

Chess Tests: Basic Suite, Positions 31-35

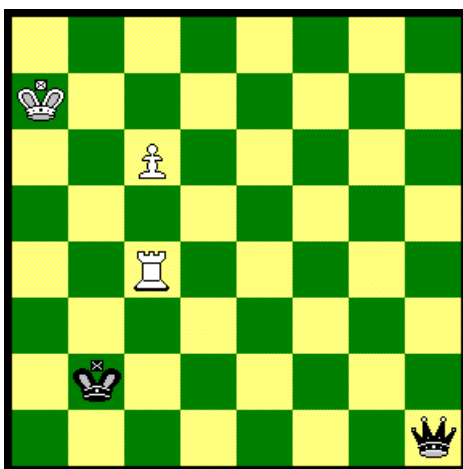
(c) Valentin Albillo, 2020



Last update: 04/03/98

See the Notes on Problem Solving

31.- Ken Thompson's Endgame Database



FEN: 8/K7/2P5/8/2R5/8/1k6/7q/ w

White to play and win: 1. c6-c7

Results

Program	CPU/Mhz	Hash table	Move	Value	Plys/Max	Time	Notes
Chess Genius 1.0	P100	320 Kb	c6-c7	+5.39	10/22	00:02:05	sees the win
Rebel Decade 1.2	P100	192 Kb	c6-c7	-0.72	10	08:00:00	can't see it
NEW Rebel Decade 2.0	P100	512 Kb	c6-c7	+0.00	12	06:25:56	can't see it
Crafty 12.7	P100	12+5 Mb	c6-c7	+5.408	10/16	00:04:04	sees the win
KAI Crafty 12.6	Pentium Pro 200 Mhz	24+16 Mb	c6-c7	+5.408	10	00:01:52	seen at 58s
KAI Chess Master 5500	Pentium Pro 200 Mhz	?	c6-c7	+5.58	11	00:02:20	seen at 1:01

Notes:

This is an exceptional endgame taken from one of **Ken Thompson's Endgame Databases**, where Rook + Pawn *can defeat* a Queen. Any program which interfaces to this Thompson's Database will play the correct *c6-c7* move *instantly*.

One such commercial program is **Shredder**, which comes with 4 CD-ROMs including all 5-pieces endgame databases. **Crafty**, a freeware program, can also be installed with a number of endgame databases, this time called *tablebases*.

If you consult the relevant database for this position, it will tell you that White has 17 legal moves, all of which are *bad* except for *c6-c7*, which either mates or wins the queen (thus reducing the endgame to a winning K+R vs. K) within 8 moves at most.

Of course, if the program has no access to a database, it will have to compute very hard to see the winning line. **Chess Genius 1.0** does see the correct move, and it does see that it wins the queen, but it has to search 10 full plies plus 12 additional ones, for a total

of 22, thus seeing the necessary 16-ply winning line, all in quite a short time.

Crafty 12.7, *without* using endgame tablebases, also manages to both find the correct move *and* see that it wins, but it has to look 10 full plies, plus 6 additional ones, totalling the 16 plies required, and 2 times slower than CGI.0.

Crafty 12.6 does exactly as **Crafty 12.7**, but as it uses faster hardware and more RAM, it finds the win two times faster.

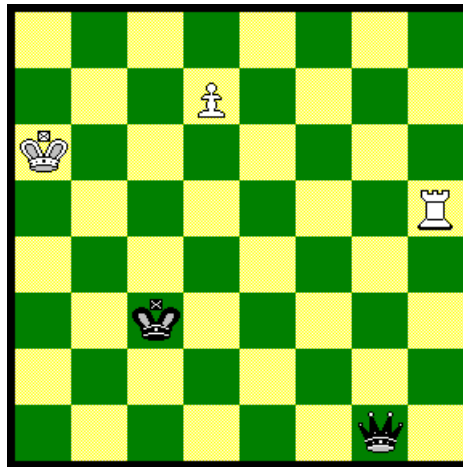
Rebel Decade 1.2 is a good, friendly program, but its little 192 Kb hashtable is *insufficient* for this difficult endgame, and though it finds the correct move, it *does not see that it wins*, after searching just 10 plies, more than 100 times slower than **Crafty**.

