

PATTERNS

quoted values. For example, from Table 2, only 1 percent of the tests should have a result below 69.2, while only 1 percent should be above 134.6.

The software generator is again well behaved, with all the results well within the limits. But the results from the hardware generator are very high, with half the values above the 99 percent limit, indicating a big departure from uniform distribution.

To check this further, I next ran a simple test on each generator. 200,000 samples were distributed among 70 slots and the totals in each slot displayed on the screen as a bar chart; 70 was chosen so that the results would fit conveniently on the screen in low resolution mode.

The software generator behaves as it should, with a nice even distribution of values. Figure 1 shows a plot of the results from one test photographed from the screen and Figure 2 shows the corresponding results from the hardware generator. You don't have to know a thing about statistics to see what is happening. At the extremes of the range, near 0 and 1, there are far more values than there should be. There is also a lesser peak in the middle and some other minor peaks in between. I could not have asked for a better example to illustrate this article.

I don't want to spoil your fun too much by giving away the rest of the story, because I think you should buy or borrow this book of programs and run some of them. All I will say is that some of the other tests for randomness have intriguing names: the Komolgorov-Smirnov test for uniformity, the serial test and the gap test for randomness, the poker test and the coupon collector test for the RND function, among others.

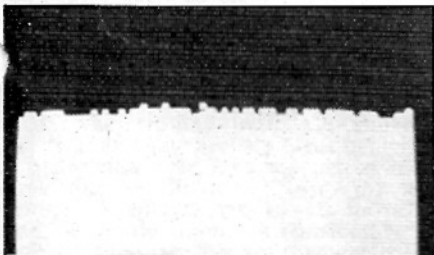


Figure 1

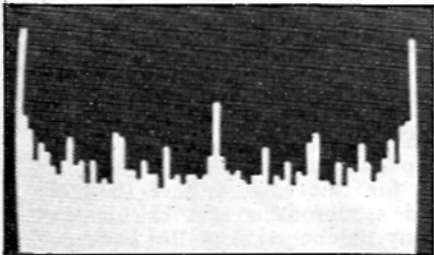


Figure 2

Crossword composition

The Computer Journal is not noted for articles of popular interest; more usually it is devoted to technical topics such as the 'Determination of Eigenvalues of

Expt	Software	Hardware
1	91.3	129.4
2	102.1	172.3
3	92.6	119.7
4	92.4	140.6
5	84.5	152.4
6	98.7	138.5
7	97.2	143.3
8	103.4	110.4
9	96.0	131.1
10	104.6	110.1

Chi-Square Limits

1%	69.2
5%	77.1
95%	123.2
99%	134.6

Table 2 Result of tests of distribution of random numbers from the DAI computer, with 100 slots and 5000 samples in each test.

Symmetric Quindagonal Matrices'. But the May 1981 issue has a fascinating description by P D Smith and S Y Steen of their Prototype Crossword Compiler.

Input to the compiler is a diagram of blank and blocked-in squares of the usual kind. The program then attempts to fill the blank squares with words looked up in a dictionary of nearly 8000 words held on disk. The use of bit lists and heuristic tree searching allows non-trivial puzzles to be composed in reasonable time, anything from six to 600 processor seconds on an ICL 1904S. To ensure a fair trial, input diagrams were taken from puzzles in daily papers.

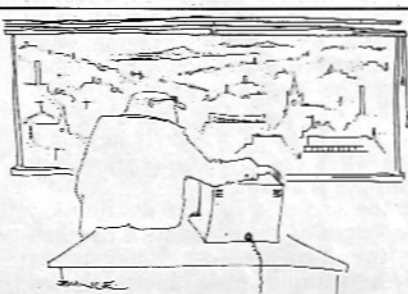
That still leaves the clues to be composed and the authors think that the simple type of multiple-definition would be easy to generate (Utensil god = PAN), but see no prospect of making up cryptic clues by program. A dictionary of anagrams could be computed once and for all. The methods described could be adapted to run on a small machine.

