THOMPSON'S NEW DATA-BASE RESULTS

As reported by
I.S. Herschberg and H.J. van den Herik
Delft University of Technology
The Netherlands

We have it on good authority that, in the last months of 1985, Kenneth L. Thompson has completed construction of several more 5-piece endgame data bases. After his KBBKN breakthrough, the 1983 Turing Award winner has succeeded in penetrating ever deeper into the mysteries of complex endgames. In doing so, he presented us with an impressive number of new maximin solutions, previously unknown and not even suspected in the literature. It is a wry comment that, precisely by doing so, he provided the chess world with at least as many questions unsolved as with new solutions. His results sharpened the paradox that, while a data base may 'know' everything, it may explain precisely nothing and has no revelations to offer even to a grandmaster. He has succeeded in multiplying the number of moves and variations which are optimal but ununderstandable to any.

In a recent electronic mail message to the Editor, Thompson intimated: "I will write it up". Taken at face value this would involve that Thompson would finally see his name included in an endgame-data-base bibliography, a feat he has studiously avoided up to now. In the interim, giving due thanks to John Roycroft who was Thompson's guest during much of the time span involved, we are in a position to reveal some of the results of Thompson's research. Admittedly, this publication is preliminary only: many of the fascinating details must be deferred. Our readers must be left in uncertainty about Thompson's program design, his representation, his storage requirements and run times. For the time being, we are left equally in the dark about most endgames' characteristics (won, won*, drawn*, as well as the preciser q and $\bar{q}$), let alone about samples of maximins and lines of optimal play.

This short contribution should be regarded as a provisional sequel to our 'A Gauge of Endgames' (ICCA Journal, Vol. 8, No. 4, pp. 225-229), with the additional caution that our report, being at one or two removes, can never have the authority of a first-hand publication.

Let us present the results as far as known to us in tabular form below.

ENDGAME	RESULT	MAXIMIN
KQKBB	drawn* ♭	71 to conversion into KQKB
KQKBN	drawn*	42 to conversion into KQKB or KQKN
KQKNN	drawn* ♭	63 to conversion into KQKN
KQQKQ	won*	30 to mate
KQRKQ	won* ♭	67 to mate
KQBKQ	drawn*	33 to mate
KQNKQ	drawn*	41 to mate
KRRKR	won*	31 to mate

Table 1: Thompson's New Endgame Results.

A few words of comment on Table 1 may be in order. The first line, for example, should be read to mean that in the majority of cases the endgame is drawn. Should the initial configuration be, however, among the minority won for White, conversion into the simpler KQKB endgame may at worst require 71 moves. Since such a line of play would violate the obnoxious 50-move rule, it follows that in this worst case and many others, Black could claim a draw in what is essentially a lost position, had it not been for the sad artifice of this rule. Such a circumstance when occuring is indicated by the sign '♭'. Thompson's KRPKR and KQRKR results are not available to us at this writing.

The KQPKQ endgames

The above endgames have been fairly straightforward and, during the data-base construction, the positions of the men could be successfully abstracted from. This simplicity is lost when both a Queen and a Pawn appear on the stronger side while the defender possesses a Queen. It turns out that maximins are then critically dependent on the Pawn's position and the optimal solutions break down into a veritable plethora of particular cases. It is remarkable in Table 2 below that the maximins may range from as few as 17 up to as many as 71 moves, all according to the White Pawn's initial square. The best characterization of KQPKQ probably is drawn*. However, there are so many won positions that they merit close study. Table 2 concentrates on these cases. Of course, it should be read so as to imply reflection symmetry in the vertical mid-line.

PAWN SQUARE	MAXIMIN	PAWN SQUARE	MAXIMIN	PAWN SQUARE	MAXIMIN	PAWN SQUARE	MAXIMIN
a2	17	b2	31	c2	47	d2	41
a3	20	b3	51 ‡	c3	53 ‡	d3	53 ‡
a4	29	b4	30	c4	47	d4	64 ‡
a5	33	b5	38	c5	43	d5	45
a6	71 ‡	b6	61 ‡	c6	46	d6	58 ‡
a7	70 ‡	b7	55	c7	43	d7	42

Table 2: Thompson's New Results for the KQPKQ Endgame.

