JULY 81

MICRO CHESS

Compiled by Kevin O'Connell

BELLE, BELLER, BELLEST

I find it hard to accept that Belle, the World Computer Chess Champion, is a micro. However, Belle's principal creator, Dr Ken Thompson of Bell Labs (and Unix fame), argued tenaciously that it might reasonably be considered to be so. This raises some important questions on which I would like to hear your views; for the purpose of a chess tournament, what *is* a micro? However, for the sake of argument and so that I can tell you something about the World Computer Champion in this column, let's accept Dr Thompson's argument.

Those who attended the recent conference on Advances in Computer Chess at Imperial College heard Dr Thompson talk about his chess machine. Since most of you were not present, here are some of the details which he revealed.

Belle is now in its (her?) third generation. The original Belle was a small piece of special hardware which was a good enough player to finish equal fourth in the World Computer Championship in Toronto in 1977. Finishing 1½ points behind the winner (Chess 4.6) in a four-round tournament seems to have acted as a spur to Dr Thompson.

The second incarnation of Belle followed about a year after the Toronto tournament and again took the form of special chess hardware (LSI/11, move generator, move evaluator and associated memory). This hardware, with 256k main memory and 1 Mbyte of 'associated memory' (used for storing a look-up table of about 100k chess positions) performed quite well and achieved a respectable rating of 1900 on the World Chess Federation scale.

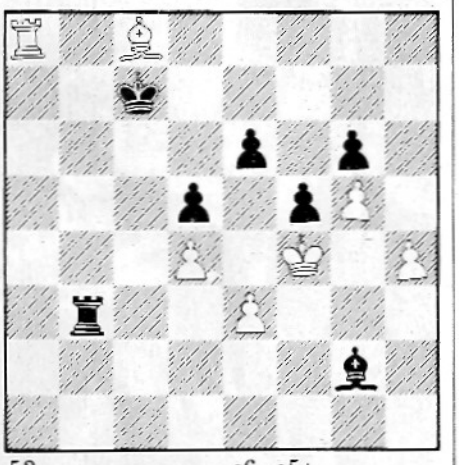
It is, though, the third machine, which adds a PDP-11 and a 35 Mbyte Winchester (used principally for the openings book of 300k positions) to the special hardware, that has attained formidable strength and which won the World Championship in Linz last year. The rough chronology of its development during 1980 was: February — basic design; May — finalisation of design; June — construction; July — development; 20 July — the machine made its first half-move; at the beginning of August it played its first game, losing to the old Belle program; 6 August — it beat the old program convincingly; 8 August — first games played against a human opponent, winning two games of '30-30' (each player has 30 minutes' thinking time to make 30 moves) against a master strength player; late August — played its first tournament in preparation for Linz; September — program still being debugged and it played its second tournament since when the program has not changed significantly (erasing and blowing 256 PROMs is something of a deterrent to fixing even major bugs).

At the end of last September, Belle tied for first place in the World Computer Championship in Linz and then won the play-off match against 'Chaos'. Since then, Belle has had a series of considerable successes, including scoring 1½ out of 2 in 30-30 games against the internationally known US master Mike Valvo and taking second place in a human master tournament (albeit a very weak one). Belle's current rating on the world scale is 2140, but its performances in the last year have been running at about 2320 — and that is better than several of the world's 300 or so active International Masters.

That is an amazing achievement for a pure brute force program, even analysing 160,000 nodes per second. No less amazing is the following game played on 9 August last year, less than a week after the program started playing. The West German Grandmaster Helmut Pfleger (one of the 100 or so best players in the world) was given a simultaneous display against 26 opponents, apparently all humans, for German TV. It turned out, however, that one of the humans was relaying moves to and from a telephone line to Bell Labs in New Jersey.

