A.C.C NEWSLETTER VOL 2 ISS 1 APRIL 1974

CPU VIEW

◆ OPEN AFTERNOON at the GALDOR CENTRE ◆

Saturday 25 May 2 - 5pm

52 Brighton Road, Surbiton, Surrey

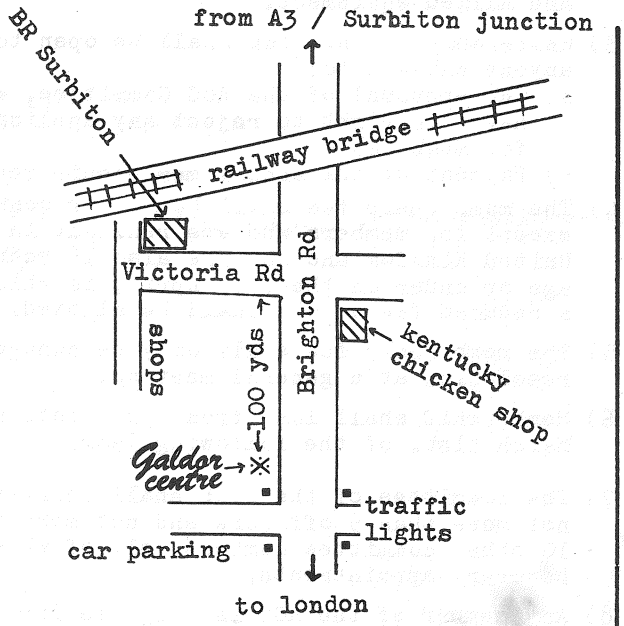
Stuart Fyfe (of the centre) and the ACC Committee will be on hand.

Hardware ; ICL 1301A + 4 mag tape units, line printer, card reader & punch, full paper tape equipment, drum.

Software ; Come & see.

Where ? ; see map

Support the alternative processor, come and see the singing CPU. All ACC members welcome.



RANDOM NOISE by PAL

I believe that the thin end of the wedge being driven between the consumer and the power station may already be seen in the guise of an existing Act of Parliament. It is intended to prevent obscene or hoax phone calls, but states that wilful mis-use of electricity is a punishable offence. Laws, like Polly, tend to become something that 'just growed'. With the present power cricis, and the impending drying up of supplies of fossil fuels and the scarcer elements in the not-to-distant future, it may well be that misuse of electricity, even in the form of chemical batteries, will become in the eyes of the law a very serious offence.Perhaps punishable by 10 years on the power station treadmill ?.

All of which has very much to do with computers. ENIAC, with its 18000 valves and 1500 relays must have rated at least 200KW. A modern minicomputer installation might rate 15KW peak, of which less than 1KW is consumed by the central processor. The consumption of the actual control circuitry will be rated in milliwatts. As the hobnail boots of the march of progress crush more and more logical elements into less and less space, there comes a time when almost the whole power requirement will be due to peripherals. The space saved in the central processor will be taken up by extra peripherals in order to increase computing power. The power requirements will then tend to increase with miniaturisation.

Having given the bushes a very sound beating - I will now get to the point, which is 'How To Run A Home Computer Without Crying All The Way To The Bank When You Get The Electricity Bill'.

Even when a printer is not chatting merrily away it is still consuming power, as are all peripherals. It therefore makes economic sense to isolate a peripheral from the mains when it is not in use. With a little imagination, I am sure readers could devise circuitry through which the processor can control the power switching of peripherals. Power must be applied in time to allow a warming up period, so a buffer store is required in the data link. The processor transmits a "power on" command and dumps data into the store. A timer then gives a "ready" signal to the buffer store.

Carrying the idea a stage further, it may be possible in the future to switch individual I/C's on and off according to program requirements. Perhaps by using these techniques the power requirements of the next generation of minicomputers may be so drastically reduced as to cut running costs, even in the face of continuing inflation.

4k r.a.m.

MOSTEK has released details of its first 4096 bit random access memory I/C. Organised as 4K words of 1 bit, the (12) address lines are multiplexed to allow it to use a standard 16 lead dual-in-line package.

Access time 350nS , cycle time 500ns.

The price (£25 each for quantities of 100 or more) may put it out of the reach of the amateur for the time being, but FAIRCHILD have announced that they will second-source it so it stands a good chance of becoming an industry standard - so keep an eye open, the devices code is MK4096P (Fairchild 4096dc).

