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MICRO CHESS

PHANTOM MOVES

Tony Harrington provides an insight into the seemingly magical effect of a chess computer, known as the 'Phantom', which mysteriously moves its own pieces.

For your true chess enthusiast, once the game has well begun the best that can be said about the materials, with which the game is played, is that they should cause as little of a distraction as possible. A chess board that draws attention to itself by its fluorescent colouring or any other oddity is simply an irritant. Similarly, an ornamental chess set modelled on the Chinese Mandarins of the tenth century might be a wonder in a showcase, but a pain in the neck to play with.

Much the same is true of chess computers. Once the game is under way, it really does not matter how the computer signals its move, so long as it does so clearly and concisely. Like most chess players, I've got used to the quiet flashing of a couple of LED lights, accompanied by a demure 'beep' whenever the machine has found its move.

So when I was given the opportunity to look at the Milton Bradley machine, which rejoices in the mysterious name 'The Phantom', I had my doubts. The marvellous feature of this machine, I was told, is that it moves the piece itself. It has a reasonable program, but that is almost beside the point — the point was that progress had been made in the direction of the magical.

The usefulness of a machine that could literally make its own moves was not clear to me. Why should it be a significant advance on existing machines which simply sit there, lighting up their LEDs in a friendly sort of way and waiting patiently for you to do the decent thing by them?

I sat down before the Phantom with some scepticism. Following the great — and now almost forgotten Bobby Fisher's dictum — I opened with the king's pawn. What followed is hard to describe. A motor started into life, rather audibly, and Black's king's pawn slid firmly out to e5 and stopped. So did the motor, and I was left in a deepening silence to think about my next move.

I brought the king's knight out to f3. The motor rasped into action and Black's pawn on f7 slid a fraction of an inch to one side. For a moment I thought the machine had slipped a gear, or sprung a solenoid or something. Then its knight moved majestically through the gap created between the pawns on f7 and g7 to take up its station on f6. 'What about the touch move rule?' I said to my absent opponent. But then, no-one had touched a piece, so I suppose it didn't apply. A pity, I hate playing against the Petroff.

More surprising things were to come a few moves later when I took Black's pawn on d5 with my e pawn. There were several possibilities for Black, and I was brooding over a few of them when my e pawn, now on d5, suddenly sidled off the board and stood out of play. I was left staring at the blank square and wondering what it was going to recapture with. The pause could only have been a half second or so, but it produced a distinctly odd feeling.

The game itself was not particularly memorable, but it was interesting in its own right. As it developed it began to seem more like a game of chess than the circus performance it had seemed at the beginning. As a marketing gimmick, I think that Milton Bradley has hit on something rather special. My only hope is that the company doesn't put a voice chip in the blasted thing, or you may as well call the neighbour over and play a human being.

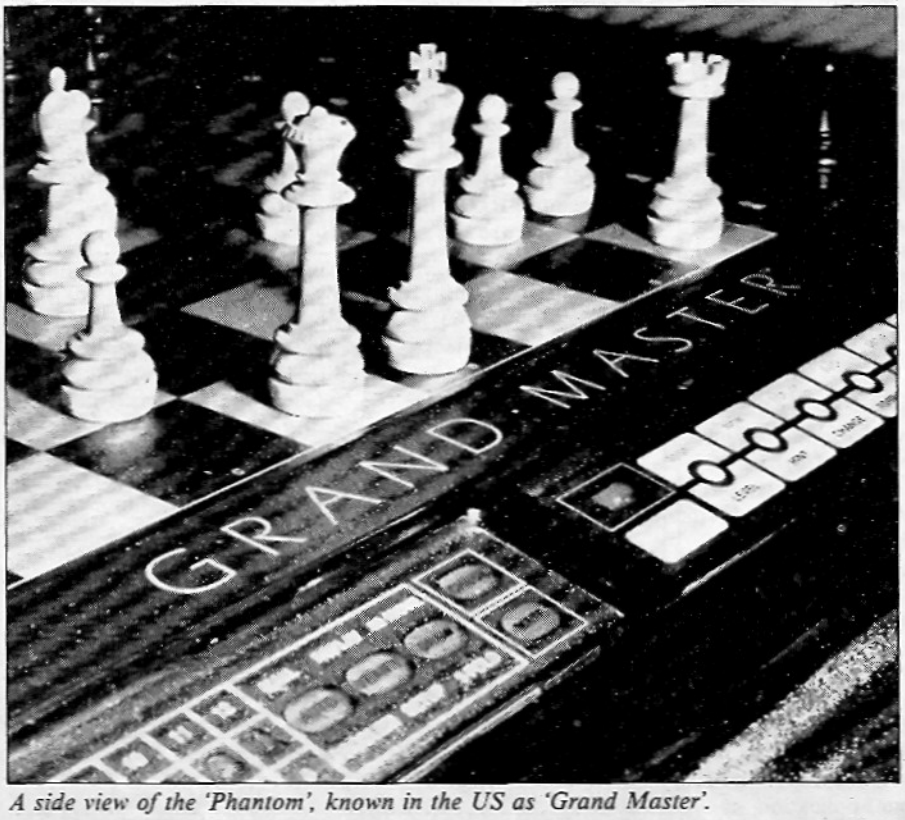
Now for the origins of the machine. Milton Bradley rang up Intelligent Software in June 1981 while David Levy and his colleagues were still hard at work on programs for SciSys. According to Levy, whoever spoke to him simply said that he wanted some advice on chess computers. They phoned from the States and asked Levy to go and see them at their East Longmeadow, Massachusetts offices.