The newer version, **Rebel Decade 2.0**, also fails to see the win, even looking 2 plies deeper, at 12 plies in some 6 hours. It examines 363.850.450 positions and selects the correct move, but evaluated as a mere draw, +0.00. Notice the effect of the larger hashtable (512 Kb vs. 192 Kb): though it searches 2 plies deeper, it still takes less time than **Rebel Decade 1.2**.

Chess Master 5500 isn't just a good, friendly program, but also quite strong as well (though it has its surprises, see **Test 27** and **Test 30**), and finds the correct move, properly evaluated as a large gain. Its timing is comparable to that of **Crafty 12.6**, but 2 times slower than good old **Chess Genius 1.0**.



32.- Ken Thompson's Endgame Database



FEN: 8/3P4/K7/7R/8/2k5/8/6q1/ w

White to play and win: 1. Rh5-d5

Results

Program	CPU/Mhz	Hash table	Move	Value	Plys/Max	Time	Notes
Chess Master 2175	P100	16 Mb	Rh5-d5	-0.04	13	00:07:40	
Chess Genius 1.0	P100	320 Kb	Rh5-d5	+5.33	9/21	00:01:16	
Rebel Decade 1.2	P100	192 Kb	Rh5-h3+	+0.00	9	00:04:48	can't see it
Rebel Decade 2.0	P100	512 Kb	Rh5-h3+	+0.00	12	00:35:30	can't see it
Crafty 12.7	P100	12+5 Mb	Rh5-d5	+5.748	11/18	00:04:21	seen at 1m 46s
KAI Crafty 12.6	Pentium Pro 200 MHz	24+16 Mb	Rh5-d5	+5.616	12/16	00:07:06	seen at 2m54s
KAI Chess Master 5500	Pentium Pro 200 Mhz	?	Rh5-d5	+5.85	9	00:01:21	seen at 54 sec.

Notes:

This is another exceptional endgame taken from one of **Ken Thompson's Endgame Databases**, where Rook + Pawn *can defeat* a Queen. As stated in the Notes of **Test 31**, any program which interfaces to this Thompson's Database will play the correct *Rh5-d5* move *instantly*.

Consulting the relevant database for this position, we find that White has 21 legal moves, all of which are *bad* except for *Rh5-d5*, which either mates or wins the queen (thus reducing the endgame to a winning K+R vs. K) within 8 moves at most, that is, 15 plies.

Chess Master 2175, without tablebases but with a large 16 Mb hash table, finds the correct move, but it *does not see that it wins*, after looking at 13 plies in a reasonable, but somewhat long, time.

Chess Genius 1.0, also without recourse to endgame tablebases, finds the correct move and *sees that it wins the queen*, after searching 9+12 plies in very, very little time for such a difficult position.

Rebel Decade 1.2 once again (see **Test 31**) cannot cope with this kind of positions, this time not even finding the correct move. The one found after looking at 9 plies (4.821.408 positions) just *draws*, though it used more than double the time of CG1.0.

Even the newest version **Rebel Decade 2.0** is unable to solve this position. It looks 3 plies deeper, to 12 plies, examines 35.173.246 positions taking more than half an hour to do it, yet it only finds the drawing check, not the winning move.

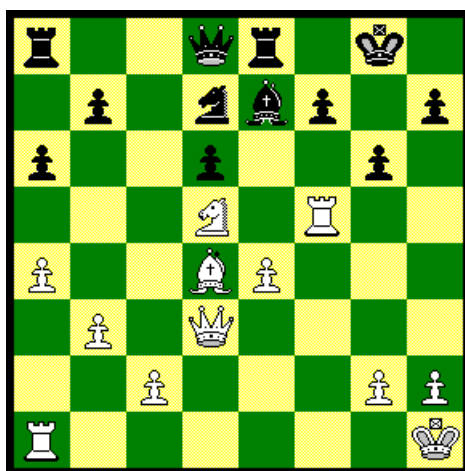
Crafty 12.7, *without using tablebases* (though it could be installed to use them), does find the correct move, and it also *sees that it wins*, after looking a 11+7 plies, some 3 times slower than CG1.0, which is written entirely in *assembler language*, while **Crafty** is written in portable C, and compiled with the GNU C++ compiler.