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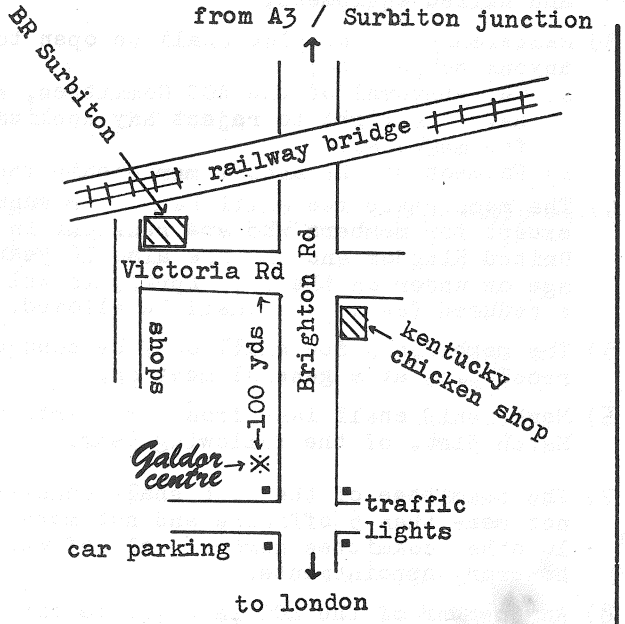

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CONSTITUTION OF THE ACC

as revised & agreed at the AGM of 21/3/1974

1) The Club shall be known as the Amateur Computer Club.

2) The aims of the Club are to promote and coordinate interest in the design, construction or programming of computers and allied equipment.

3) Membership of the club shall be open to anyone subject to;
   a) The approval of the ACC Committee, who have the right to reject any application for membership.
   b) Payment of the annual membership fee.

4) The membership fee shall be £1 per annum except for members who are resident in the United Kingdom and who are also 16 years of age or under on the 1st. April, in which case a reduced fee of 50p shall be allowed.

5) The membership fee shall only be changed by resolution at a general meeting.

6) Membership shall last from April 1st. until March 31st. of the following year.

7) The committee of the club shall consist of not more than 5 officers and not more than 10 other committee members, all of which are honorary appointments.

8) Any member of the ACC is eligible for election to the Committee, provided that he or she is proposed and seconded by two other ACC members.

9) Officers of the Committee must be 18 years of age or older.

10) Elections for officers and committee members shall be held at the AGM.

11) The activities of the club shall be coordinated by the committee in accordance with the constitution.

12) All resolutions shall be carried by a simple majority of those present & voting. In the case of a tie the chairman has the casting vote.

13) All general meetings shall be held within 10 miles of the centre of London.

14) Notice for any general meeting shall be sent to members of the club not later than 2 weeks before the date of the meeting.

15) An extra-ordinary general meeting may be called by 10 members provided that they give 6 weeks notice to the chairman and pay any costs incurred in informing all club members of the proposed meeting, and also the costs of the meeting.

16) At any general meeting a quorum shall consist of 10 members, including 3 members of the committee, at least one of who shall be an officer.

17) A resolution for the dissolution of the club shall require a three quarters majority as a result of a postal ballot of all current members. Any assets of the club remaining on dissolution shall be distributed among the current members, pro-rata according to their subscription for that year.

18) The address for all communications to the club shall be 7 Dordells, Basildon, Essex.

19) A resolution to change this constitution can only be approved at a general meeting.

First Annual General Meeting of the Amateur Computer Club

Held at the Polytechnic of the South Bank on Thursday March 21 1974

Prior to the election of Officers and Committee the constitution of the club was discussed and a revised form agreed.

Mr.J.Creutzberg was elected as chairman.
Mr.M.Lord was elected treasurer and editor of the newsletter.
Mr.J.Aslett was elected secretary.

The chairman proceeded to take nominations for election to the committee as follows;
R.Cowderoy proposed by G.Hankey, seconded by M.Lord.
G.Hankey proposed by P.Stern, seconded by R.Cowderoy.
M.Reeve proposed by M.Lord, seconded by R.Cowderoy.

All those nominated were unanimously elected onto the Committee.

A resolution was then carried;
The resolution was 'that the Committee (including officers) should consist of six members and that no ordinary member of the club would be barred from a Committee meeting.'

The chairman then proceeded to AOB.
Mr. Cowderoy raised the subject of local branches of the club, the position of possible local groups at Cambridge & Oxford was noted.

Mr.Stern raised the need for local & lecture meetings in the London area. After some debate suggestions were noted for 'technical' meetings on software & hardware. The Committee was charged with the task of producing a programme for meetings in the London Area during the near future.

