Not only computing — also art

JOHN LANSDOWN

The mole emerges

By the time you read these notes it is hoped that the long-awaited *Logical Mole* display will be installed in the Computer Art section of the Science Museum Computing Gallery. The concept of the display was devised by a number of members of the Computer Arts Society but the particular manifestation of the idea belongs to my colleague, Colin Emmett. Essentially the exhibit, which is under the control of a microcomputer, consists of two separate but related elements in the form of display panels about 1.5m high by 1m wide. The first is an animated flowchart illustrating the program which the microcomputer is able to execute and the second is a display which shows the results of executing the program. On pressing the start button which initiates the process, a visitor is able to drive the microcomputer through the flowchart, making appropriate decisions on which paths to take by means of touch switches on the surface of the chart. The program is meant to illustrate the decisions of a logical mole as he tunnels through the earth, turning this way and that as obstacles are met. His progress is shown on the display as a set of illuminated lines and arcs. Depending on circumstances, the tunnels can remain after the mole digs them or progressively collapse behind him as he goes forward, and there are sufficient variables in the process to make for a large variety of different cases.

Once the flowchart has been traversed, the display pattern begins to pick up speed until it is running almost as fast as the electronics will allow. At this point, it is not possible to absorb the flowchart information and only the tunnel display is comprehensible. It is hoped that the visitor will see this both as an art work and as a teaching tool. For all sorts of reasons: financial, personal, managerial and technical, the project has been a difficult one to complete and, if we were doing it again, we would approach it in a quite different way. It is surprising how quickly changes in hardware allow you to modify your ideas.

Many people have contributed to the venture: the Science Museum provided much of the cash, manufacturers some of the equipment, Leicester Polytechnic helped with microprocessor expertise, Grazebrook Laboratories built the displays, and CAP did the programming (twice, because we changed our minds!). I am sure you will find the exhibit of considerable interest—the whole gallery is worth a visit.

FROLICsome computing

Colin Emmett has also been busy developing a Fortran-based computer animation package: FROLIC. Essentially, the package consists of a set of commands to facilitate the production of animation sequences, especially for an FR80 microfilm plotter. The commands fall into two types: the first manipulate the data structure; naming files, linking files together, copying one file onto another and so on, whilst the second manipulate the data itself; transforming it in various ways to suit the particular animation needs.

Working on computer animation for some years now, Colin has concluded that whereas conventional hand methods are best for simple animation of complex images, computer methods score at complex animation of simple images. Thus Figure 1 (a frame of a FROLIC-produced sequence) which is of the former variety is not best suited to computer animation. Figure 2 on the other hand—a frame from a FROLIC-produced sequence of a tumbling man—is a relatively simple image (albeit consisting of more than 8000 data points) but with relatively complex movements of rotation, translation and scaling.

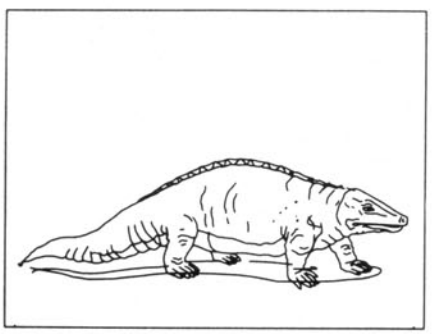
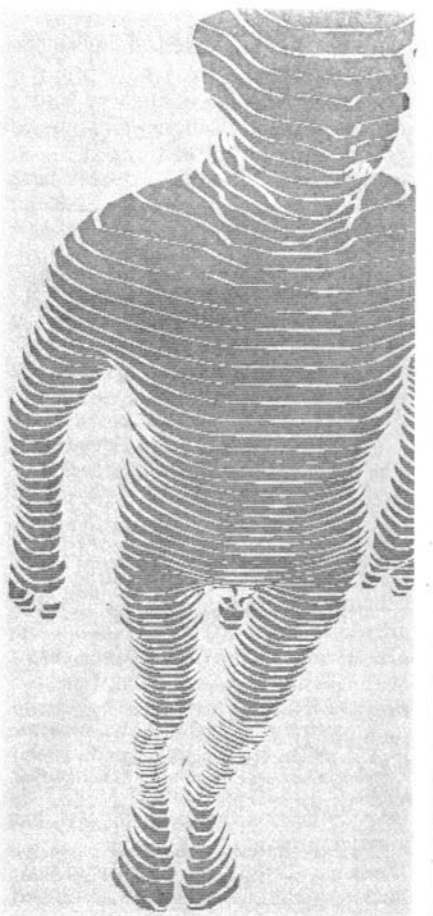