A curious thing is that **Crafty 12.6** needs to look one ply deeper to find the win. If searching to just 11+6 plies, it does find the correct move, but is evaluated only as +0.632, i.e., it does not see the win. This extra ply takes longer, so much in fact that, even running on faster hardware and with more RAM, it is *two times slower* than **Crafty 12.7** in this position.

Finally, **Chess Master 5500** finds the solution properly evaluated and does it some *6 times faster* than **Crafty 12.6**, but even so, *2 times slower* than **Chess Genius 1.0**.



33.- Svidler vs. Rodriguez, Linares 1994



FEN: r2qr1k1/1p1nbp1p/p2p2p1/3N1R2/P2BP3/1P1Q4/2P3PP/R6K/ w

White to play and win: 1. Ra1-f1

Results

Program	CPU/Mhz	Hash table	Move	Value	Plys/Max	Time	Notes
Chess Genius 1.0	P100	320 Kb	Ra1-f1	+1.06	5/17	00:00:29	
Rebel Decade 2.0	P100	512 Kb	Ra1-f1	+1.50	11	01:50:34	seen at 21m 42s
Crafty 12.7	P100	12/5 Mb	Ra1-f1	+1.613	11	00:58:58	
KAI Chess Master 5500	Pentium Pro 200 Mhz	?	Ra1-f1	+1.66	9	00:04:18	

Notes:

In the actual game, **GM Rodriguez** (Cuba) has just played *g6*, threatening white's rook. Young **IM Piotr Svidler** (Russia) forgets about that rook and finds this fine continuation that took his strong adversary by surprise. After the text, black cannot answer *gx5* lest he would walk right into a *mating net*.

Chess Genius 1.0 does admirably in this position, and finds the winning move in an amazingly short amount of time, after looking at 5+12 plies. It also finds the correct main line: 1. *Ra1-f1!! Rf8*; 2. *Qh3!*.

Freeware **Rebel Decade 2.0** finds the correct move, too, but it needs to look at 9 plies to discover it, with a +1.43 evaluation. Going to 10 plies gives the same evaluation, and by the time it reaches 11 plies, it has examined 107.389.791 positions and the evaluation raises to +1.50. This is *2 times slower* than **Crafty 12.7** at the same depth, and many times slower than the other programs tested.

Crafty 12.7, using two large hash tables, a 12 Mb one for transpositions, and a 5 Mb one for pawn structures, does also find both the correct move and the correct main variation, but it has to look at 11 full plies (instead of CG's five), and so it finds them more than *100 times slower* than CG1.0.

Chess Master 5500 doesn't beat **Chess Genius 1.0** either. It needs to look at 9 plies (compared to 5/17), and takes *8 times longer*, even running on hardware some 2 to 3 times faster ! The evaluation for the move is higher, though (+1.66 vs. +1.06).

I think this is quite a good example on how *difficult* it is to compare chess programs: on one hand, **Crafty 12.7** is a much more *modern* program than CGI.0, has been written by **Robert Hyatt**, of **Cray Blitz** fame, and incorporates all the most advanced chess techniques there are. Also, it tremendously benefits from its capability to use large *hash tables*.

On the other hand, **Chess Genius 1.0** is a relatively *old version* of the **Chess Genius** saga, but it has been written by **Richard Lang**, one of the best chess programmers in the world, its extended search at terminal nodes is the best there is, and it's written completely in *hand-tuned assembly language*, against **Crafty's** portable C code. That alone is sufficient to give it a sizable edge in *speed*, from some 4 to 10 times faster.

This results in CGI.0 finding the answer 100 times faster in this particular position than **Crafty**. But this isn't curtains for the speed fight: just have a look at **Test 13** to see the reverse of the coin, in an example where **Crafty** finds *almost instantly* a complicated *mate in 13* that takes CGI.0 a long time ! Also, see **Robert Hyatt** comments in the **Addendum** below.

This is one of the reasons you can never say *in advance* if a given test position is going to be *easy*. It very much depends on the particular program, even when using identical hardware.