Mr. Wyatt said that publicity for local groups should be available through the newsletters, and that the Committee should actively foster the formation of local groups. After some debate the chair accepted the motion with the addition of co-ordination.

COMMITTEE MEETING of 8 April 1974

Present Messrs Creutzberg, Lord, Aslett, Reeve and Hankey.

M.Lord started discussion of the membership level and steps that could be taken to improve membership. It was resolved that persons who showed interest in the ACC but did not take up membership would be circulated with a Vol 2 membership form. Mr.Lord undertook to send circulars to 50 of those people who had initially applied for details of the club.
At this time there are about 80 members, the financial break-even point for Vol 2 being about 120.
It was also decided that the secretary would circulate the technical/trade etc. mags with a press release to obtain further publicity of the club's activities.

A long discussion followed on what activities etc. could be arranged for the interest of the members. A possible aim of the club emerged as 'a project for the entire club to design and

build a unique computer'.

The subject of software education for hardware people and vica-versa was discussed but after a lot of thought it became clear that without concentrated 'pockets' of members sessions would be very difficult to organise so proposals were deferred to the next meeting.

Extensive consideration was given to the problem of providing computer access to members. Various schemes were discussed ranging from some sort of simplified terminal to batch processing either by mark-sense or pre-punched cards.

It was decided to enquire if a club visit could be made to the Galdor Centre as a first step in some sort of program of visits.

M.Lord raised the subject of rules etc for clubs wishing to be assosciated to the ACC. The following rules were formulated;

1) A group with similar interests as the ACC may be affiliated to the ACC at the discretion of the ACC Committee.

2) The affiliated group shall have the same rights as a ordinary member. In addition the group will receive ten copies of the Newsletter and shall be entitled to two voting representatives.

3) The membership fee for an affiliated group shall be £10 per annum.

FIRST YEAR FINANCES

(at 20/2/74)

Receipts ;		£ 111.50
Expenditure;		
Postage	£27.52	
Printing	£84.65	
Stationary	£ 1.84	
Total;		£ 114.01
Balance carried forward;		(£ 2.51)

This deficit of £2.51 has since been recouped by sales of Vol 1 back issues.

Accounts available for inspection.

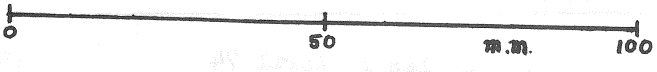
M.Lord

THE MINIATURISED NEWSLETTER

Thanks to all contributors who have made the editor's life easier by typing their contributions in such a way that they can be used directly in the composition of the ACCN.

From this issue, however, we are taking advantage of one of the benefits of the offset lithography process used to print the ACCN by producing the original artwork 20% (linear dimension) larger than the printed sheet. This gives us nearly 50% more space for the same cost, but allowance must be made when producing the artwork.

The original for this page is 250mm (or say just under 10") wide so when typed this column was - including its fair share of the margins - 125mm ; and the scale below was correct.



BOOKLIST

ICL International Computers Limited
30-31 Friar Street
Reading
Berkshire
RG1 1JP
England

Software Distribution Department

POCKET AND INTRODUCTORY BOOKS

3340A	ALGOL October 1970 £0.75	4952	Aids to Program Design December 1971 £1.44
4269A	Extended FORTRAN May 1971 £0.75	4953	BASIC January 1972 £1.20

COMPUTER WORSHIP

Hardback £1.80 net
PITMAN PUBLISHING

By Ivor Catt

NATIONAL COMPUTER CENTRE PUBLICATIONS

Three very interesting titles in their series of 'Studyguides' have been published by the NCC. Not only do they provide extremely useful background reading for teachers of non-mathematical subjects, but they also suggest many examples for students to attempt.

'Computers in Language Studies'

This book shows how computers can be used in the fields of music, ballet, graphics and literature, and includes a range of examples for the student to attempt, and thereby enhance his understanding. It is written by members of the Computer Arts Society which is composed of enthusiasts in the application of computers to the arts.

'Computers in the Social Sciences'

This guide aims to give an introduction to three areas within the social sciences, economics, geography and history, and to the ways in which computers may assist the worker in these areas. It is shown how the computer may help in three particular ways. Examples are given in each of the three subject areas and exercises are suggested by means of which students may discover at first hand some of the problems involved, and ways in which computers can help.

