

TWO STRATEGIC SHORTCOMINGS IN CHESS PROGRAMS

*J. van Reek*¹, *J.W.H.M. Uiterwijk*², and *H.J. van den Herik*²

Margraten, The Netherlands / Maastricht, The Netherlands

ABSTRACT

Chess programs have great difficulty in finding the correct moves for the strategic concepts *consolidation* and *positional sacrifice*. We suggest the application of two evaluation criteria as a solution, viz. the *strengths of a blockade* and the *control over one's own territory*.

1. INTRODUCTION

The ability of chess programs to calculate the key moves of strategies was tested in Van Reek, Uiterwijk and Van den Herik (1998). In the great majority of cases, the outcome was positive. We recall the strategies *centralisation*, *attack on the Queenside*, *attack on the Kingside*, *encirclement*, *restriction* and *counterattack*, and the pocket strategies *development sacrifice* and *prophylactic manoeuvre*. Further research revealed difficulties with *consolidation* (Van Reek, 1999) and *positional sacrifice* (Van Reek and Uiterwijk, 1999). Below we provide some insights into the background of the shortcomings and investigate the causes. Thereafter, some suggestions for improvement are made.

2. EXPERIMENTAL SET-UP

At the present stage the application of computer programs for chess analysis faces three main obstacles: (1) lack of computing power, (2) insufficient theoretical knowledge of the opening and endgame, and (3) incorrect evaluations of crucial positions. We solved the lack of computing power to a large extent by running the test positions on a Pentium III 500MHz for a maximum time of twelve hours. Assuming that the applied programs have a rating of 2570 on a Pentium II 200MHz for a run of three minutes, and that a rating increases by 60 points, when the computing time or speed is doubled, the resulting analytical strength of our test can be estimated to be performed by a program with a rating of over 3000, if no systematic errors are made. This allows us to raise the question: are the effects of insufficient knowledge and incorrect evaluations compensated by these favourable circumstances? For our experiments we used the last versions of four top-quality programs: combining the tactical wit of FRITZ 5.32, the solidity of HIARCS 7 and REBEL 10, and the creativity of M-CHESS 8. For the test we selected some problematic positions from the articles mentioned above. **Player to move** and **key moves** are given in bold.

3. SOME RESULTS

The powerful set-up allowed a new analysis of a **Kasparov**-Anand position (cf. Diagram 1). Kasparov had prepared the *positional sacrifices* (i.e., development sacrifices) 14. **Bc2** Qxc3 15. **Nb3**. In the game 15. ... Nxb3 16. Bxb3 Nd4 was played. Previously we assumed correctness and a lack of computing time to establish the correct key move (cf. Van Reek, Uiterwijk and Van den Herik, 1998). In the current experiment we were able to find 15. ... **Rd8**. The tactical justification is 16. Qh5+? g6 17. Bxg6+ hxg6 18. Qxh8 Nxb3 19. axb3 Qxa1 20. Qxf8+ Kxf8 21. Bh6+ Ke8 22. Rxa1 a5, and the endgame is favourable for Black. In *Chess Informant 64*, Kasparov mentions 16. **Bd2**. He rejects 16. **Qxe5** due to 17. Qg4, but this can be refuted by 17. ... Bd6 18. f4 (18. g3 0-0) 18. ... Qf6. A similar but stronger continuation is 17. **Re1** Qd5 18. **Qg4**. FRITZ found the combination 18. ... Ne5? 19. Rxe5 Qxe5 20. Re1 Qd5 21. Nxc5 Bxc5 22. Rxe6+ Be7 23. Rxe7+. Therefore Black should play 18. ... Nd4 19. Nxc5 Bxc5 20. Qxg7 Rf8 21. Bxh7 Rd7. Again the tactics by White lead to a

¹ De Erk 8, 6269 BJ Margraten, The Netherlands.

² Universiteit Maastricht, Department of Computer Science, Faculty of General Sciences, P.O. Box 616, 6200 MD Maastricht, The Netherlands. Email: {uiterwijk, herik}@cs.unimaas.nl

strategically poor ending: 22. Be4 Rxc7 23. Bxd5 Kd7 24. Bh6 exd5 25. Bxc7 Rf7 26. Be5 Nc2. After 22. Qg6+ Kd8 the difficult position arisen looks even. Hence as a test position, the position is not appropriate due to an inconclusive solution.

Kasparov – Anand
New York 1995



Diagram 1: New analysis.

Topalov - Shirov
Linares 1998



Diagram 2: Insufficient knowledge.

Anand - Ivanchuk
Las Palmas 1996



Diagram 3: Positional sacrifice.

In the famous endgame Topalov-**Shirov** (Diagram 2), Black won by 47. ... **Bh3** 48. gxh3 Kf5 49. Kf2 **Ke4** 50. Bxf6 d4 51. Be7 Kd3 52. Bc5 Kc4. The correct solution was not found by the chess programs (i.e., they did not find the first key move). For one or another reason, it seemed to remain behind the horizon of the potential computing depth. After two moves were carried out, all programs found the second key move. Apparently, the four programs overrated the value of Black's Bishop in an ending with Bishops of the opposite colour.

Positional sacrifices, leading to consolidation problems, are difficult to find by chess programs. In Diagram 3, all programs chose 14. Nc3. Additional information about the analysis by FRITZ5.32 revealed the following. The preferred choice was 14. Nc3 b5 15. Bc2 f5 16. Re2 bxc4 (rated at -0.56). This line **Anand** wanted to avoid on his birthday. A lower ranking got 14. **Rxh4** Qxh4 15. Qxh4 Nxh4 16. Nb6 Rb8 17. Bf4 Nf5 (rated at -0.72), the actual moves played in the game. When the second variation was entered on the board, the evaluation did not change. The ample compensation for the material loss was insufficiently recognized.

4. DISCUSSION

Finally, it is remarked that previous positive results of M-CHESS 7 for *blockade* and *positional sacrifices* could not be repeated for the other three programs (the positions P3, S11 and S12 in Van Reek, Uiterwijk, and Van den Herik, 1998). Our second obstacle mentioned above, insufficient opening and endgame knowledge, is still a main concern among chess programmers. For *prophylaxis*, we may have a glimpse of a solution in that Berliner (1999) mentions as the standard criteria: material, king safety, pawn structure, board control, development, piece placement, and mobility. These criteria are similar to a listing in Den Hertog and Euwe (1928). Indeed, they are also frequently used as main criteria in chess programs. However, the prophylactic advantages of *strengths of a blockader* (stopping a Pawn, being a hiding place for frontal attack, and being a restraint of hostile chessmen) and the particular importance of *control over one's own territory* are usually not included, except for M-CHESS 8. That may account for the difference in their behaviour and that should be changed.

5. REFERENCES

Berliner, H.J. (1999). *The System. A World Champion's Approach to Chess*. Gambit, London. ISBN 1 901983 10 2.

Hertog, H.J. den and Euwe, M. (1928). *Practische schaaklessen. IV*. Van Goor, Gouda.

Reek, J. van, Uiterwijk, J.W.H.M., and Herik, H.J. van den (1998). Planning a Strategy in Chess. *ICCA Journal*, Vol. 21, No. 3, pp. 183-192.

Reek, J. van (1999) Computerprogramma's en Strategie (2): een Gat in Schaakprogramma's. *Computerschaak*, Vol. 19, No. 1, pp. 8-9. (In Dutch).

Reek, J. van, and Uiterwijk, J.W.H.M. (1999). Computerprogramma's en Strategie (3): het tweede Gat in Schaakprogramma's. *Computerschaak*, Vol. 19, No. 2, pp. 21-23. (In Dutch).