Turing, Kasparov and the future

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TURING, KASPAROV AND THE FUTURE

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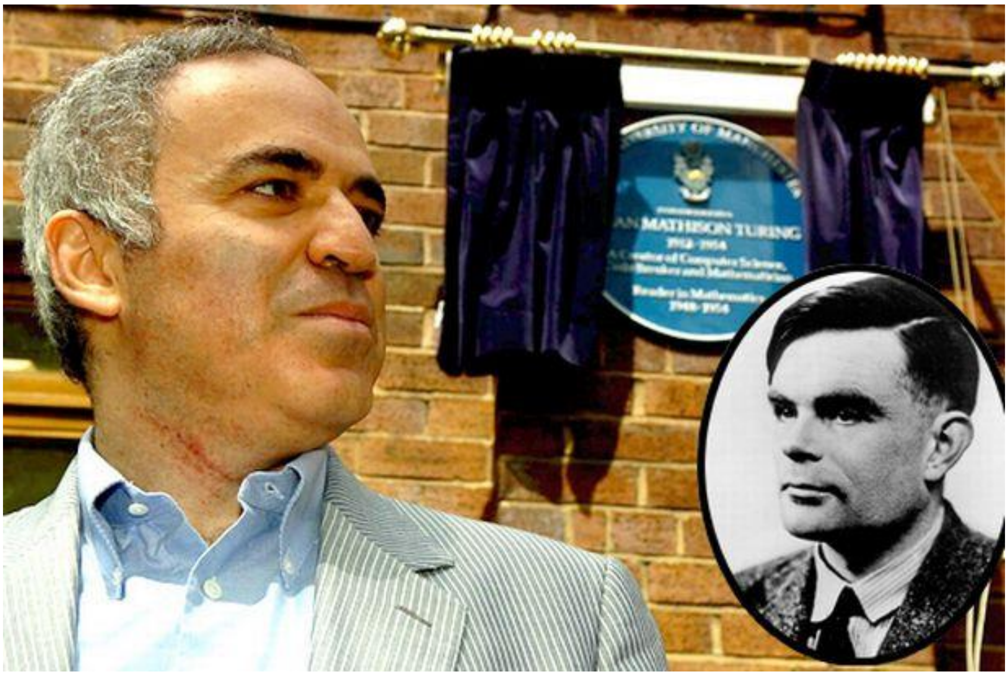
The ‘Turing 100’ conference (Manchester University, 2012) was held precisely 100 years after Alan Turing’s birth on the 23rd June 1912. It was the main event of the Turing Year organised by the Turing Centenary Advisory Committee, TCAC. Certainly the line-up was stellar, including (ACM, 2012) nine Turing Award winners (Fred Brooks, Vint Cerf, Edmund Clarke, Sir Tony Hoare, Don Knuth, Michael Rabin, Adi Shamir, Leslie Valiant, Andrew Chi-Chih Yao), not to mention amongst others David Ferrucci, Samuel Klein and Roger Penrose. The lectures are available on the web, have been frequently revisited and are strongly recommended.



Kasparov and the University of Manchester’s Alan Turing plaque (courtesy, Manchester Evening News)

Garry Kasparov was given the honour of unveiling the blue plaque commemorating Alan Turing, perhaps a pragmatic recognition that his name would be most familiar to the public. Kasparov’s (2012) popular talk was ostensibly to centre on the computer-based emulation of Turing’s second definition of a chess engine,[2] on a short game which he played against it, and on the Turing Test. In fact, his broader canvas considered the influence that computer chess had had on him, on the grass-roots game and on professional chess players. He also revealed, especially in the question session, his own perspective about chess and computers, past and future.

Kasparov noted that Goethe’s ‘Chess is the touchstone of the intellect’ certainly applied to Alan Turing who enjoyed playing the game, albeit with the advantage of heavy odds, against his much more capable colleagues at Bletchley Park.[3] Turing’s results over the board no doubt led him to consider his own thought processes and their mechanisation. Kasparov thanked Alan Turing for his contributions to computer chess which not only formulated familiar chess engine concepts (forward search, quiescence, mobility, King safety and static position evaluation) but which also made chess central to early thinking about Artificial Intelligence, learning and the Turing Test (Copeland, 2004; Isenberg, 2013). He conjectured that, had Turing lived longer, progress in computer chess would have been even more rapid: one could mention other domains of computation such as theorem-proving.[4]

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[2] The talk was mistakenly trailed and thus in places misreported as being focused on the first ‘chess engine’, TUROCHAMP, as defined by Turing and Champernowne. Copeland (2004) clearly distinguishes between two paper engines.