'Computers in the Creative Arts'

This book shows how computers can be used in the fields of music, ballet, graphics and literature, and includes a range of examples for the student to attempt, and thereby enhance his understanding. It is written by members of the Computer Arts Society which is composed of enthusiasts in the application of computers to the arts.

Each book costs only 80p and should be ordered directly (cash with order) from:

NCC Publications,
David & Charles (Holdings) Ltd.,
South Devon House,
Railway Station,
Newton Abbot, DEVON.

CHEAP CALC BITS

'Wireless World' have arranged a deal which allows their readers to buy a GI C500 calculator I/C plus 8 seven segment LED displays for a total price of £14.14.

See 'WW' , March edition, pages 49/50 for details.

X & Y DRIVE CIRCUITS continued

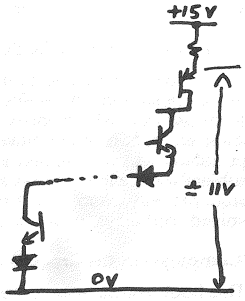
If '0's (low) are applied to all inputs except for one B' and one A', a current will flow in a selected wire. Changing the '0's to the corrresponding B & A inputs will reverse the direction of the current flow.

NPN transistors can be BFY50, 2N2219 or similar - but see later notes on power dissipation, diodes BAY72 type.

The diodes DA are used to protect the top NPN transistors from excessive reverse base-emitter voltage, they are not part of the diode matrix - although on reflection the matrix diodes will protect the transistors, so the diodes DA in the emitters of the SA switches could be left out. Diode DE and the capacitor across it (which is about 1 μF) bias the emitters of the bottom transistors to about +1V ; not strictly necessary but it does speed up the turn-off of these transistors.

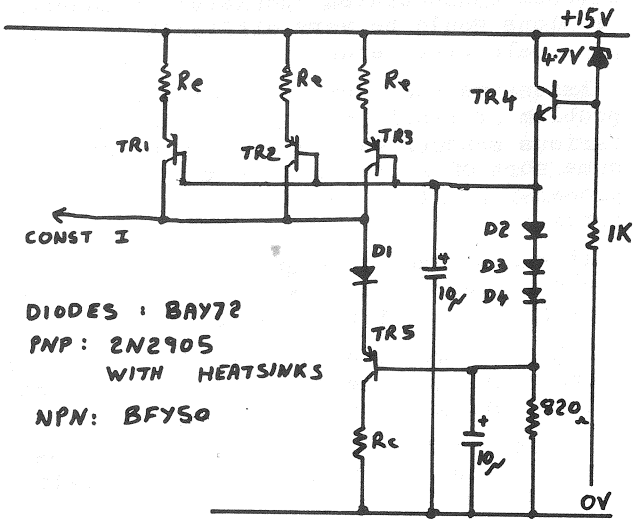
The NPN transistors should be driven hard enough to ensure that they do turn on, yet not so hard that they take a long time to turn off. A reasonable compromise is to make the base drive current about 0.05 of the collector current. This gives values for R1 & R2 of about 600 ohms for X (or Y) drive currents of ½A.

One serious problem with this circuit is power dissipation in the transistors. Current flows as shown in the circuit on the right. Allowing 1V drop in each diode and in the X (or Y) wire, we are left with about 8V to be dropped across the three transistors. In practice 2 of the 3 transistors will tend to saturate, dropping about 0.5 V each, leaving 7V across the remaining one. As far as the NPN transistors are affected, the worst case occurs when we alternate reading and writing, with no guard space in-between, on one address or a group of addresses such that one of the switches is turned on for every read (or write) cycle. In this case the average current in the transistor will be ½ of the drive current, so for a store having ½A drive currents the worst case dissipation in any of the NPN transistors will be ½ x ½ x 7 + = 1.75W. This is just achievable with the transistors mentioned if 'clip-on' heatsinks and fan cooling are used.



Alternatively, the use of a 'guard space' between the write and read current pulses will reduce the dissipation.

The PNP transistor in the current source has a harder time of it - as it is passing current all of the time. As it must be a high frequency transistor, you can either use several TO5 transistors such as the 2N2905 series, each contributing a part of the required current, or one high frequency power transistor. A practical circuit using multiple transistors is shown at the top of the next column.