Further study

The City University in London is running several evening courses this winter on computing and related subjects. The list below shows the starting dates, some of the shorter classes being run twice.

Elementary Programming in Fortran, January; Introduction to Basic, October and January; Pascal and Structured Programming, October and January; Computer Music, October; Business Programming in Cobol, October.

For more information contact: Adult Education, Centre for Arts and Related Studies, City University, Northampton Square, London EC1V 0HB, telephone 01-253 4399 ext 496.



'One day this will all be yours.'



CHESS FINAL '81

For the second year running the Personal Computer World Show played host to the European Microcomputer Chess Championship. The accommodation provided, namely a discreet suite well removed from the howling mobs, seemed somehow more in keeping with the spirit of the game than last year's site next to the bar.

Twelve programs found their way into the finals: Advance 2.0 (Dave Wilson, Mike Johnson); Albatross 3.0 (Michael J Parker); Caesar (John Lowe); Chess Champion (Sci Sys-W Ltd: David Broughton, M Johnson, D Levy, KO'Connell, M Taylor); Chessnut (Geoffrey J Bulmer); Cyrus (Richard Lang); Gambiet 81 (Microtrend Ltd: Wim Rens); Logichess (Kaare Danielsen); Microtrend Experimental (Microtrend Ltd: Wim Rens); Philidor Experimental (Philidor Software: D Broughton, D Levy, K O'Connell, M Taylor); Philidor (Philidor Software: D Broughton, D Levy, K O'Connell, M Taylor); White Knight (Philidor Software: M Bryant).

Of these entries I had only heard of the Philidor before the event and, considering the claims the programmers had made about it, it seemed natural that it would win quite easily. In the absence of the Great Game Machine (with the Granfeld and Morphy Cartridges) and other well known machines such as the Mephisto and the Sensory Voice Challenger (the winner of the 1st Official World Championship for micro-computers last year), surely there could be no doubt.

The final result was very surprising. The non-commercial entries scored very well.

As a very keen chess player, I am much more interested in the quality of the games than the bare results. Many of the games were decided, in my view, in a most random manner — but this was not the case with the games played by Cyrus. Cyrus played such good games I would have been quite pleased had I played them myself. Only in the first round did Cyrus get into a diffi-

cult position. Philidor Experimental won material and then insisted on a continual attack on Cyrus's pieces while ignoring the defence of its own king which Cyrus finally managed to checkmate.

For the remainder of the tournament Cyrus played remarkable chess and I have chosen two games for comments although all five are well worth publication.

Philidor-Cyrus: round 3

1 d2-d4 d7-d5
2 c2-c4 d5xc4
3 e2-e4 e7-e5
4 Ng1-f3 e5xd4
5 Bf1xc4 Nb8-c6

Both programs are now out of their book openings. Instead of Cyrus's last move, the recommended move is Bf8-b4 00 Ng8-f6.

'Knights before Bishops' is an often-quoted recipe for use in opening play. The reason is that it's rarely clear which are the best squares to develop bishops, whereas knights nearly always belong as near to the centre as possible.

7 e4-e5 Nf6-e4
8 Qd1-e2 Ne4-cs
9 Bcl-g5 Bf8-e7
10 Bg5xe7 Qd8 x e7
11 b2-b4

he Levy *et al* programs seem to play this move a lot in different types of positions. Here it is easily understandable in that after the exchange of Philidor's b-pawn for Cyrus's d-pawn, White will have made a small gain in position. Central pawns tend to be worth more than the outer pawns because of their influence over the central squares (although this tends to be reversed as the end game approaches and outside passed pawns become very important).

