HAWORTH’S LAW

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The latest ‘Depth to Mate’ results from the Lomonosov team (Zakharov, 2013) find a maxDTM 7-man wtm win in KQPKRBN of 1,097 plies, i.e., of 549 winner’s moves. They therefore add one data point to an already suggestive trend of log(maxDTM) against k, the number of men on the board. Figure 1 is a plot of the data (Haworth, 2013) showing the actuals for 3- to 7-man chess, the best least-squares linear fit to these points, and the extrapolation of that ‘fit’ to 10-man chess with 2σ, 97% probability, confidence levels.

Here are some of the conjectures which may be made, using the following notation:

\[ E = WB, \text{ an endgame with White force } W \text{ and Black force } B, \]
\[ Em = WinBm, \text{ endgame } E \text{ with man } m \text{ added to both sides,} \]
\[ \text{maxDTM}(E) = \text{the maximum DTM in plies of the White wins in } E \text{ (’0’ if there are no wins),} \]
\[ \text{maxDTM}(k) = \max \{ \text{maxDTM}(E) \mid E \text{ is a } k \text{-man endgame} \} \]

1) if \( k \geq 3 \), \( \text{maxDTM}(k+1) > \text{maxDTM}(k) \),
2) if \( k \geq 3 \), a maxDTM \( k \)-man position \( p_k \) may be modified to a position \( p_{k+1} \) with greater DTM depth:
   the side which does not have the move may often be imagined to have just captured a man,
3) if \( k \geq 3 \), there is a \( k \)-man endgame \( E \) and man \( m \) such that \( \text{maxDTM}(Em) \geq \text{maxDTM}(E) \),
4) the linear trend above will continue for some time, i.e., ‘Three more men: maxDTM times ten!”

With Moore’s Law in mind, the last conjecture was dubbed Haworth’s Law, as it were, en passant by a visiting Thomine Stolberg-Rohr WFM. It is certainly a prediction like Moore’s Law rather than a provable, physical law. However, it is not a self-fulfilling prophecy as many argue Moore’s Law is. The rules of the game have determined those deep wins and losses already. For 8/9/10-man chess, the model gives a 50% probability of decisive results in 2400°/5220°/11340° plies and 2σ-predictions of results in 1810°/3940°/8570° plies. It gives a 90% probability of an 8m result in 2000° plies and an 80% probability of a 10m result in 10000° plies. The model at least challenges us to consider why this might be and how long the trend will continue.

References


1 The University of Reading, Berkshire, UK, RG6 6AH, email: guy.haworth@bnc.oxon.org.
2 The best-fit quadratic polynomial reduces the ‘linear’ residual error by only 6% and gives even higher predictions for the 8/9/10-man maxDTM. The best cubic and quartic fits clearly give overfitted models which are not credible.