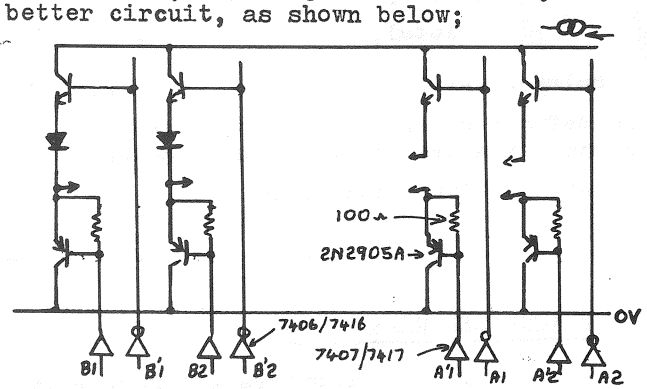


TR1,2 & 3 each supply one third of the required current, as determined by Re. TR4 is a buffer to provide a low impedance drive to the bases of TR1,2,3. TR5 provides a 'by-pass' path for the current when none of the NPN transistors are on. Rc limits the dissipation in TR5 and should be chosen so that only about 1.5V is dropped across TR5 (emitter-collector) when it is passing the current.

VARIATIONS ON A THEME

PNP switches.

Some readers have suggested the use of PNP , rather than NPN, transistors for the current switches. Although PNP transistors are generally more expensive than their NPN equivalents, we can get a technically better circuit, as shown below;



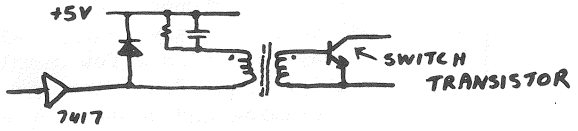
We have left NPN transistors for the top switches as the use of PNP's there gives us problems in their base drive circuits, but have replaced the bottom switches by PNP transistors. Note that the PNP's are driven from buffers, not from inverters, to keep the input signals consistent with the earlier version of the drive circuit. The advantages of this circuit are;

a) The PNP transistors can never saturate but will on the other hand have a low (about 1.2V) collector-emitter voltage when on. This gives fast switching and low dissipation.

b) Less power is required from the +15V supply.

Transformer drive circuits.

Most commercial core stores use transformer drive to the switch transistors, using a circuit similar to that shown below;



This type of circuit has the advantages;

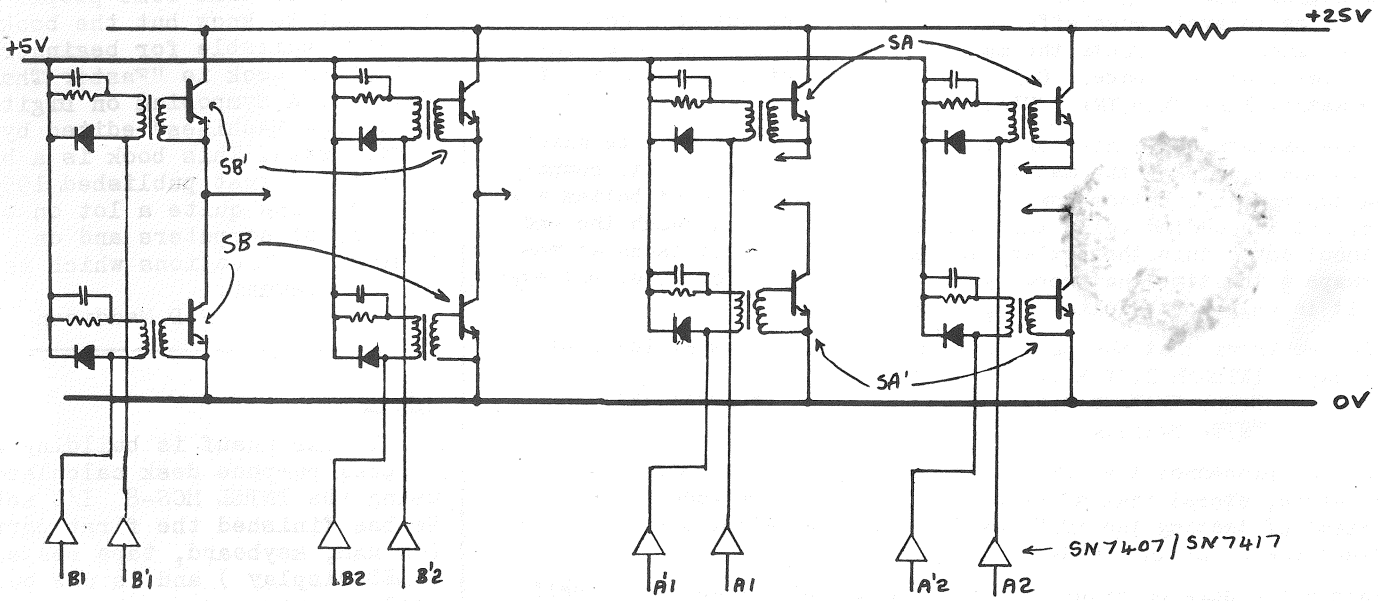
a) The base current of the switching transistor does not add to or subtract from the stack drive current (in the circuits given so far the base current taken by the top switching transistors adds to that from the constant current source).
b) The drive circuits take less power.
c) The capacitor speeds up turn-on of the switching transistor, and the energy stored in the capacitor and in the transformer during the ON time help to turn the switching transistor off quickly at the end of the pulse.