[3] Players included James Aitken, Hugh Alexander, Harry Golombek, Jack Good, Donald Michie and Stuart Milner-Barry.

[4] An excellent theorem-proving competition was run within Turing 100 by Geoff Sutcliffe of the University of Miami.

It is clear that Turing changed the world for all of us but created specific opportunities and challenges for Kasparov personally, leading to computers reaching world championship standard just as he became the world champion. Recognising that computers had been both a blessing and a curse, Kasparov fondly recalled 'the good old days of computer chess' when in 1985 he could play 32 machines simultaneously and win 32-0.[5] He mentioned that the computer, perhaps for the first time at world championship level, had helped find a novelty in 1995 - the rook-sac (17. Qg4) of the 10th game of his PCA match with Anand (Chessgames, 2013b), see Appendix 1.3. The computer contribution to the forthcoming Anand-Carlsen match will be interesting.

Ruefully, he recalled losing to IBM's DEEP BLUE in their second match and not getting a deciding match. He suggested that the real question now is 'On what basis would the best human players give the best computers a game when one slip might be enough to lose?' In net terms however, Kasparov was positive about the contributions of computers to chess and society: he did not see computers as 'the enemy' and looked forward to man-and-machine rather than man-v-machine. He referred to his Advanced Chess match with Topalov (Friedel, 1998) as an attempt to combine human intuition and brute-force to create the perfect game of chess.

Anticipating the following panel on the Turing Test, Kasparov referred to the early role of chess in the formulation and use of the test, and to (Friedel, 2001):

- the insertion of Thompson's BELLE into Pfleger's 1980 simultaneous event, see Appendix 1.2,
- Kasparov's identification of the BELLE game from five games of that simultaneous event, and
- the questioning of Allwermann's play at the Böblinger Open in 1999.

Kasparov sees the covert involvement of computers in what should be 'human chess' as a major problem for today, the negative side of man-and-machine. On the other hand, it is clear that databases of games, chess engines, the real-time analysis of top-level games, web services and AGON's recent tablet-based tournament interfacing application are all serving to raise playing standards and make chess more accessible, attractive and popular.

And so to the discussion of and game against the Chessbase 2004 'TURING' reification[6] of Turing's second specification of a chess engine, unnamed but named 'AT2' here. AT2 searched two ply and performed static evaluation of leaf positions after following lines to quiescence. It 'played' one game, via Turing's emulation, against Alick Glennie, see Appendix 1.1 which identifies ten apparent mistakes in Turing's arithmetic.

This is the 'Turing 100' game with comments by Kasparov, and by Frederic Friedel who supported on the day:

> TURING - Kasparov: **1. e3 Nf6 2. Nc3 d5 3. Nh3?** {GK: not the best move!} **e5 4. Qf3 Nc6 5. Bd3??** {FF post hoc: At two ply the engine cannot see the coming fork. At five ply, TURING plays 5. a4.} **5. ...e4 6. Bxe4 dxe4 7. Nxe4 Be7** {GH: waiting?} **8. Ng3 0-0** {GH: still waiting?} **9. 0-0 Bg4 10. Qf4 Bd6 11. Qc4 Bxh3 12. gxh3 Qd7 13. h4 Qh3 14. b3??** {FF: At five ply, TURING plays 14. f3 preventing the next move by Black.} **14. ... Ng4 15. Re1?** {FF: at five ply, TURING prevents immediate mate with 15. Qxg4} **15. ... Qxh2+ 16. Kf1 Qxf2#** 0–1.

Two questions arise. To what extent was Kasparov playing opponent-neutral, objectively-best chess and to what extent was he playing on TURING's known weaknesses? How quickly can one, playing White or Black, beat a fallible TURING searching forward a nominal *n*-plies? Responses to the author are invited. The game sets the bar at 32 plies for 'Black/2'. Chessbase (2012) reported that TURING had lasted 27 and 30 moves the previous evening when searching 5-ply but gave no profile of figures for other search-horizons.