11 Nc6 x b4
12 Nf3 x d4 Bc8-e6
13 Nd4 x e6 Nc5 x e6
14 Nbl-c3 00-0 (Ke8-c8)

This seems a most unusual decision. A human player would think twice before castling in front of so many open files. However, in this position, this move is a very good idea for several reasons: Had Cyrus played 14...00 (Ke8-g8) then Philidor could have generated a strong attacking position with moves such as f2-f4, f5-f6, Nc3-e4 and so on. Further, if (after 14...000) Philidor attempts to attack on the queen-side, the active Black pieces could easily be able to defend. Lastly, Cyrus can now contemplate a King-side attack. The trouble with the above ideas is that they are all plans which can materialise over, let's say, six to 10 moves (12 - 20 ply). Now, for a machine to analyse six to 10 moves ahead, it would require a considerable length of time. In this tournament the machines had to play at a time rate of 30 moves by each player per hour of that player's time, so, there is no way these long range ideas could have been considered. Yet, amazingly, Cyrus castled Queen-side, easily defended its own King and successfully attacked Philidor's King!

15 a2-a3 Nb4-c6
16 Nc3-d5 Qe7-c5
17 Rf1-d1 Nc6-d4
18 Qe2-a2 C7-c6
19 Nd5-e3 Qc5 x e5
20 Racl h7-h5

I like to imagine Cyrus's last move as the inauguration of a King-side attack, although it was played simply to increase the scope of the Rook on h8.

21 Bc4-d5 Kc8-b8
22 Bd5-C4 h5-h4

Philidor's last two moves show a common weakness of chess programs. A strong human player would not consider placing a piece on a bad

		Rnd 1	Rnd 2	Rnd 3	Rnd 4	Rnd 5	
1	Cyrus	W5	W7	W4	W2	W6	5
2	Advance 2.0	W12	W3	W9	L1	W4	4
3	Logichess	W9	L2	W5	L4	W8	3
4	Philidor	W10	W8	L1	W3	L2	3
5	Philidor Expl.	L1	W11	L3	W9	W10	3
6	Caesar	D8	L10	W12	W7	L1	2½
7	Gambiet 81	W11	L1	D10	L6	W12	2½
8	Microtrend Expl.	D8	L4	W11	W10	L3	2½
9	Ch. Champ Mk V	L3	W12	L2	L5	W11	2
10	White Knight	L10	W6	D7	L8	L5	1½
11	Chessnut	L7	L5	L8	W12	L9	1
12	Albatross 3.0	L2	L9	L6	L11	L7	0

Table 1 Results

square in order to make a random attack if, after a straightforward defensive move, that piece is forced to withdraw to the position from which it came. Philidor's last two moves did nothing to improve its own position, while Cyrus uses in effect the extra two moves very constructively.

Another weakness of chess programs is that they do not 'learn' from their mistakes, so Philidor makes the same error with its next two moves.

23 Ne3-g4 Qe5-g5
24 Ng4-e3 Nd4-f3+
25 Kgl-hl Rd8xd1+
26 Rclxd1 Nf6-d4
27 Rdl-bl h4-h3
Cyrus gives points to moves which attack its opponents castled position.

28 Qa2-b2 h3xg2+
29 Ne3xg2 b7-b5
30 h2-h4 Nf3xh4
This is the only move in the game which disappointed me. I would have liked to have seen Cyrus play 31... Qg5-g4 with the threat of check mate next move. Only delaying moves such as Qb2-e5+ would prolong the game but then only for a few moves. The move chosen by Cyrus is still very strong, and indeed wins a lot of material, but Philidor lasts a lot longer than necessary.

32 Qxb2xb5+ c6xb5
33 Rb1xb5+ Kb8-c7
34 Rb5xg5 Nh4-f3+
35 Ng2-h4 Rh8xh4+
36 Kh1-g2 Ne6xg5
and Cyrus delivered checkmate on move 53.

Finally, the game that essentially decided the tournament. After three rounds only two programs, Advance 2.0 and Cyrus, had won all their games. They now had to play each other.