Resistor as a current source.

If the current source in any of the circuits given so far is replaced by a resistor, then if we neglect the effect of the inductance of the core stack, the drive current will be determined by the resistance, the supply voltage, and the voltage drops across the transistors and diodes. So that we can define the drive current as accurately as possible, we should keep the transistor and diode voltage drops small in relation to the supply voltage. There is not much we can do about the diodes, but by driving the transistors with a base current sufficient to saturate them, we can keep their voltage drops to about 0.5V. A base current of about one tenth of the collector current will ensure saturation. Unfortunately, by driving the transistors hard we guarantee that they will be slow in turning off unless we use a transformer drive - and even then turn off can take an appreciable time in a fast store.

The effect of the inductance of the stack is to slow the rise of current at the start of the pulse - if it is too slow the drive current will never reach the desired value. The time constant of the circuit is given by L divided by R where L is the stack wire inductance, and R is the resistance. Increasing the resistance will decrease the time constant, but at the cost of increasing the supply voltage (to keep the current the same). Increasing the supply voltage will also reduce the effects of the diode and transistor drops, and is therefore a GOOD THING, if care is taken that the transistor collector-emitter voltage ratings are not exceeded.

By combining transformer drive and the use of a resistor to define the drive current, we arrive at the final (at least for this issue) drive circuit;



SOS

'Silicon on Sapphire' integrated circuit technology that is. General Automation have announced a general purpose 8 bit minicomputer based on SOS LSI technology. The entire computer , called the LSI-12/16, fits with 2K bytes of memory on a single 7¾ x 10 in PC board.

Performance is said to be comparable with GA's SPC-12 (an 8 bit mini) but the new computer is 4 times smaller and costs about £700 less. Cycle time is 2.64uS.

Although the CPU chip itself will not be sold separately, a complete machine with 1K of RAM should be available later this year.

DECLARATION

Being an independant body, with a regard for the traditions of the computer business, we herebye state that the ACC will continue to use the word 'BYTE' to refer to a group of EIGHT (8) bits. It is our contention that any manufacturer who wishes to use bundles of 9 bits should refer to them by another name (Nyte ?).

LETTERS

MOVIELIFE

Your series of articles about LIFE has inspired me to write a program, based on similar lines, to generate the frames of a computer animated film. The film (and program) are called 'Film '74' (though if my present rate of progress continues I may have to rename it!) and the computer generates each position of the new frame by applying semi-statistical rules to the corresponding positions of the old frame. For example: "If the current square is black(=0) and is surrounded by less or more than 3 coloured (>0) squares, it remains black with a probability of 9/10" etc. The program is of course written in BASIC, it being the only language I know of with a random number facility. Incedentally, my program uses a toroidal matrix for each pattern; I discovered this technique independantly of Mr. Andrews. I hope to have the program (and film) running by this summer.

R.J.Baker

OU + ASR33

Mike Hatt writes that he may be back on the Open University computer again after all. Although he is doing a Social Science course this year, one of the Course Tutors said they might let Mike have some time on the computer to test out theories in the Economics section of the course. With any luck this may result in a few simple statistical programs from Mike for members to examine and comment on - at the moment he is working on a BASIC program to produce and sort sets of random numbers for use in sample surveys.

In the meantime, Mike would be very interested to hear of anyone with a fairly cheap ASR 33 or similar for sale - Mike is at 11, Jones Way, Hedgerley, Slough, Bucks SL2 3YF. Telephone: Farnham Common 5728. (STD Code 028 14).

FASTLIFE

One way of speeding up "LIFE" is as follows:

If at any point in its history the pattern of live cells is symmetrical about a vertical or horizontal line, it is bound to keep its symmetry for the rest of its life. Also, even if the original pattern of cells is unsymmetrical, it often becomes symmetrical after several generations. So if one always processes the whole of a pattern, one is often duplicating one's work.