Addendum:

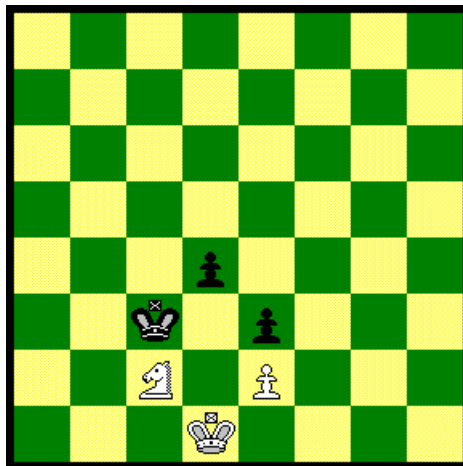
I sent an e-mail to **Robert Hyatt** with this comment:

VA: "... **Crafty** needs to look at 11 plies to see the win in this actual, recent game between a Grandmaster and an International Master. However, **Chess Genius 1.0** does the same thing, while looking at *only* 5 plies, a 6-ply difference. This results in **Crafty** being *100 times slower* in this position !"

RH: "Your "only 5 plies" is not quite correct. **Genius** looks at *least* 5 plies deep, but can look far deeper along selected lines. **Crafty** can extend the search, but it doesn't do any selective stuff like **Genius**. Only way to compare them is to compare times, *not* search depths, because the two search strategies are not anything like each other..."






34.- Taken from "Knight endgames", pag. 169



FEN: 8/8/8/8/3p4/2k1p3/2N1P3/3K4/w

White to play and win: 1. Nc2-e1

Results

Program	CPU/Mhz	Hash table	Move	Value	Plys/Max	Time	Notes
Chess Genius 1.0	P100	320 Kb	Nc2-e1	+2.18	24/32	01:18:12	can't see the win
 Chess Genius 5.0	PII/266	16 Mb	Nc2-e1	+2.21	27/32	00:28:55	seen at 1 sec,+2.21
Rebel Decade 1.2	P100	192 Kb	Nc2-e1	+2.21	21	00:22:05	can't see the win
Rebel Decade 2.0	P100	512 Kb	Nc2-e1	+2.00	21	00:26:47	can't see the win
Crafty 12.7	P100	12+5 Mb	Nc2-e1	+2.986	27	03:29:17	can't see the win
 Crafty 12.6	Pentium Pro 200 MHz	24+16 Mb	Nc2-e1	+2.97	21/25	00:01:50	
 Chess Master 5500	Pentium Pro 200 Mhz	?	Nc2-e1	+2.40	20	00:02:29	

KAI MChess Pro 5.0	Pentium Pro 200 Mhz	10 Mb	Nc2-e1	+3.88	15	00:04:30	
------------------------------	---------------------	-------	--------	-------	----	----------	--

Notes:

In this position, there are no passed pawns. To win, White needs to take *both black pawns*, while preserving his own, which is not easy, because there is little space for manoeuvres, and black is threatening to play *d4-d3*, exchanging white's unique pawn. To succeed, white has to get his king near black's pawn at *d4*.

This can be accomplished, but *very exact moves* are needed. In the main variation, white places black in *zugzwang* at *ply 29*, then it takes the first black pawn at *ply 39*. The second black pawn gets out of the way some 8 plies later, then white's pawn heads for promotion, winning the game.

Chess Genius 1.0, though it looks very deep, at 24 full plies, plus 8 extension plies, cannot reach the 39 plies needed to see the first black pawn capture. It finds the correct move and variation, but does not see any win.

Chess Genius 5.0, thanks to faster hardware and bigger hashtable, can go three plies deeper, 27/32, in less than half the time than CGI.0, but still doesn't see the win, nor the pawn's capture. There are a couple of things worth mentioning: first, CG5.0 could see the same move *1. Nc2-e1* with the same evaluation (+2.21) much sooner, at 11/23 plies, taking just *one second*. Second, even letting it run for another *three hours*, it would not go deeper !.

Rebel Decade 1.2 also looks quite deep, at 21 plies, but though it sees the correct move, it does not see any win either. All in all, in examined *20.912.954 positions*.