White: Helmut Pfleger (rating 2525)
Black: Belle (rating 1900)

1.	d2–d4	d7–d5
2.	c2–c4	c7–c6
3.	c4xd5	c6xd5
4.	Nb1–c3	Nb8–c6
5.	Ng1–f3	Ng8–f6
6.	Bc1–f4	Bc8–f5
7.	e2–e3	e7–e6
8.	Bf1–b5	Nf6–d7
9.	0–0(Ke1–g1)	Bf8–e7
10.	Qd1–e2	Ra8–c8
11.	Ra1–c1	Bf5–g4
12.	h2–h3	Bg4–h5
13.	g2–g4	Bh5–g6
14.	Nf3–e5	Nd7xe5
15.	Bf4xe5	0–0(Ke8–g8)
16.	Be5–g3	f7–f5
17.	Bb5–d3	Be7–d6
18.	f2–f4	Bd6–b4
19.	g4–g5	Qd8–e8
20.	a2–a3	Bg6–h5
21.	Qe2–d2	Bb4–a5
22.	b2–b4	Ba5–b6
23.	Kg1–h2	Rf8–f7
24.	Nc3–b5	Rf7–d7
25.	a3–a4	a7–a5
26.	b4xa5	Bb6xa5
27.	Qd2–b2	Ba5–b4
28.	Bg3–e1	Bb4xe1
29.	Rf1xe1	Qe8–d8
30.	Qb2–a3	Bh5–f3
31.	Kh2–g3	Bf3–h5
32.	Rc1–c2	Qd8–a5
33.	Re1–c1	Rc8–a8
34.	Nb5–d6	Qa5xa4
35.	Qa3xa4	Ra8xa4
36.	Nd6xb7	Rd7xb7
37.	Rc2xc6	Ra4–a3
38.	Rc1–c3	Ra3xc3
39.	Rc6xc3	h7–h6
40.	h3–h4	Kg8–f8
41.	Bd3–a6	Rb7–b6
42.	Ba6–f1	h6xg5
43.	f4xg5	g7–g6
44.	Kg3–f4	Kf8–e7
45.	Kf4–e5	Bh5–f3
46.	Rc3–c7+	Ke7–d8
47.	Rc7–g7	Bf3–h5
48.	Rg7–a7	Bh5–f3
49.	Bf1–a6	Bf3–g2
50.	Ra7–a8+	Kd8–c7
51.	Ba6–c8	Rb6–b3
52.	Ke5–f4	



52.	...	e6–e5+
53.	Kf4xe5	Rb3xe3+
54.	Ke5–f6	f5–f4
55.	Bc8–e6	Kc7–b6
56.	h4–h5	g6xh5
57.	g5–g6	f4–f3
58.	Be6xd5	Bg2–h1
59.	Ra8–a1	f3–f2
60.	Ra1–b1+	Kb6–c7
61.	Bd5xh1	Re3–e1
62.	Bh1–g2	Re1xb1
63.	g6–g7	Rb1–g1
64.	g7–g8Q	f2–f1Q+
65.	Bg2xf1	Rg1xg8
66.	Bf1–h3	Kc7–d6
67.	d4–d5	h5–h4
68.	Bh3–e6	Rg8–g3

White resigns.

Whether or not Belle should be counted as a micro, the micro chess machines are making great progress. One of the mini-micros that I am associated with, the Chess Champion Mk V, played a couple of games against the second-generation Belle during the computer conference, winning one and drawing one, which establishes that at about 1900, and the new Morphy machine from ACI is close behind — Danny Kopec, another speaker at the conference, assessed its rating at about 1850.

The 2nd European Microcomputer Chess Championship

Don't forget — the Second European Microcomputer Chess Championship

GOTO page 157

bers in three 8-bit bytes (12x2=8x3). Thus:
1. Store the wholly used byte of the first number.
2. Store the wholly used byte of the second number.
3. Assemble the two remaining 4-bit sections into one byte.
4. Store the assembled byte.

The process is reversed when the stored data are later retrieved.

I am not familiar with Basic, so I cannot suggest any byte assembly/disassembly routines in that language, but the code in Figure 1 should run on a PET, or any other 6502 machine.