To prevent this:

1) Assume that the program processes a rectangular matrix just big enough to hold the pattern and one dead cell all around it. This is contained in the middle of a much larger matrix (as large as one has storage for - say 100x100) which one has "killed" at the beginning to avoid edge effects. After working out each generation one expands or contracts the matrix so as to leave just one line of dead cells at each edge. Call the integers defining the size of the matrix XMAX,XMIN,YMAX,YMIN.

2) If the pattern has a horizontal line of symmetry it must be exactly in the middle of the matrix, so simply scan through it, comparing top row with bottom row, second top row with second bottom row, etc. until you find cells that don't match. If you reach the end without doing this the pattern is symmetrical. This takes at most perhaps ⅓ the time that working out a new generation does, but even so it is only worth doing every 10 generations.

3) Once one knows that the pattern is horizontally symmetrical one can say:

```
INTEGER Z,YMIN,YMAX
Z=MOD(YMAX+YMIN,2)                    (FORTRAN IV)
YMIN=(YMIN+YMAX+2000)/2-1000
```

One then processes the new matrix (half the size of the old one) as before, except that after working out each new generation, instead of testing the YMIN row for any live cells, one makes the YMIN-1 row equal the YMIN+Z row.

4) Exactly the same procedure can be used to cut the matrix in half vertically, if it becomes vertically symmetrical, and so it is possible to cut down processing time by nearly 75%.

T.Clarke

COMPUBOOKS

I have been reading one or two computer books & I think you might be interested;

For anyone who is starting to learn ALGOL, a good book is "Computer Programming for Schools, First Steps in ALGOL" by D.Michie, A.Ortony and R.M. Burstall. This book starts off quite simply and finishes with a typical program, explaining the different ALGOL methods used. Note that not everything is included that some people may want to know but the book is very suitable for beginners.

Another book is "Faster Than Thought: A Symposium on Digital Computing Machines" edited by Lord Bowden. This book is a bit outdated (first published 1953) but contains quite a lot on the history of computers and on typical applications which is still relevant.

P.D.Maddison

MCS-8

Thomas Knauf is building a general purpose desk calculator using the INTEL MCS-8 I/C set. He has finished the first part (1K RAM, keyboard, tape reader & LED display) and is now busy writing programs.

He would be very glad to hear from anyone else working with the MCS-8, especially with a view to exchanging programs or subroutines for floating point mathematics.

T.Knauf
24 Lubeck
Hamburger Strasse 85
West Germany

WELCOME

Unfortunately I will be unable to attend the AGM on the 21st. However if any of the club members wish to come round and have a good "chin-wag" I shall be only too delighted. I will be in any time after 7pm, or all the weekend. Please write first (sorry, I'm not on the phone).

Jim Beard
13 Mayesford Rd
Chadwell Heath
Romford, Essex

COMPUSHOW

I am planning an exhibition of Computers in July and would appreciate all the help I can get. The main themes will be the History of Computing and Computer Art. Will anyone interested please get in touch.

R.J.Baker
54 Brixton Rd.
London SW9 6BS

BASIC LIFE

```
100 DIM P1(11,11)
105 DIM P2(11,11)
110 GOSUB 1000
115 LET G=1
120 GOSUB 3000
125 LET G=G+1
130 GOSUB 2000
135 GOSUB 4000
140 GOSUB 5000
145 IF G=N THEN END
150 GOTO 125
```

RESERVE STORAGE SPACE FOR P1 (CELL MATRIX) & P2 (WORKING COPY).

GET PATTERN FOR FIRST GEN & NO OF GEN REQ'D.

PRINT 1ST PATTERN

TOROIDALIZE

MAKE & PRINT NEXT GEN (P2)