Advance 2.0 - Cyrus: round 4

1 e2-e4 c7-c5
2 Ng1-f3 Nb8-c6
3 d2-d4 c5xd4
4 Nf3xd4 Ng8-f6
5 Nbl-c3 d7-d6
6 Bcl-g5

This is a standard opening variation known as the Sicilian Richter-Rauzer. Cyrus now goes its own way and by accident transposes into an extremely popular variation called the Sicilian Svesnikov!

6 e7-e5
7 Nd4-b5 a7-a6

Advance 2.0 should have played the attacked knight to f5. Now the opening has become a Sicilian Svesnikov.

8 Bg5xf6 g7xf6
9 Nb5-a3 Bc8-e6
10 Bf1-c4

Generally 10 Na3-c4 is considered the best move here but I'm sure most computers would give more weight to developing an unmoved piece rather than spend time improving the position of a piece already developed.

10 Qd8-b6
11 Bc4xe6 F7xe6
12 a3-c4 Qb6-b4
13 Qd1-e2 d6-d5!

Cyrus begins a tactical phase, resulting in the gain of material and

finally checkmate. In several of its games Cyrus initiated a sequence of simple tactics, which resulted in the gain of material, but only after building up its position to the point where the tactics were justified. The significant point to consider here is that it is in exactly this manner that the majority of games between strong human players are decided. Both players will manoeuvre until one player gains the greater freedom of action for his pieces. Then, using this freedom, the player creates a sequence of threats which usually force a sudden deterioration in his opponent's position, often resulting in the gain of material. 'As usual, tactics flow from a positionally superior game.' (Bobby Fischer.)

14 Qe2-h5+ Ke8-e7
Rather dynamic play this! Yet completely in tune with the nature of the opening variation.

15 e4xd5 Nc6-d4
16 Nc4-e3 Qb4xb2
17 d5-d6+ Ke7-d8
18 Ke1-d2

Forced to avoid the loss of a piece. But now the White king is rapidly executed.

18 Ra8-c8
19 Nc3-e4 Nd4Xc2
20 Ne3Xc2 Qb2-c2+
21 Kd2-e3 Rc8-c4
22 Qh5-h4 Bf8-h6+!

One of those moves any human player would have found extremely pleasant to play. If the bishop is captured, Cyrus mates in three moves. After the move played it's mate in 4.

23 Ke3-f3 Qc2-d3+
24 Kf3-g4 Qd3xe4+
25 Kg4-g3

and the operators of Advance 2.0 resigned.

The last round was a bit of an anti-climax as Cyrus had already disposed of its main rivals. Yet again Cyrus won a nice game after Caesar managed to get a knight trapped among Cyrus's pawns.

What strikes me most about the games played by Cyrus, compared with those played by the other programs, is that Cyrus seems to co-ordinate its pieces. It gets them working well together then begins an attack for which it is well prepared.

Richard Lang kindly provided some information about his program, part of which I reproduce here.

Cyrus has seven levels of play; the levels correspond to the number of ½ moves (ply) that Cyrus looks ahead (the search is automatically made deeper in the end-game and for checks at the top ply). The most useful levels are 3, 4 and 5 which have average response times of about six seconds, 40 seconds and 1 minute 45 seconds respectively.

Cyrus occupies just over 7k of memory, of which about 1.25k is a table of 450 opening moves. In addition, level 5 needs a 2k workspace and level 7 needs 2.5k.

Cyrus uses depth-first alpha-beta

MICROMART

PET'S

PETS - We Sell Them

As authorised Commodore Dealers we stock and supply all PET Hardware, Computhink Discs, Oki Microline 80 Decwriter LA34, Texas 810, Qume Sprint 5 - all at competitive prices

PETS - We Buy Them

Part Exchange is very welcome, we also buy for cash.