Derek Moody, Dorchester, Dorset

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Code    Mnemonic
AD      LDA     ;To assemble two 4-bit remainders held in
YZ      YZ      ;address WXYZ (any location)
WX      WX      ;and address STUV into one byte,
29      AND     ;and put the result into WXYZ.
0F      0F
0A      ASL     ;ie, if WXYZ contains 05
0A      ASL     ;   and STUV contains 0A
0A      ASL     ;after running
0A      ASL     ;   WXYZ contains 5A
8D      STA
YZ      YZ
WX      WX      ;This subroutine is relocatable, and
AD      LDA     ;WXYZ and STUV may be anywhere in memory.
UV      UV
ST      ST
29      AND
0F      0F
18      CLC
6D      ADC
YZ      YZ
WX      WX
8D      STA
YZ      YZ
WX      WX
60      RTS     ;Return to calling routine.

Code    Mnemonic
AD      LDA     ;To disassemble the byte held in WXYZ and put the
YZ      YZ      ;results into addresses WXYZ and STUV.
WX      WX
AA      TAX     ;ie, if WXYZ contains B6.
29      AND     ;   After running,
F0      F0      ;      WXYZ contains 0B
4A      LSR     ;   and STUV contains 06
4A      LSR
4A      LSR
4A      LSR
8D      STA
YZ      YZ
WX      WX
8A      TXA
29      AND
0F      0F
8D      STA
UV      UV
ST      ST
60      RTS     ;Return.
```

MICROCHESS

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will be held as part of the Fourth *Personal Computer World* Show at the Cunard Hotel, Hammersmith, London, 10-12 September.

The closing date for entries is 15 August 1981, although entries may be accepted after that date at the discretion of the organising committee.

Confirmation of acceptance or rejection of entries will be made known by 25 August 1981.

The full rules were published in the June 1980 *PCW*.

All queries regarding the competition shall be addressed to: Second European Microcomputer Chess Championship, *Personal Computer World*, 14 Rathbone Place, London W1P 1DE.

CALCULATOR CORNER

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an analysis of the flow structure shows that the reverse sequence will execute faster, providing $p(A+B+2C) > 2A+D$.

The beauty of Figure 3(b) is that if we modify the steps INV DSZ, GOTO 0 by replacing them with INV DSZ, INV N0P, MR0, INV x = 0, then the loop GOTO 0/LBL 0 will be followed once only and the reverse sequence will be faster if:

$p(A+B+2C) > A$ as $p \rightarrow 1$ this will invariably hold.

Operation	Execution time in seconds 10,000 steps	Comments
INV N0P	27.0	
+	123.2	1 + + = = ...
X	200.3	1 x x = = ...
Min 0	89.2	1 Min 0 . . . . .
MR 0	64.0	
M+0	167.2	1 M+0 . . . . .
GSB	10.7	Read time 10,000 steps
GOTO	11.8	Read time 10,000 steps

Fig 4. Comparison of execution and read times.

TOM'S TANDY PROBES PRANGS

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would be possible for the program to be made available to insurance companies, probably on a time-sharing system, so that he can keep control over changes and updates without getting into immense administration hassles. In this way, insurance clerks would be able to check claim forms as they come in. The system could easily be modified to talk in terms of 'wet tarmac' instead of 'a coefficient of friction of 0.5', making things far more user-friendly.

And Tom knows that exactly the same principles could be applied to any sort of disaster, including shipping and aeroplanes. The potential to make a fortune there must be vast, but Tom's overriding concern is to have just enough money coming in so that he can continue his vital research into road safety. He tells me that when you've dug a few people out of crashes, all the fortunes in the world seem rather irrelevant.

SECRETS OF SYSTEMS ANALYSIS

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be careful to store paper records properly and take copies of anything which might get lost; well, now you have to do this with your data files. You've probably forgotten by now that you had to learn how to look after paper with things written on it. Kids know that by the time they get to school. You'll remember learning about how to file bits of paper, even if you did find it a bit of a bore. Looking after computerised data is actually easier, even though you can't see what's happened to the data by looking at the disk.

Next month

Next month will be the final installment, covering the monitoring of a system in operation and listing a whole lot of books that you might like to read.

BLUDNERS

Beat you to it this month — page 104. fourth paragraph: there are many hundreds of possible states in noughts and crosses but not during the course of a single game. And the Acorn Atom Maze program published in April: lines 248, 256, 266 contain characters which look like colons (:) should be inverse backslashes. Finally, last month's UK101 Zor, line 180, contains POKE L — 44,96, but the minus sign didn't reproduce clearly on some copies.