MAKE P1 = P2

THIS IS WHAT WE WANT TO DO BUT TO DO IT WE HAVE TO USE THE SUBROUTINES GIVEN BELOW ↓

```
1000 REM GET STARTING PATTERN & NO OF GENERATIONS
1010REM FIRST ZERO P1
1015 FOR R= 0 TO 11
1020 FOR C= 0 TO 11
1025 LET P1(R,C)=0
1030 NEXT C
1035 NEXT R
1100 REM NOW INPUT 'LIVE' CELLS AS NUMBER PAIRS (R,C)
1101 REM INPUT UNTIL R OR C > 10 OR <= 0
1110 PRINT "LIVE CELL ";
1115 INPUT R,C
1120 IF R >10 GOTO 1200
1125 IF C >10 GOTO 1200
1130 IF R <=0 GOTO 1200
1135 IF C <=0 GOTO 1200
1140 LET P1(R,C)=1
1145 GOTO 1110
1200 REM NOW GET N (NUMBER OF GENERATIONS)
1210 PRINT "GENERATIONS ";
1215 INPUT N
1300 RETURN
```

```
3000 REM GENERATION PRINT SUBROUTINE
3100 PRINT
3105 PRINT
3110 PRINT "GENERATION ";G
3200 FOR R=1 TO 10
3205 FOR C=1 TO 10
3210 IF P1(R,C)=1 THEN PRINT "* ";
3215 IF P1(R,C)=0 THEN PRINT "  ";
3220 NEXT C
3225 PRINT
3230 NEXT R
3235 RETURN
```

```
2000 REM TORIODALIZATION SUBROUTINE
2100 REM MAKE ROW 0 = ROW 10, ROW 11 = ROW 1
2105 FOR C=0 TO 11
2110 LET P1(0,C)=P1(10,C)
2115 LET P1(11,C)=P1(1,C)
2120 NEXT C
2200 REM MAKE COL 0 = COL 10, COL 11 = COL 1
2205 FOR R= 0 TO 11
2210 LET P1(R,0)=P1(R,10)
2215 LET P1(R,11)=P1(R,1)
2220 NEXT R
2300 RETURN
```

```
4000 REM CALCULATE & PRINT NEW GENERATION
4005 PRINT "GENERATION ";G
4010 FOR R=1 TO 10
4015 GOSUB 4200
4020 NEXT R
4025 RETURN
```

```
5000 REM SUBROUTINE TO MAKE P1=P2
5010 FOR R=0 TO 11
5015 FOR C= 0 TO 11
5020 LET P1(R,C)=P2(R,C)
5025 NEXT C
5030 NEXT R
5035 RETURN
```

```
4200 REM SUBROUTINE TO CALCULATE &
4201 REM ONE ROW OF NEW GENERATION
4215 LET C1=P1(R-1,0)+P1(R,0)+P1(R+1,0)
4220 LET C2=P1(R-1,1)+P1(R,1)+P1(R+1,1)
4225 FOR C=1 TO 10
4230 GOSUB 4400
4235 IF P=0 THEN PRINT "  ";
4240 IF P=1 THEN PRINT "* ";
4245 LET P2(R,C)=P
4250 NEXT C
4255 PRINT
4260 RETURN
```

```
4400 REM
4410 LET C3=P1(R-1,C+1)+P1(R,C+1)+P1(R+1,C+1)
4415 LET Y=C1+C2+C3
4420 LET P=0
4425 IF Y=3 THEN LET P=1
4430 IF Y-P1(R,C)=3 THEN LET P=1
4435 LET C1=C2
4440 LET C2=C3
4445 RETURN
```

```
RUN
LIVE CELL ?5,2
LIVE CELL ?5,3
LIVE CELL ?5,4
LIVE CELL ?5,5
LIVE CELL ?5,6
LIVE CELL ?5,7
LIVE CELL ?5,8
LIVE CELL ?0,0
GENERATIONS ?99
```

← OPTIMIST !

GENERATION 1

```
* * * * * * *
```

GENERATION 2

```
* * * * *
* * * * *
* * * * *
```

GENERATION 3

```
    * * *
  *     *
*         *
  *     *
    * * *
```

GENERATION 4

```
      *
    * * *
  * * * * *
* *       * *
  * * * * *
    * * *
      *
```

GENERATION 5

```
    * * *
  *     *
*         *
*         *
*         *
  *     *
    * * *
```

GENERATION 6

```
      *
    * * *
  * * * * *
* *       * *
* * *   * * *
* *       * *
  * * * * *
    * * *
      *
```

GENERATION 7

```
    * * *
  *     *
*         *
*   *   *
*         *
  *     *
    * * *
```

GENERATION 8

```
    * * *
  * * * * *
*         *
* *   *   * *
* *   *   * *
* *   *   * *
*         *
  * * * * *
    * * *
```

ETC.

THE HALL OF FAME

We would like to receive suitable photographs (your hand-carved hardware, the Chief Programmer and a punch operator locked in a deadly embrace) for printing in a future copy of the Newsletter.

Send prints (not negatives) which should be black & white - they will be returned.

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S.Fyfe - The Galdor Centre, 52 Brighton Rd., Surbiton, Surrey KT6 5PL has information on ICL 1300 systems coming up for disposal if anyone is interested in taking on a machine.

WHODUNIT ?

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