Figure 1 (above)
Figure 2 (below)



Controversial techniques

There is a considerable and often heated debate proceeding in architectural circles on the merits and demerits of computer aided architectural design (CAAD). The seeds of the controversy were probably laid in a spirited discussion between Professor Tom Maver and Mike Cooley at the Second International Conference on Computers in Engineering and Building Design (CAD 76) in 1976, but the person who has done most to stir up response in this area is Nigel Cross of the Faculty of Technology, Open University. He began his criticisms of CAAD in two recent publications: a book, *The Automated Architect* (Pion, London 1977) and an article, Problems and Threats of Computer-Aided Design in the *RIBA Journal* (London, Oct 1977, pp 439–440). In March 1978 he returned to his theme in a paper to the CAD 78 Conference, Assessing Computer-Aided Architectural Design Systems, in which he suggested that, far from improving the ability of an architect to design, CAAD techniques actually have the opposite effect. I believe he came to this conclusion from limited evidence but I think he is right in his (and Mike Cooley's) insistence that we should continually evaluate and monitor the effects of introducing computers into architectural practice both from the point of view of architectural quality and of job satisfaction. On the other hand, I also share Tom Maver's view that the public is not getting the best architecture it could and that CAAD techniques (in their widest sense) can help remedy this defect.

The debate will continue but, meanwhile, more and more practices are acquiring machines and many interesting examples of their use were shown at CAD 78 confirming that, in this field at least, Britain is leading the

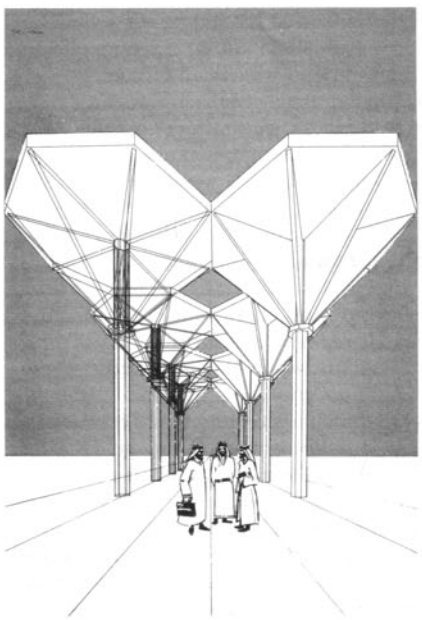


Figure 3

world. Dr J. A. Davison showed some beautiful computer produced drawings of which Figure 3 is an example of general interest. Such perspective drawings are used by the architects of GMW Partnership to help visualise complex geometries without the need for making physical models and were generated by means of Col. Nigel Hitch's AUTOPROD program on one of the partnership's two minicomputer work stations each consisting of a 32K PDP11/40, 17″ refreshed graphics display and light pen, 36″ × 48″ digitiser drawingboard, 2 × 1.2 Megaword cartridge discs and 36″ drum plotter. The main use of the workstation is the production of detailed contract drawings and John Davison's CAD 78 paper, RUCAPS: Cost Effective Drafting for the Building Industry, gives a full description of their use. Anyone interested in the state of the art in this rapidly developing field should read the Proceedings of CAD 78 (IPC Science and Technology Press), I particularly commend you to look at Paul Richen's The OXSYS System for the Design of Buildings and Thomson and Webster's Progress with CEDAR 3: these two papers describe what are surely the most advanced CAAD systems in day-to-day use in the world.

Words and pictures

The enormous growth in microcomputer production has been accompanied by a corresponding burgeoning of computer magazines aimed at the non-professional public. I have now read all of them—indeed, to the detriment of my bank balance and storage space, seem to subscribe to most, so the following informal review may be of interest.