The newer version, **Rebel Decade 2.0**, has a hash table 3 times larger, at 512 Kb, and is allegedly stronger, but in this particular example, it takes slightly longer to reach the same depth, 21 plies, and finds the correct move but with a slightly lower evaluation, +2.00. It examines *20.606.003 positions*, and does not see any win whatsoever.

Crafty 12.7, *without using tablebases* (though it could be installed to use them), looks at 27 plies in several hours, but though it finds the correct move and the beginning of the main variation, it does not see any pawn captures. It would need to search 12 extra plies to do so.

Paradoxically, **Crafty 12.6** does much better. Perhaps helped by the much faster hardware and the significantly greater hash tables, it looks at 21/25 plies (instead of 27) in a very short time, yet it finds the same gain, though it does not see the win.

Chess Master 5500 does more or less as **Rebel Decade 1.2**, nearly same depth, same gain, but some *5 times faster*. It does not see the win, either.

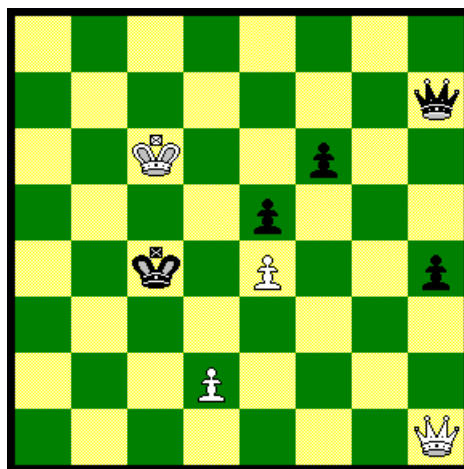
MChess Pro 5.0 also fails to see the win, but as nearly always, it takes *the less number of plies* (15 vs. 20, 21, 24, 27) to see the greatest gain (+3.88) and does it quite fast, too. Finding the win is beyond its technical possibilities, as this program is *limited to searches up to 26 plies* deep, and the win is far, far deeper in this case.

Addendum:

On the topic of hard limits to depth of search, **Kai Luebke** told me that **Rebel Decade 1.2** has a 30 ply limit, **MChess Pro 5.0** 26 ply, **MChess 6** 50 ply ("*if I remember correctly*"), **Chess Master 5500** 38 ply, **Crafty** 60 ply, **Rebel 9** 60 ply, and I further add that **Chess Master 2175** has a limit of 21 plies, **Chess Genius 1.0**, 32 plies, and **Rebel Decade 2.0** 60 ply. Nuff said !



35.- Rinck, Bohemia 1906



FEN: 8/7q/2K2p2/4p3/2k1P2p/8/3P4/7Q/ w

White to play and win: 1.Qh1-b1 Kc4-d4; 2. Qb1-b3

Results

Program	CPU/Mhz	Hash table	Move	Value	Plys/Max	Time	Notes
Chess Master 2175	P100	16 Mb	Qh1-f3	-0.04	15	03:04:18	can't see it
Chess Genius 1.0	P100	320 Kb	Qh1-b1	+7.78	13/25	04:07:53	sees the win
PANEK Chess Genius 5.0	PII/266	10 Mb	Qh1-b1	+8.36	11/23	00:15:20	seen at 14:16,+0.60
PANEK Chess Genius 5.0	PII/266	10 Mb	Qh1-b1	+8.69	14/26	02:03:12	sees the win
Rebel Decade 1.2	P100	192 Kb	Qh1-f3	+0.00	10	01:00:00	can't see it
Rebel Decade 2.0	P100	512 Kb	Qh1-f3	+0.00	12	03:33:04	can't see it
Comet-A.75	P100	13786 Kb	Qh1-f3	+0.00	13	03:40:45	can't see it
Crafty 12.7	P100	12+5 Mb	Qh1-f3	+0.000	13	00:11:02	can't see it
KAI Crafty 12.6	Pentium Pro 200 MHz	24+16 Mb	Qh1-f3	+0.00	13	00:04:58	can't see it
KAI Chess Master 5500	Pentium Pro 200 Mhz	?	Qh1-b1	+7.42	6	00:00:03	amazing !
KAI MChess Pro 5.0	Pentium Pro 200 Mhz	10 Mb	Qh1-b1	+11.60	8/17	00:13:07	see notes

Notes:

This is a *very difficult queens endgame*. Most players really fear having to play a queens endgame, because they usually require very long sequences of the the utmost *precise* moves to win. Queens are very powerful pieces, with many moves at their disposal and long range attacks, so escaping perpetual check or even checkmate is hard on the nerves.