Kasparov is to be congratulated for seeing computer chess in the broader context of Turing's basic question 'What can computers do?' He sees WATSON as a greater achievement than DEEP BLUE, and like Picasso challenges us to ask the right questions for computers to answer. There are many more games and model-worlds to conquer.

References

ACM (2012). A.M. Turing Award winners. http://amturing.acm.org/byyear.cfm

Chessbase (2012). 'Turing 100'/Kasparov report and discussion/download of Turing's Engine. http://www.-chessbase.com/newsdetail.asp?newsid=8283.

Chessgames (2013a). The 32 Kasparov-computer games of the Hamburg, 1985 simultaneous display.

[5] Hamburg (Kasparov, 2010; Chessgames, 2013a): some games posed problems and/or lasted longer than 70 moves.
[6] Created, extended, by Mathias Feist - assisted by Ken Thompson when TURING did not reproduce Turing's own choices.

Chessgames (2013b). Kasparov-Anand, Game 10. http://www.chessgames.com/perl/chessgame?gid=1018625

Copeland, J. (2004). The Essential Turing, esp. Chapter 16, pp. 569-575.

Friedel, F. (1998). Advanced Chess by Kasparov and Topalov. ICCA Journal, Vol. 21, No. 2, pp. 126-130.

Friedel, F. (2001). Cheating in Chess. In: Advances in Computer Games 9, pp. 327-346. (ed. H. J. van den Herik and B. Monien). IKAT, Maastricht, The Netherlands.

Isenberg, G. (2013). Alan Turing: chess programmer. http://chessprogramming.wikispaces.com/Alan+Turing.

Kasparov, G. (2010). The Chess Master and the Computer: a review of *Chess Metaphors: Artificial Intelligence and the Human Mind* by D. Rasskin-Gutman. New York Review of Books, Feb. 11th.

Kasparov, G. (2012). Alan Turing's Paper Machine. The Turing 100 Conference, Manchester. http://videolectures.net/turing100_kasparov_friedel_paper_machine/.

Manchester University (2012). Turing 100: The Alan Turing Centenary Conference, June 22-25, 2012. http://www.turing100.manchester.ac.uk/.

Appendix 1: the cited games

A1.1 Turing as engine 'AT2' v Glennie (1951)

The TURING rendition by Chessbase of 'AT2', Turing's second definition of a chess engine, varies from Turing's choices ten times – on moves 1, 4, 5, 15, 17, 19, 20, 22, 23 and 26.

(ECO C26) **1. e4** {TURING 1. e3. Kasparov referred to 'e4' as possibly the first case of human interference in a computer's play} **1... e5 2. Nc3 Nf6 3. d4 Bb4 4. Nf3?** {TURING 4. dxe5} **4... d6 5. Bd2** {TURING 5. Bg5} **5... Nc6 6. d5 Nd4 7. h4 Bg4 8. a4 Nxf3+ 9. gxf3 Bh5 10. Bb5+ c6 11. dxc6 O-O 12. cxb7 Rb8 13. Ba6 Qa5 14. Qe2 Nd7 15. Rg1** {TURING 15. Rh3} **15... Nc5 16. Rg5 Bg6 17. Bb5** {TURING 17. h5} **17... Nxb7 18. O-O-O Nc5 19. Bc6** {TURING 19. Be3} **19... Rfc8 20. Bd5** {TURING 20. Bb5} **20... Bxc3 21. Bxc3 Qxa4 22. Kd2** {TURING 22. Qe3} **22... Ne6 23. Rg4** {TURING 23. Bb3} **23... Nd4 24. Qd3 Nb5 25. Bb3 Qa6 26. Bc4** {TURING 26. Rg5} **26... Bh5 27. Rg3 Qa4 28. Bxb5 Qxb5 29. Qxd6 Rd8 30. Rxg7+** 0-1.

A1.2 Pfleger v BELLE (1980)

Pfleger was only asked afterwards if he noticed anything about this game, which he did not. Similarly, Kasparov was asked later by Friedel to identify the one participating computer from five of Pfleger's games. Thus, neither of these 'tests' was strictly a chessic Turing test. Kasparov correctly and instantly identified Black here as the computer, not because of excellence on its part but because the human players made simple errors which a computer of the time would not make. Note that Pfleger still had a win at move 58 and a draw at move 62.

