MICROCOMPUTER CHESS: HAS IT REACHED A NEW MILESTONE?

ICCA Communication
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Recent advances in hardware architecture have resulted in yet another leap for microcomputer chess. Formerly stymied at approximately the class A level (USCF rating 1800 to 2000), there is strong evidence to support the contention that there now exist commercially available microcomputer-chess machines that break into the candidate-master category (USCF rating 2000 to 2200), and perhaps even low master category (USCF 2200). This article supplies data to support the above assertion.

On the weekend of February 14th and 15th, 1987, the U.S. Amateur Team Tournament was held in Pasadena, California. This particular event allows teams of four players to play a six-round Swiss-style tournament. The computer manufacturer Novag entered four of its commercially available machines. The Novag machines were Super Constellation (at 6.0 Mhz), Forte (at 5.5 Mhz), Expert (at 6.0 Mhz), and Turbo (at 16.0 Mhz). Two of these machines, Super Constellation and Expert, are well-known and have been available to the public for quite some time. The other two entries, Forte and Turbo, represent fairly recent additions to Novag's product line.

The result of the tournament was interesting. In the table reproduced below, the data represent the result of the outcome from the machine's point of view and the rating of the opponent.

<table>
<thead>
<tr>
<th>Board Number</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round Numbers</td>
<td>Expert</td>
<td>Turbo</td>
<td>Super-C</td>
<td>Forte</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1615</td>
<td>1</td>
<td>1820</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>2396</td>
<td>1</td>
<td>2117</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>2369</td>
<td>1</td>
<td>2108</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>2217</td>
<td>1</td>
<td>2126</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2115</td>
<td>1</td>
<td>1908</td>
</tr>
<tr>
<td>6</td>
<td>½</td>
<td>2071</td>
<td>1</td>
<td>2057</td>
</tr>
</tbody>
</table>

TOTAL SCORE: 2½ 6 2 3
Average Rating of Opponents: 2130 2023 1989 1927
Performance Rating of Machine: 2072 2423 1872 1927

Some additional information is useful in evaluating this table. (1) Turbo was placed on board 2 rather than board 1 due to its being an experimental machine with relatively little previous practical experience on which to judge its strength. (2) Against master opponents, no points or half-points were won. But only three such games were played, all by the Expert. (3) Against expert opponents, in twelve games, a total of eight points were won for a winning percentage of 67%. (4) Against lower-rated opponents, a total of ten games were played and six points were won, for a total winning percentage of 60%. (5) Forte's result may be understated because of time-control problems resulting from one person operating all four machines at once.

The most remarkable result of this tournament, obviously, belongs to the Turbo, an advanced, bitsliced, 6502-based processor-design that is now commercially available. Bit-slicing involves the redesign of single processors using multiple, faster chips. Turbo's six-win clean sweep against strong opposition is remarkable. This machine has also played a 10-game speed match against USCF Senior Master Jeremy Silman and won 7.5 to 2.5 against him.
In evaluating the Turbo’s result and estimating its strength, it is important to realize that it is exactly four times as fast as the original 4 Megahertz version of the Novag Expert. Additionally, it searches approximately 3000-4000 chess positions per second. The author performed a test that showed the Turbo searched the opening position of a chess game to a depth of six ply exactly four times as fast as the Expert which ran at 4 Megahertz, thus confirming the manufacturer’s claims.

A rough rule-of-thumb by chess researchers over the years is that if a machine doubles in processor speed, an approximate 100 point rating increase will result. This relationship is true in the range up to 2000 rating points. According to some later results, the increase is not quite 100 points for ranges beyond 2000 rating points. However, this is a point of contention among researchers and there is no general agreement. For our purposes, 100 points per doubling is a good estimate. Since the Turbo is four times as fast as the Expert, one would expect it to be perhaps 200 points stronger, a full class.

The Novag Expert 4 Mhz is rated on the Swedish Rating List (published in the ICCA Journal, Vol. 9, No. 4, December 1986) as having an ELO rating of 1845, based on 371 games played against human competition, with the Novag Expert 4 Mhz holding a 52% edge against opponents who had an average rating of 1831. This would roughly correspond to a USCF rating of 1945 and corresponds with my own evaluation of the Novag Expert in a twenty-game match between it and myself. The Expert showed an approximate 90% winning percentage over me, a provisionally-rated player of 1553. This translates to a rating of 1919, closely approximating the Swedish rating. Also, the latest USCF rating of the Expert 6 Mhz (50% faster than the Expert 4 Mhz) is 2106.

Since the Expert 4 Mhz is rated as a strong A player (USCF 1919-1945), we can now calculate the estimated rating of the Turbo as one full class ahead of the Expert 4 Mhz. This would translate to a USCF 2119-2145 rating, strong candidate master, an excellent result for the Turbo. Turbo’s programmer, David Kittinger, estimates that Turbo is a "weak master" based on master results of a less-speedy version of the commercially available Turbo. His estimate, while somewhat higher than our own, is reasonable. Additional tournament results for the Turbo will supply a more definite rating. At the very least, Turbo (along with Mephisto’s top-of-the-line machine) is the strongest commercially-marketed machine ever.

We now reproduce the six games played by the Turbo at the Pasadena tournament.

**Round 1, Hwang (White) vs. Novag Turbo (Black), USCF 1820**

**Round 2, Novag Turbo (White) vs. Pell (Black), USCF 2117**

**Round 3, Saints (White) vs. Novag Turbo (Black) USCF 2108**
Round 4, Novag Turbo (White) vs. Ludwinski (Black), USCF 2126

Round 5, Parrott (White) vs. Novag Turbo (Black), USCF 1908

Round 6, Novag Turbo (White) vs Hodges (Black), USCF 2057

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