The pioneers in the field were Edmund Berkeley's excellent *Computers and Automation* now, in view of its content, more appropriately called *Computers and People*, and the Computer Arts Society's *PAGE* (although, in the nine years of its production, only 39 issues of this have been produced: less than 300 pages in all!). Both these magazines are worth reading for the information they give which is not readily available elsewhere. One of the first of the new magazines was *Creative Computing* (6 issues a year). This publication tends to concentrate on computer games and simulations, giving useful general advice on programming—mainly in Basic, and reviewing software and hardware. *Personal Computing* (12 issues a year) gives news on hardware and software developments, and tends to encourage readers to use their personal computers for moneymaking ventures. When it gives program listings, these too are generally in Basic.

Kilobaud (12 issues a year) has a slight bias towards hardware construction and gives programs in micro machine code, assembler and Basic. *Byte* (12 issues a year) also gives details of hardware construction, together with hardware reviews and articles of general interest. *People's Computers* (6 issues a year) deals with games, simulations, robotics and so on. It too gives program listings in assembler and Basic. *Dr Dobb's Journal* (10 issues a year) concentrates on complete systems, application software and consumer evaluations. It is full of assembler and machine code programs. *Interface Age* (12 issues a year) is similar to *Personal Computing* but perhaps with a greater bias towards hardware construction.

All these magazines (except *PAGE* which is Anglo/US) are American in origin and are generally written in a chatty, informal style. One or two articles seem to be contributed by young enthusiasts on an ego-trip and this gives at least one reader nausea, but all are well-produced and informative—the advertisements being particularly useful in drawing attention to new developments. A new British magazine, *Personal Computer World* (6 copies a year) has entered the lists and, judging from the first issue, will be dealing with hardware construction, general information and hardware and software evaluation.

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safely be entrusted the future well-being and development of the profession. This is a more ambitious definition, going beyond current competence to require understanding, vision and adequate resources with which to handle the unknown.

There is a place for both types of worker in computing as in other professions. Having called in the troops once already, it is tempting to quote the analogy, proposed to me recently by a colleague, of the NCOs and the officers. Perhaps the BCS ought to recognise the two levels explicitly in its membership structure. The difference is emphatically not the difference between Parts I and II of the examinations or between any two existing grades. The present structures do not provide for two levels of terminal qualification and all the controversy seems to arise from a failure to recognise this. For the future we can either decide unambiguously which one level to go for or, and in my personal view preferably, seek a broadening of the Society's objectives so as to encompass both levels.

C. M. REEVES
Chairman of Examinations Board

Fire protection

I would be grateful if you would allow me to draw the attention of your readers to the publication of a draft for public comment of the newly revised British Standard Code of Practice for fire protection of EDP installations (previously BSI CP 95). This is likely to be extremely important for all computer owners, as it may come to be used by fire protection authorities, insurers, and safety inspectors. Thus the structure and equipping of computer and data preparation rooms is likely to be affected, and also the owner's obligations relating to the safety of his staff and users of the computer.

The draft attempts to take into account new developments, both in computer equipment and in fire protection methods, which have occurred since the publication of the original standard. Its recommendations cover the design and construction of accommodation for the equipment; the air-conditioning plant and power distribution and controls; operational fire precautions; and, where required, fire detection and extinguishing systems. The committee which produced the draft was fully agreed on most aspects but there were differing views on the need for, and the

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Computer Puzzles

ALEPH NULL

Computers are not renowned for their ability to do card manipulations, but there are one or two tricks which can puzzle the uninitiated. Probably the best one is as follows.

Invite someone to pick five cards randomly from an ordinary deck of 52 cards. Having done this ask the person to select one of these five random cards; the remaining four cards are then input to a computer and the machine names the selected card.

This trick involves the coding of information. Since none of the four cards input to the computer can be the selected card, it is necessary to code the identity of one of the remaining 48 cards. Now, since I wrote the program, I and the program have an agreed integer for each of the 52 cards and there are 24 different ways in which I can arrange the four cards that I input to the program—Table one shows all these possibilities. The program's first task is to reduce the input to just four integers in the range nought to three (as shown in the table). It then applies the simple algorithm

if $i < j$ **then** $j := j - 1$;
if $i < k$ **then** $k := k - 1$;
if $j < k$ **then** $k := k - 1$;
CARD: $= i * 6 + j * 2 + k + 1$;

to obtain the integer in the range 1 to 24. To pick 1 in 48 we have to cheat a bit (literally); the single extra bit of information is entered by the presence or absence of a trailing space in the input line.