'When I arrived they showed me into a room and, after asking me to sign the traditional non-disclosure agreement, they put a machine on the table, switched it on, and a pawn moved — as if by magic — from e2 to e4 — without any human intervention or any visible, physical device for making it move. I was fascinated,' Levy said.

This was the idea they wanted to develop: that is, they wanted the mechanism that had just moved the pawn developed to the point where it would be reliable enough to be used in a consumer product. And they wanted a chess program that would work with this mechanism.'

Levy phoned the technical director of Intelligent Software from Milton Bradley's offices and told his colleague about this new machine. After a brief huddle, they decided that this was very much the sort of project they wanted to get involved in. In Levy's words: 'It was the most exciting chess product that we had been faced with and we could not resist the challenge.'

All the chess programming that Levy and Intelligent Software had previously



A side view of the 'Phantom', known in the US as 'Grand Master'.

been involved with had been straightforward software programming. This was the first time that they had to get involved with electro-mechanical technology.

Despite this, they undertook to write the chess program and the software to control the electro-magnetic system which moved the pieces. Levy reckons that when he was first shown the machine it worked to the point where it was possible to demonstrate the idea, but there was still quite a way to go before it could be turned into a reliable product which would stand up to the rigours of life in the average home.

So how does the machine move its pieces? The idea is basically simple. There is a solenoid (an electro-magnet) underneath the playing surface. This is connected to a mechanism which moves on two axes, consisting of two metal bars. The one can move down the length of the board, while the other moves down the width of the board.

The solenoid is fixed onto the one axis and is constrained to move by the other axis so that it is always at the centre of the cross-hairs formed by the intersection of the two axes. The bars are controlled by two belts (with teeth), which go round two wheels (also with teeth). A photosensitive device counts how many teeth on each of the wheels move past a certain point. So by counting how many fractions of a turn each wheel has made, the program is able to tell exactly where the solenoid is located under the chess board.

Each piece has a permanent magnet in its base, and when the Phantom wants to move, it first moves the solenoid to the exact position of the piece on the board (all the pieces are of course tracked by the program). It switches on, detects that there is indeed a piece on that square, and then moves to the target square — 'dragging' the chess piece with it.

In the case of captures, it first moves the captured piece from its square to a place at the side of the board, off the playing surface, set aside for it. The surface of the board is a touch sensitive surface, much like that of the Sensory Nine. When the player captures one of the computer's pieces, that piece has to be placed at the side of the board as well, and there is a symbol for every piece set out in two lines on the right and left hand sides of the chess board.

One of the quirks that fascinated me was the fussiness of the machine. Each time I captured one of its pieces and put it down on its square, there was the audible sound of its motor starting up as the solenoid rushed over to check that I had placed the piece correctly on the square appointed for it. According to Levy, if I had put the knight down on a square reserved for a queen, the machine would have immediately moved it — by the shortest possible route (no inefficiency here, please) — to the right square.

As with the Sensory Nine, when the player makes a move, it is necessary to press down lightly on the square of the piece that you are moving and on the square that you are moving to. Levy reckons that the program has an approximate rating of 1550. This is considerably weaker than that of La Regence, Intelligent Software's own machine, released last December (which has an estimated rating of 1750).

The explanation for this is that La Regence was designed after the Phantom, and with a more leisurely research and development period. Levy's brief was to produce a program stronger than the Sargon 2 running on the Apple computer. The processor involved was the 6502A processor with 2k of RAM and 16k of ROM.

'The rating of 1550', he said, 'comes from 40 games played against the Sensory Nine and the Sargon 2.5, both of which were chosen as adversaries because they have already been rated by the United States Chess Foundation. Thirty games against rated players or rated machines are enough to get a statistically reliable result,' Levy said. 'We played 40 in order to gain even greater confidence.'