(ECO D10) **1. d4 d5 2. c4 c6 3. cxd5 cxd5 4. Nc3 Nc6 5. Nf3 Nf6 6. Bf4 Bf5 7. e3 e6 8. Bb5 Nd7 9. 0-0 Be7 10. Qe2 Rc8 11. Rac1 Bg4 12. h3 Bh5 13. g4 Bg6 14. Ne5 Ndxe5 15. Bxe5 O-O 16. Bg3 f5 17. Bd3 Bd6 18. f4 Bb4 19. g5 Qe8 20. a3 Bh5 21. Qd2 Ba5 22. b4 Bb6 23. Kh2 Rf7 24. Nb5 Rd7 25. a4 a5 26. bxa5 Bxa5 27. Qb2 Bb4 28. Be1 Bxe1 29. Rfxe1 Qd8 30. Qa3 Bf3 31. Kg3 Bh5 32. Rc2 Qa5 33. Rec1 Ra8 34. Nd6 Qxa4 35. Qxa4 Rxa4 36. Nxb7 Rxb7 37. Rxc6 Ra3 38. R1c3 Rxc3 39. Rxc3 h6 40. h4 Kf8 41. Ba6 Rb6 42. Bf1 hxg5 43. fxg5 g6 44. Kf4 Ke7 45. Ke5 Bf3 46. Rc7+ Kd8 47. Rg7 Bh5 48. Ra7 Bf3 49. Ba6 Bg2** {Ken Thompson was ready to resign for BELLE: 50. h5 is crushing} **50. Ra8+? 50... Kc7 51. Bc8?** {h5 still wins here or on the next move} **Rb3 52. Kf4?= e5+ 53. Kxe5 Rxe3+ 54. Kf6 f4 55. Be6 Kb6 56. h5 gxh5 57. g6 f3??** (57. … Rg3 58. g7 f3 59. Bxd5 f2 60. Bxg2 Rxg2=) **58. Bxd5?** (58. g7! wins f2 59. g8=Q f1Q+ 60. Bf5 Qf4 61. Qd8+ Qc7 62. Rb8+ Kc6 63. Rc8) **Bh1 59. Ra1 f2 60. Rb1+ Kc7 61. Bxh1 Re1 62. Bg2??** (62.Rb7+ =) **Rxb1 63. g7 Rg1?** (63. … f1=Q+ wins more clearly) **64. g8=Q** {BELLE sees h1=Q ahead} **f1=Q+ 65. Bxf1 Rxg8 66. Bh3 Kd6 67. d5 h4 68. Be6 Rg3** 0-1.

A1.3 Kasparov v Anand: game 10 (1995)

This is Kasparov's early example of a line prepared with computer help (Chessgames, 2013b):

(ECO C80) **1.e4 e5 2.Nf3 Nc6 3.Bb5 a6 4.Ba4 Nf6 5.O-O Nxe4 6.d4 b5 7.Bb3 d5 8.dxe5 Be6 9.Nbd2 Nc5 10.c3 d4 11.Ng5 dxc3 12.Nxe6 fxe6 13.bxc3 Qd3 14.Bc2 Qxc3 15.Nb3 Nxb3 16.Bxb3 Nd4**[7] **17.Qg4!** {'deep' in some computer searches} **Qxa1 18.Bxe6 Rd8 19.Bh6 Qc3 20.Bxg7** {all played by White in 6 minutes} **Qd3 21.Bxh8 Qg6 22.Bf6 Be7 23.Bxe7 Qxg4 24.Bxg4 Kxe7 25.Rc1 c6 26.f4 a5 27.Kf2 a4 28.Ke3 b4 29.Bd1 a3 30.g4 Rd5 31.Rc4 c5 32.Ke4 Rd8 33.Rxc5 Ne6 34.Rd5 Rc8 35.f5 Rc4+ 36.Ke3 Nc5 37.g5 Rc1 38.Rd6** 1-0.

[7] Position 17w is r3kb1r/2p3pp/p3p3/1p2P3/3n4/1Bq5/P4PPP/R1BQ1RK1 w kq - 0 17.