



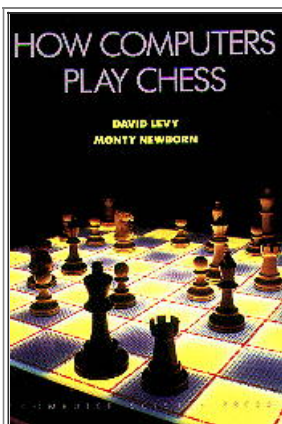
Chess Bibliography: How computers play chess

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How computers play chess



Title: How Computers play chess
Author: David Levy, Monty Newborn
Editorial: Computer Science Press
ISBN: 0-7167-8121-2, 246 pages
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Abstract: This book assesses the current state of the art and offers expert insight into just when computers will beat the world's best humans. The book answers such questions as: How do computers select moves ? Who is DEEP BLUE ? Who are the other best programs ? Can programs learn ?

Review:

This excellent book was and still is one of the state-of-the-art books in computer chess literature, dealing with both a very interesting history of computer chess, including many rare examples of the play of early programs, and several recent examples of the best actual programs, as well as discussing in sufficient detail the quite complex technical aspects of programming a computer to play chess.

In **The Challenge Is World Champion Kasparov**, we are introduced to one of the first encounters between Garry Kasparov and the former incarnation of Deep Blue, then called Deep Thought, through the detailed discussion of the proceedings and analysis of both games. A game between Karpov and Deep Thought is also carefully analyzed.

Next, **The Early Ideas** present historically the pioneer works of Shannon, Turing, Zuse, and many others, whose theoretical works provided the basement for writing procedures to allow a machine to play chess.

Then, in **The First Working Programs**, we see Bernstein, Kotok, McCarthy, and other AI specialist, as they struggled to implement Shannon's ideas to make Jurassic computers play some passable chess. Several games between both computers and humans are discussed.

After these preliminary attempts, **The Formative Years** discusses more advanced programs, such as Greenblatt's MacHack VI program, Botvinnik's Pioneer, and specially Slate & Atkin's Chess program and soviet Kaissa, focusing both on the internal of the programs and on relevant sample games.

The following chapter, **The Challenges for the Levy Bet**, tells us all the details of the famous Levy bet, nicely commented by co-author David Levy himself. The best games between him and Chess are commented, as well as a particularly beautiful miniature of Blitz against Belle.

As the field advances, **The Computer Becomes a Master** discusses the ever increasing achievements of the new generation of stronger hardware-assisted chess programs, such as Belle (written by Ken Thompson, who also has developed many Endgame Databases) and Cray Blitz (written by Bob Hyatt, who is also the author of Crafty, a strong freeware chess program), which use their incredibly fast underlying hardware to compensate for their lack of chess sophistication. We can also read all about how the first International human Masters began to know defeat against them on a regular basis.

The next step, the defeat of strong human Grandmasters, is introduced in **Eyeball to Eyeball with Grandmasters**, where we see several commented games between the strongest chess programs, such as Deep Thought and Hitech, and human grandmasters such as Miles and Larsen. Also, microprocessor commercial chess program Mephisto has a close encounter of the 3rd kind against macroprocessor non-commercial Deep Thought, and far from ashamed, beats him hands down !

Once those historical details have been dealt with, the book enters into a discussion of the more advanced chess techniques there are, such as **Endgame Play and Endgame Databases**, an area pioneered by Ken Thompson's Belle, where computers have conquered new grounds, and become invincible players. The development of a K+R vs K database is discussed in detail enough to allow anyone to program it, and then both games of the mini-match between grandmaster Walter Browne and Belle, the former trying to mate the computer with K+Q against K+R, are commented in detail.

A very technical chapter follows, **Search Techniques Used by Chess Programs**, where the most advanced techniques are explained, such as Minimizing, Alpha-Beta pruning, Iterative Deepening, and a large, detailed, and complete explanation of Hash tables, with many diagrams and examples, to make it crystal clear. Other aspects such as Time management, Evaluation functions, Move generation, etc. are thoroughly discussed as well.

The next chapter, **The Evolution of Computing Systems for Chess Programs**, explains what lies ahead: faster processors, chess-specific hardware, multiprocessors, and makes dire predictions on the increment of playing strength all these advances will bring.