'We had never done anything using electro-mechanical devices before. When we first discussed the machine in the company's offices, I was asked how long I thought the job would take. More specifically, I was asked if we could do the work within five months. When I phoned our technical director I didn't tell him the time period Milton Bradley was considering. I just asked him how long he thought it would take. He said: 'five months . . .'

My guess is that with Intelligent Software already marketing a machine with a stronger program than the Milton Bradley machine, it won't be too long before the Phantom gets a program worthy of its mechanical dexterity.

Games section

White: Fidelity Sensory 9 (level 3); Black: Phantom (level 10); Pirc Defence: Notes by David Levy.

1	e2-e4	d7-d6
2	d2-d4	Ng8-f6
3	Nb1-c3	g7-g6
4	f2-f4	Nb8-c6
5	Bf1-b5	

(Unusual and rather pointless. The pin on Black's knight is of no consequence and the bishop would be better placed on almost any other square.)

5	. . .	a7-a6
6	Bb5xc6+	b7xc6

(Black has an isolated pawn (a6) and doubled pawns (c7 and c6) but despite having made these concessions in its pawn structure, the Phantom actually has the better long-term prospects. This is partly because White has ceded bishop for knight; partly because of the attacking prospects along the b-file; and partly because White's impressive looking pawn centre might eventually prove vulnerable to pressure.)

7	Ng1-f3	Bf8-g7
8	0-0	0-0
9	Bc1-d2	

(A poor square for the bishop, but 9 Bc1-e3 accomplishes nothing after 9. . .Nf6-g4. Perhaps White should have tried 9 h2-h3 and 10 Bc1-e3.)

9	. . .	Ra8-b8
10	Ra1-b1	Bc8-e6
11	Qd1-e2	

(Otherwise . . .Be6-c4 might be embarrassing, and now White threatens 12 Qe2xa6.)

11	. . .	Rb8-b6
12	e4-e5	Nf6-g4
13	h2-h3	Ng4-h6
14	Nf3-g5	Be6-f5
15	Bd2-e3?	

(Too slow. I would have tried 15 g2-g4, when 15. . .Bf5xc2 16 Rb1-c1 Rb6xb2 17 Bd2-e3 wins a piece (17. . .Bc2-d3 is best met by 18 Qe2xb2 Bd3xf1 19 Rc1xf1, rather than 18 Qe2xd3 d6xe5 19 f4xe5 Bg7xe5!).

Since Black cannot capture on c2 after 15 g2-g4, play might continue 15. . .Bf5-d7 16 Qe2-f2, with an eventual Qf2-h4 and f4-f5, attacking Black's king.

The move played in the game hands the initiative to Black.)

15	. . .	Qd8-b8
16	g2-g4	Bf5-d7
17	e5xd6?	

(A serious positional error. White weakens itself on the a1-h8 diagonal. Better would have been 17 Nc3-d1, followed by Qe2-f2 and Qf2-h4.)

17	. . .	e7xd6

(More dynamic than the obvious looking 17. . .c7xd6. Black now has the possibility of play along the e-file.)

18	Nc3-a4	

(Putting the knight offside. White's only chances lie on the K-side, so again 18 Nc3-d1 was called for.)

18	. . .	Rb6-b5
19	c2-c4	RB5-a5
20	Na4-c3	Rf8-e8
21	b2-b4	

(Further weakening White's position.)

21	. . .	Ra5-a3
22	Qe2-b2?	

(22 Qe2-d2 was essential.)

22	. . .	Re8xe3!

(A simple combination which wins material.)

23	Qb2xa3	Bg7xd4

(The point. As a result of the numerous threats created by the discovered check (if Black moves the rook from e3), White has no time to defend the c3 knight.)

24	Kg1-h1	Re3xc3
25	Qa3xa6	Bd7-c8!

(Winning another pawn, since 26 Qa6xc6 loses the queen to 26. . .Bc8-b7.)

26	Qa6-a4	Rc3xc4

(Black has a significant material advantage (two bishops and a pawn for a rook), and its king is much safer than White's, so the result of the game is hardly in doubt.)

27	Rf1-e1	Bc8-d7
28	Re1-e7	Qb8-d8
29	Re7-e4	

(If 29 Rb1-e1 Bd4-c3, threatening . . .Bc3xe1, . . .Rd4xb4 and . . .Rd4xf4.)

29	. . .	f7-f5
30	Qa4-a6	d6-d5
31	Ng5-e6	Bd7xe6
32	Re4xe6	f5xg4
33	Rb1-e1	

(Threatening to win Black's queen by 34 Re6-e8+.)

33	. . .	Kg8-f7
34	f4-f5	Nh6-f5
35	h3xg4	Qd8-h4+
36	Kh1-g2	Qh4-f2+
37	Kg2-h3	Qf2-g3 mate