PETS - We Hire Them

Our specialist hire service, with maintenance included for all Commodore equipment.
- Complete systems for evaluation
- Multiple units for educational courses
- Single units for individual use

From 1 day upwards, all units available. Delivery by arrangement, anywhere in UK.

PETS - Software

We are fully authorised BUSINESS SOFTWARE DEALERS for Commodore Software - COMPACT COMSTOCK, WORDPRO etc. Also PETSOFT, BRISTOL SOFTWARE, LANDSLER PAYROLL & HOTEL SYSTEM.

PLUS for ACCOUNTANTS, the unique CSM INCOMPLETE RECORDS PACKAGE - this is the best available.

MAIL - ORDER

All Hardware and Software can be bought by Mail Order Delivery by Securicor, or Registered Post. Discounts for Cash & Carry or Mail-Order. Access accepted or by Leasing (subject to acceptance)

MICRO-FACILITIES LTD

129 High Street, Hampton Hill, Middlesex, TW12 1NJ 01-979 4546 or 01-941 1197

GAMES

SHARP MZ-80K (48K - £399 plus VAT)
SHARP MZ-80B (£960 plus VAT)
VIDEO GENIE (£289 plus VAT)
ACORN ATOM (assembled - £150 plus VAT)
ATARI 400 (16K - £285 plus VAT)
ATARI 800 (16K - £525 plus VAT)
TEXAS TI99/4 (£242.50 plus VAT)
Send large SAE for computer price list.
ATARI 400 £285 plus VAT
ATARI 800 £525 plus VAT
+ INTELVISION + ACE TV GAMES
+ CHESS COMPUTERS
+ HAND HELD ELECTRONIC GAMES
+ SF, FANTASY & WAR GAMES
+ ALL KINDS OF GAMES & PUZZLES

BRIGHTON 18 SYDNEY STREET
TEL 0273 698424

i systems Ltd.

VERY HIGH RESOLUTION FOR NASCOM 2
380 x 220 individually addressable points

FEATURES:

- fully bit mapped from dynamic RAM
- software controlled
- software supplied for point-plot, line-draw, - block shading and display control
- mixed text and graphics
- real time plotting
- display size variable to suit memory available

Price... £55 + 15% VAT (post free)

EPROM PROGRAMMER FEATURES:

- programs: 3-rail 2708, 2716 2716, 2516 and single rail: 2758, 2508 2732, 2532
- EPROM type selected by plug-in modules - 3 modules supplied with simple wiring diagrams for all EPROM types
- driven from NASCOM 1 or 2 PIO
- powered from NASCOM and transformer supplied
- software supplied for READ/PROGRAM/VERIFY

** CAN BE USED WITH OTHER MACHINES WITH 2 PARALLEL PORTS

Price... £63 + 15% VAT (post free)

All products built & fully tested supplied with comprehensive documentation and full instructions for simple installation

Send SAE for free data sheets
AVAILABLE NOW direct from:-

6 Laleham Ave., Mill Hill London NW7 3HL
Tel: 01-959 0106



PROGRAMS

```

1010 FOR N=0 TO 2: IF SX(N)>14 AND SX(N)<20 AND SY(N)>639 AND SY(N)<656 AND SYN
=0 SYN=1
1020 NEXT: PRINT#461,S;
1030 IF S(0)=0 OR S(1)=0 OR S(2)=0 GOTO 1000
1099 *** FINISH/REPLAY
1100 PRINT#57,"YOU HAVE COMPLETED THE COURSE";
1110 PRINT#164,"WITH A TOTAL OF"RS+S"POINTS.";
1120 PRINT#239,"AGAIN (Y OR N)?"
1130 IS=INKEY$: IF IS="N" CLS: END ELSE IF IS<>"Y" GOTO 1130
1140 RESTORE: FOR N=1 TO 228: READ D: NEXT: GOTO 500
    
```