Once these almost unearthly machines have been shown, it is the time for down-to-earth-ones, the ones everyone can buy, and **Commercially Available Chess Computers and Software** introduces them all, from the primitive, very early Chess Challenger, to Mephisto Almeria announcing mate in 7 to a 2350 ELO player under tournament conditions.

On Writing a Chess Program gives a concise advice on how to write a chess program oneself, and by way of comparison shows a table with the ELO rating of the best chess programs as compared to that of their programmers and more chess-proficient technical advisors.

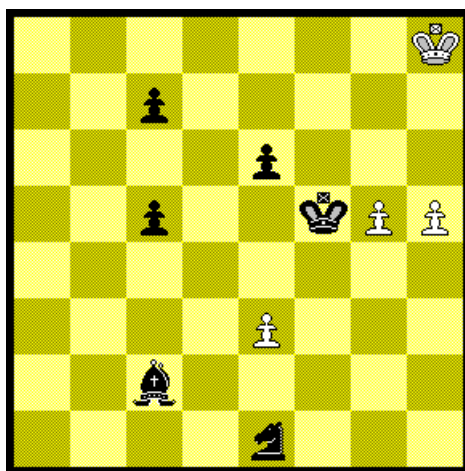
Finally, closing the book with a gem, **Stop Press** shows commercial program Mephisto Portoroz defeating former World Champion Anatoli Karpov during a simultaneous exhibition. That such a machine, which anyone could buy, without any special ultrafast hardware, can defend successfully against as superb a grandmaster as Karpov, says much about how far computer chess has progressed.

The book closes with an extensive bibliography given in **Additional Reading**, and some information on the ICCA, given in **Appendix A: The International Computer Chess Association**, and a table with complementary data in **Appendix B: Results of Major Tournaments**.

Here is a sample position from this book: quoted from pag.67, **The Formative Years**:

... **Botvinnik** devised an algorithm for enabling a computer to search the game tree in the same kind of way as he himself would do. His most often quoted example is this position. White wins with the sequence shown. His publications described how his program **PIONEER** was able to solve such positions while examining only a very small number of positions in the game tree. In this particular case, **only 200** positions were examined ...

Fig. 4.3: Position solved by Botvinnik's program: White to play



FEN: 7K/2p5/4p3/2p2kPP/8/4P3/2b5/4n3/ w

1. g5-g6 Kf5-f6; 2. g6-g7 Bc2-h7!; 3. e3-e4 Ne1-f3; 4. e4-e5+ Nf3xe5; 5. Kh8xh7 Ne5-f7;
6. g7-g8=Q Nf7-g5+; 7. Qg8xg5+ Kf6xg5; 8. h5-h6 c5-c4; 9. Kh7-g7 c4-c3;
10. h6-h7 c3-c2; 11. h7-h8=Q c2-c1=Q; 12. Qh8-h6+!

Reviewer Notes:

If **PIONEER** could indeed solve this position reaching a depth of 23 plies while looking at *only 200 positions*, it must have been an amazing piece of software, indeed!. Modern chess programs can solve this position, running in more powerful hardware than that existing at Botvinnik's time, and searching much larger trees.

For instance, **Crafty 12.7** running on a P100 and using a 12 Mb hash table, finds g5-g6 in 01:39 after looking at 11 plies, plus another 14 of extended search, and assigns it a value of +0.376 pawn units.

Rebel Decade 1.2, which is also freeware, running on the same hardware but using a hash table of only 192 Kbytes, looks at 12 plies in 01:26 and finds the correct move too, giving it a drawish value of +0.00 pawn units. By the way, it does not look at a mere 200 positions, but at more than *1 million!*

Chess Master 2175, an older commercial program but nevertheless strong, using a huge 16 Mb hash table, looks at 13 plies in 01:55 and finds the correct move g5-g6, which it evaluates at +0.32 pawn units.

And finally, commercial **Chess Genius 1.0** with a hash table of 320 Kbytes, looks deeper, at 14 plies plus 12 extended search plies, taking some 6 minutes, and also finds g5-g6, evaluating it this time at +0.27 pawn units.

Ed Panek tested this position with **Chess Genis 5.0**, running on a PII at 266 Mhz, with 10 Mb for the hashtable. Though it saw the correct *g5-g6* in just 5 seconds, **Ed** let it run for 9 h 25m 33s, till it reached 18/30 plies. At that tremendous depth, it still considered *g5-g6* best, evaluated at +0.93.



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