Another interesting card trick depends upon knowing the binary system. In many tricks the selected card is disclosed when the spectator is handed some cards and asked to shift the top card to the bottom of the pack, deal the next card to the table, shift the next card to the bottom, deal the next to the table, and so on, until only one card remains—which is the selected card. Just where must this card be at the beginning?

The answer is to express the number of cards in the binary system, shift the top digit to the bottom and the resulting binary number is where the selected card must be from the top of the original deck. For example, take the full deck of 52 cards. The binary for 52 is 110100. Shift the top bit to the bottom and we have 101001, *ie* the number is 41, therefore the selected card must be the 41st card from the top of the deck.

This trick is a special case of the more general problem known as the Josephus problem which is the basis of many puzzles. You are one of a group of men who are going to be executed. You have to stand in a circle and the executioner starts counting round and round the circle, executing every n^{th} man, until ony one man remains; this man is allowed to live. Where should a man stand at the beginning? When $n=2$ we have the card situation, but I leave it to the reader to investigate the other values of n.

	i	j	k	–
1	0	1	2	3
2	0	1	3	2
3	0	2	1	3
4	0	2	3	1
5	0	3	1	2
6	0	3	2	1
7	1	0	2	3
8	1	0	3	2
9	1	2	0	3
10	1	2	3	0
11	1	3	0	2
12	1	3	2	0
13	2	0	1	3
14	2	0	3	1
15	2	1	0	3
16	2	1	3	0
17	2	3	0	1
18	2	3	1	0
19	3	0	1	2
20	3	0	2	1
21	3	1	0	2
22	3	1	2	0
23	3	2	0	1
24	3	2	1	0

Table 1 The 24 ways 4 different integers can be arranged

One final card trick is neat because you can actually convince people that you have a computer-like memory! Take a deck of cards and openly scan through saying that you are memorising the entire sequence. In actual fact all you are looking for is the identity of the 26th card from the top (lets say it is the ace of spades). Put the deck down and ask someone to take up to about half the deck and put these cards in his pocket (make sure he takes less than 26 though). Now ask him to look at the top card of the remaining deck and then cut the deck burying the card into the middle of the pack. You now pick up this depleted deck and scan for the ace of spades. Cut this to the bottom of the pack. Now count 25 cards and cut the deck again and replace it on the table—do this as fast as you can. You give the spiel 'I have counted the cards and also spotted where the sequence differs from the original. I have placed the card you selected at the same number of cards from the top as you have in you pocket.' The nice thing about this trick is that you don't have the slightest idea how many cards he took or what he selected—the trick works all by itself. Nevertheless it gives the impression of acute memory and dexterity. I should be interested to hear from readers who have any computer card tricks of their own.

Computer chess comment

Having spent over a year in Australia doing full time research in computer chess and also writing a book *The Machine Plays Chess?* (Pergamon Press) I have often been asked whether I think David Levy will win his bet that no computer will beat him at chess before 31 August 1978. I have always thought this bet to be detrimental to the subject; reducing it to a publicity stunt and preventing any serious funding. If anyone really believes that the way to support research in artificial intelligence is to bet £250 on whether unpaid amateurs with more ingenuity than common sense can achieve a certain level within a decade then I suggest that £250 per decade is all that is required to fund the subject.

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hazards of, installing total gas flooding and/or automatic sprinkler systems in computer areas.

Views are sought both on this issue and on other aspects of this draft. The committee is most anxious to take into account the comments of users as well as manufacturers, insurers and other interested parties on the issues—which not only affect the cost of an installation and its insurance, but also concern the safety of staff employed in the computing centres and the vital need to prevent damage or destruction of computer records and equipment.

Copies of the draft can be obtained from BSI General Office, 101 Pentonville Road, London N1 9ND; remittance of £1.50 with order. The latest date for comments has been extended until the end of June.

H. McGREGOR ROSS *London*