ZX81 Sun and Planets

by C Ward

This program calculates the day-by-day the Sun; day zero is 1 January 1980.
positions of the inner planets relative to

```

10 LET A=327.95626
20 LET B=0
30 LET C=-258.47927
40 LET D=-135.14322
45 PLOT 30,20
46 PRINT "SUN"
50 PLOT 30+SIN(A/180*PI)*20,20
+COS(A/180*PI)*20
60 PRINT "MARS"
61 PLOT 30+SIN(B/180*PI)*13.180432,20
+COS(B/180*PI)*13.180432
65 PRINT "EARTH"
70 PLOT 30+SIN(C/180*PI)*9.5330396,20
+COS(C/180*PI)*9.5330396
75 PRINT "VENUS"
80 PLOT 30+SIN(D/180*PI)*5.1013216,20
+COS(D/180*PI)*5.1013216
85 PRINT "M"
90 LET A=A-0.5240327
100 LET B=B-0.98561
110 LET C=C-1.6021291
120 LET D=D-4.0923507
130 PAUSE 40
140 CLS
150 GOTO 45
    
```

CHESS FINAL '81

Continued from page 101

search with the killer heuristic and employs selective 'pruning' of the tree. The amount of 'pruning' is increased in complex situations to keep the thinking time reasonably constant. Cyrus examines about 200 positions a second and includes an allowance for future captures in each assessment.

Cyrus is the result of about six months spare time work by its author. Version 2 is currently being planned and will be considerably stronger.

Three points are worth stressing here: firstly, Cyrus only uses around 7k whereas all the other computers use considerably more: Logichess 2.1 uses 26k for instance. Secondly, version 2 promises to be stronger. M Stean, one of England's International Grand Masters discussed Cyrus's games with the author, finding them most impressive. He estimated the strength of Cyrus to be around 170 on the BCF grading scale (equal to about 1960 on the international list). If Cyrus is really this strong now what will it be like when improved?

Finally, Cyrus is in fact a better player than its author!

Clearly most people would like to know how Cyrus would fare against the best commercially available computers and how it would stand up to human opposition. I am afraid we will have to wait a while before that can be answered. No doubt all the big names will be competing for the World Micro Computer Chess Championship (to be held in Hamburg, 21-29 September.) Unfortunately, Cyrus will not be taking part. Still, there is no doubt everyone interested in chess programs is going to hear a lot about Cyrus in the coming months.

Thanks must go to the organising committee, D Levy, K O'Connell, PCW, the tournament director, Peter Morrish, Stewart Reuben (FIDE International Arbiter) and Graham Lee. Kaane Danielsen would like to thank Dylan Harris and John John Jones of Thames Polytechnic for operating his program and Nascom for loaning the machine on which it ran. Thanks also to Cetrone for supplying the mains conditioners.

SPECIAL LIMITED OFFER

for just one month only

THE EPSON MX100 for just £499

Yes, this popular 15 inch carriage 80 cps bi-directional printer which is ideal for APPLE, PET, SHARP, SUPERBRAIN, TANDY etc. is offered at this special price for 1 month only. Interfaces extra. Specify which micro on order.

FULL 12 MONTH GUARANTEE

To claim your special offer send this advert together with your cash/cheque or bankers draft to:

ANDERLEE COMPUTING SERVICES
17 ADELPHI CRES., HAYES PARK, MIDDLEX.
PHONE: 01-841 1507

Offer is subject to product availability and will end on 30 November 1981.

APPLE DOS 3.2 PERSONALISED DISKETTE SERVICE

Your own DOS commands to order
Flashing Disk Volume to order
Flashing Disk File to order
Free Sector Count in DOS

SIMPLE LETTER WRITER (Disk only)

for Apple/Paper Tiger Printer. Uses 9 1/2" computer paper. Enhanced mode for Letter Heading. 96 character line. Lower case with Lazer's I/c adaptor

SAE for details
MAIL ORDER ONLY
KWOKSONIC 27A ORCHARD ROAD
BROMLEY KENT