter W. Frey
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Abstract: This book provides a multidisciplinar view of all the complexities that the game of chess presents for both humans and machines. Various authors discuss historical, technical, and even the psychological aspects of chess skills. Several chess programs are examined.

Review:

This book is one of the pioneer works on the subject, as its 1977 publication date shows clearly. Despite its age, it remains as one of the most fascinating introductions to computer chess, and most of the ideas it presents remain still valid. Its multiple authors cover all aspects of chess playing, from technical expositions of some of the best programs of that time, to physiological and psychological considerations.

In **A brief history of computer chess tournaments: 1970-1975**, we are introduced to the atmosphere of the early tournaments, the diverse friendly matches between US and USSR chess computers, and several US and international championships, with many of the most interesting games fully commented and analyzed.

The next chapter, **Human chess skill** focuses in how does a human player select a move in the game of chess, the role of perception, the search mechanism, visualization, as well as other tipically human aspects such as motivation. Several tests applied to human players ranging from novices to grandmasters are presented and discussed.

After that introspective look at we humans, and our not-so-well understood thought processes, **An introduction to computer chess** begin to shift the focus to the computer, including such basic topics as how to represent the chess board, the moves, the status, how to generate the legal moves, search strategies, position evaluation, so that by the end of the chapter, all necessary foundations are well stablished for the rest of the book.

With Chapter 4, **Chess 4.5 - The Northwestern University chess progam** we begin the most technical part of the book. Here, authors David J. Slate and Lawrence R. Atkin show us with great style the internal workings of their famous chess program, many times world champion, and the one mostly used against IM David Levy for the famous Levy's bet. The details are sufficient to help a lot anyone contemplating the possibility of writing his/her own chess program. Modestly, the authors assume the limitations of their creature, and offer good advice on how it can be incrementally improved.

Chapter 5, **PEASANT: An endgame program for kings and pawns** provides yet another close scrutiny of a chess program, though this time with the important novelty that it is an specialized chess program, one specifically designed for a certain class of very frequent endgames. Monroe Newborn, its author, fully describes the inner workings, and most importantly, produces a set of tests for his program, with commented results. Actually, it was this very chapter that inspired me to create the WWW page you are in right now !

The next chapter, **Plans, goals, and search strategies for the selection of a move in chess** tries to center on how do human players select good chess moves when having just a few seconds to consider the position (i.e: blitz chess), and then introduces a chess program specifically designed to play speed chess, without recourse to tree searching. This quite intriguing approach more closely mimics the human behaviour, to the point of even producing the same kind of erroneous moves a human player would play at blitz speeds.

As an alternative to the standard alpha-beta search techniques, Larry R. Harris introduces us to **The heuristic search: An alternative to the alpha-beta minimax procedure**, where it presents what it considers important pitfalls of that search strategy, fully commented with specific examples, and proposes a new paradigm that addresses each and everyone of them from the start, thus truly directing the search in an intelligent way, as opposed to brute force, so that each aspect of the position can be ascertained as soon as possible, before going to other places in the search tree.

After these mostly technical chapters, in **Man and machine: Chess achievements and chess thinking**, professor Eliot Hearst, a member of the Psychology Department at Indiana University, evaluates the present status of computer chess from the perspective of someone very knowledgeable with the game, as he is a rather skilled chess player and columnist. He includes many good practical examples, to make his points even clearer.

The book closes with a number of games played by Chess 4.5 and 4.6 in competitions during 1976, 1977, and 1978, that show a remarkable improvement on the rather pessimistic forecastings most experts agreed upon at that time.

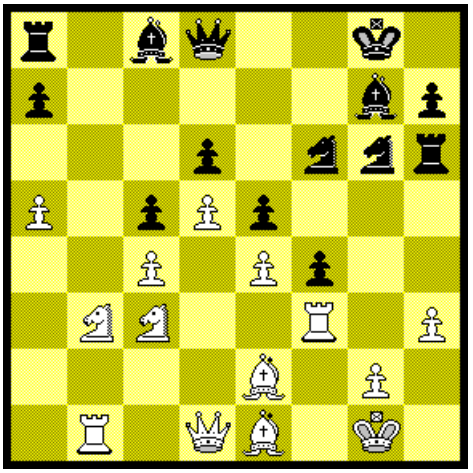
As a final comment, after reading this book one was more or less convinced that the problem of good chess playing was incredibly difficult and the prospect of achieving grandmaster strenght was pure science-fiction. However, 20 years have passed by, and such advances as processors thousand of times faster (if not millions), multi-megabyte memory for transposition tables, and multi-gigabyte disks for opening books and endgame databases, have provided the necessary hardware for the development of today's programs, than can beat grandmasters almost routinely and even World Champions from time to time. It would have seen almost impossible to this book's several authors.

Here is a sample position from this book: quoted from pag.131, **Plans, goals, and search strategies for the selection of a move in chess**:

... In the spring of 1970 at the Adriatic resort town of Herzeg-Novi, the strongest speed tournament of all time was held ... ***Bobby Fischer*** *won the double round robin with the amazing score of 19 points (out of a possible 22). The time limite for each game was 5 minutes, and it was reported that Fischer spent only half his allotted time on the average ...*

... In this position Black (Fischer) played ***24. ... Nh8****. After it was played, the point was obvious. Ficher wanted to post a knight on* ***g5*** *where it would be poised to be sacrificed at the appropriate time for White's pawn on* ***h3****. The route is* ***h8-f7-g5-h3****. The difficult part of the move was deciding on the goal; its execution was straightforward. We do not know how many seconds Fischer thought before making the move, but it is likely that the move was made after only a few seconds of reflection ...*

Fig. 6.1: Korchnoi vs. Fischer: Black to play



FEN: r1bq2k1/p5bp/3p1nnr/P1pPp3/2P1Pp2/1NN2R1P/4B1P1/1R1QB1K1/ b

1. ... Nh8

Reviewer Notes:

It's quite remarkable that **Fischer** was able to produce such a move in a few seconds. Modern chess programs, however, not only *do not* select that move in a few seconds, but neither do they when given many hours, preferring other alternatives.

For instance, **Chess Genius 1.0**, running on a P100 and using a hash table of just 320 Kb, moves the *g6* knight, but to *h4*. It finds that move as soon as it reaches 9-ply depth, valued as -0.15 pawn units, in 1h 15m. If given much more time, if goes to 11-ply depth (plus 12 additional extended search plies, totalling 23) and selects the same *Ng6-h4* move, with nearly the same value, -0.09, and taking more than 9 hours to do it.

Chess Genius 5.0, running on very fast hardware, a PII/266, with 12 Mb for the hash table, thinks the same as its older relative. Letting it go as deep as 11/23 plies takes 5h 20 min, yet it finds the same *Ng6-h4* move, evaluated at -0.15.

Crafty 12.7, running on the same hardware, but with a 12 Mb transpositions hash table and a 5 Mb pawn structures hash table, varies somewhat. With depths of 5, 6, and 10 plies, it choses *Rb8*. With depths of 7, 8, 9, 11, 12, 13, and 14 plies, it choses the same move as Chess Genius 1.0, namely *Nh4*, taking 12s, 25s, 45s, 16m, 26m, 1h 22m, and 3h 28m, respectively. The main variation predicted, for the maximum 14-ply search, is:

1. ... Nh4; 2. Rf2 Qe8; 3. Kh1 Qg6; 4. Nd2 Ng4; 5. Bxg4