We reiterate that all data refer to the subclass of won positions only, notwithstanding this being an endgame which is estimated to be more often drawn than won. Moreover, the maximins tabulated refer to the worst-case number of moves up to some conversion. We must consider three types of conversion:

- into an endgame with the Pawn on the next square, with, as a special case, an endgame with the Pawn on the next-but-one square, which may occur only when the Pawn is on s2 (s standing for any file);
- into an endgame not in Table 2, when the Pawn is initially on s7;
- into the KPK endgame.

It is worthwhile stressing that maximins are non-additive. Notably, in our case it may not be implied that starting from a position with a Pawn on c6, 46 + 43 = 89 moves are necessary to the worst-case win. In all probability, conversion from Pawn c6 to Pawn c7, even if that conversion is worst-case at 46 moves, will not lead into a KQP(c7)KQ which is worst-case too. A similar remark applies when the conversion from KQP(c6)KQ is into a fewer-pieces endgame.

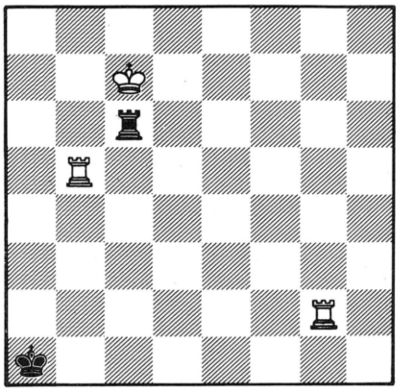
The 50-move rule reconsidered

It will be noted that Thompson's new results have led again to the discovery of endgames in Table 1 for which the 50-move rule is iniquitous to the stronger side. Moreover, Table 2 indicates that even finer distinctions should be made: considering KQPKQ generically, its maximin is 71 and therefore this endgame seems a candidate for the relaxation of this rule. However, surveying Table 2 indicates, on the contrary, that only nine specific cases justify such a relaxation. What is now, one might ask, a just cause for relaxation? Should it be based on the generic endgame or on the case distinctions discovered?

A sample play

Finally, we present an example of mutually optimal play starting from a maximin position in KRRKR (Roycroft, 1986, due to Thompson).

1. Kd8 Rd6+ 2. Ke7 Re6+ 3. Kf8 Rf6+ 4. Kg7 Rf7+ 5. Kh8 Rh7+ 6. Kg8 Rh8+ 7. Kf7 Rf8+ 8. Ke6 Rf6+ 9. Kd5 Rf5+ 10. Kc4 Rf4+ 11. Kc3 Rc4+ 12. Kd2 Rd4+ 13. Ke1 Rd1+ 14. Ke2 Re1+ 15. Kf3 Re3+ 16. Kf4 Rf3+ 17. Kg5 Rf8 18. Rg4 Ra8 19. Kf5 Ka2 20. Rd4 Ka3 21. Ke4 Rh8 22. Kd3 Rh1 23. Kc2 Rh2+ 24. Kc3 Rh3+ 25. Rd3 Rxd3+ 26. Kxd3 Ka4 27. Kc4 Ka3 28. Rb6 Ka2 29. Kc3 Ka1 30. Kc2 Ka2 31. Ra6 mate.



White: Kc7 Rb5 Rg2;

Black: Ka1 Rc6;

White to move.

Acknowledgements

The writing of this note would have been impossible but for a prior publication by Roycroft in L'Intelligenza Artificiale Ed Il Giocco Degli Scacchi (14-15 March 1986) III° Convegno Internazionale. Also, subsequent private communications from Thompson and Roycroft have been essential and are gratefully recognized.

Photo by L. Lindner

A PANEL PONTIFICATING,
Milan in March.
Left to right: Barbara Pernici, Marco Somalvico,
Jacques Pitrat and Jaap van den Herik.