Although that would appear to affect just human beings, chess programs are not at ease with this kind of endgames too, because of the *exponential explosion* of queens moves that plague the whole search tree. Unless an endgame database exists, they are very computationally expensive.

Chess Master 2175, with a large 16 Mb hash table, is unable to see the win. After searching 15 plies in a long time, it stays with a move which results in a draw by *perpetual check*. If wouldn't be that bad, taking into account that white's a pawn down and black has a dangerous passed pawn, were it not for the fact that there is a *winning move* in this position. Curiously, CM2175 selects the winning move *Qh1-b1* for depths 3 to 9 plies (though its evaluation of -0.18 shows that it doesn't see the win), then switches to *Qh1-f3* for depths 11,13, and 15.

Chess Genius 1.0, thanks to its very efficient search algorithm, solves this difficult problem finding the *only move* who secures the win, after looking at 13 full plies, plus 12 additional extensions, though it takes very long. The value it gives to the move shows that it sees *the enemy queen is won*, and it produces the exact main variation that leads to this.

Chess Genius 5.0, the newer version, uses to great effect its faster hardware and bigger hash tables, and finds the win looking at two less plies, 11/23, with a better +8.36 evaluation, and *16 times faster*. Continuing the search up to 14/26 plies raises slightly the evaluation, to +8.69.

Rebel Decade 1.2 cannot cope with this problem in a reasonable time, and after looking at 10 plies, it finds a move that gives perpetual check, a draw, +0.00, though it examined no less than *53.476.479 positions*.

The allegedly improved version, **Rebel Decade 2.0** does the same as the old. Even looking 2 plies deeper, at 12 plies, and examining *180.875.248 positions* in three and a half hours, it doesn't find the correct move, just the perpetual check, evaluated at +0.00.

Neither can **Comet-A.75**, another freeware program, which looks at 13 plies, but is unable to find the winning move, just the perpetual check. During the search, it evaluated a whopping *406.540.564 positions*, but it missed the win nevertheless.

Crafty 12.7, using a large 12 Mb hash table plus an additional 5 Mb one for pawn structures, somewhat relevant to this endgame, also fails to find the win. Instead, it finds the same move which results in a *perpetual check*, +0.000, but not the win.

Its sibling, **Crafty 12.6** looks at the same number of plies (13) as **Chess Genius 1.0** (13/25), much, much faster, but it *does not see the win*, just the draw by perpetual check. It seems its search extensions are not as refined (and time consuming) as those of CGI.0.

Now, the result for **Chess Master 5500** is *nothing short of extraordinary*. It finds the winning move, properly evaluated (+7.42) while looking at *only 6 plies* (vs. 13/25 for **Chess Genius 1.0**) in an *unbelievable* 3 seconds !! , this is, *more than 1000 times faster* than CGI.0. Anyone can explain ?

The result for **MChess Pro 5.0** pales in comparison, but it's quite good indeed. It looks at less plies than any other program (except CM5500), finds the greatest gain by far (+11.60), and does it in a reasonable time (CM5500's notwithstanding !). Actually, it even saw the correct move much sooner, at 01:00, but evaluated it as a draw. Very fine.

Addendum:

Ed Panek tried this position on **Chess Genius 5.0**, and found the exact mating sequence. It seems to be a *mate in 13*, if I counted right:

"... here are the moves to mate:

h1b1, c4d4, b1b3, h7xe4, c6d6, e4a8, b3e3, d4c4, e3c3, c4b5, c3b3, b5a5, b3a3, a5b5, a3a8, b5b4, a8f3, f6f5, f3c3, b4b5, c3b3+, b5a5, d6c5+, any pawn move, b3a3++

... see you. Ed."



(c) Valentin Albillo, 2020