

Computer Art is alive and well

JOHN LANSDOWN

The use of computers in various aspects of the creative arts has figured in two sessions of recent international computer conferences; Eurocomp in Uxbridge during May and the IFIP congress in Stockholm during August.

Animation

At Eurocomp, under the chairmanship of Alan Sutcliffe, four papers were given which, loosely, could be described as being concerned with animation.

The first, by Canadians N. Burtnyk and M. Wein, dealt with the use of the computer to produce animated films and, in particular, with a new film called 'Le Faim' by Peter Foldes, shown at the Cannes film festival during the same week as Eurocomp. Foldes, a French film maker with many conventionally animated films to his credit, was invited by the National Film Board of Canada to make use of their film animation program being developed by Burtnyk and Wein. Intermittently over a period of two years, Foldes and the computer experts advanced the film and program together, influencing one another's work during the process and succeeding in producing both a powerful art work and a useful tool for animators. One of the most striking innovations of the program was the way in which, by using a simple technique similar to that used in conventional animation studios, the so-called 'hidden-line' problem was obviated. In answer to questions though, Burtnyk pointed out that, unfortunately, the technique is not

able to be adapted to the general hidden line problem occurring so frequently in computer aided design.

William Fetter of Illinois University showed the results of his work in using computers to draw the animated human figure. This formidable problem (which required solution for a variety of purposes, notably the simulation of pilot movements in aeroplane cockpits to check intended positions of knobs and switches and so on) had been tackled at various levels of detail using what Fetter called the 10-point, 100-point and 1000-point man. The 10-point man was little more than a stick figure having fairly stylised but correct movements whereas the 1000-point man was a beautifully drawn, fully-represented figure with a complete repertoire of expressive and human joint movements. A film was shown illustrating these men going through their paces and it was quite clear that Fetter and his students had produced a set of programs which gave both useful and aesthetically pleasing results. Perhaps because it was not so relevant to their work, they had not yet tackled the hidden line problem and one wondered whether Burtnyk's technique would help here.

An entirely different form of animation was covered in the presentation of Edward Ihnatowicz of University College, London, who described the way in which he had used dedicated computers to control the behaviour of moving sculptures. Dealing first of all with his 'Senster', he showed a film of this remarkable work — a crane-like structure about fifteen feet high jointed in the manner

of a lobster's claw which is responsive to sound and movement of people in its vicinity. This responsiveness is achieved through the medium of a Honeywell-416 computer which accepts noise and movement signals from spectators by means of radar scanners and an array of microphones at the head of the Senster, processes them and then outputs control signals to the hydraulic joints which move the sculpture smoothly and in a lifelike way towards the source of the sound or movement. In order to prevent a pandemonium of shouting and waving from the spectators, the work is programmed to respond only to soothing calls and movements so that, in the event of sounds exceeding a threshold, Senster goes into an immobile 'sulk' mode and waits until the sounds have reached a level more to its liking before resuming its responsive action.

Ihnatowicz also dealt with his more recent work 'The Bandit', a computer-controlled device having a lever rather like a fruit-machine handle which, when manipulated by a user, would respond to and analyse his movements. The analysis is presented to the user as a short teletype message stating the person's sex and characterising his or her temperament; a piece of psychoanalysis not meant to be taken too seriously although sex was determined correctly 75 per cent of the time. It was clear from the questions asked of Ihnatowicz that the conference saw his work as a valuable contribution to the study of artificial intelligence as well as to creative art.

The final presentation in the Eurocomp session was given by myself. I showed two films and a videotape of my work on computer choreography. Shown in order of production, the films illustrated the changes in technique over five years from the first tentative efforts of 1969 with their sometimes hilarious errors in programming and choreographic method, to the more controlled and theatrical work of 1974. The early exercises were based on an ambition to have the program totally specify all aspects of the dance leaving very little room for creativity by the dancers themselves, whereas the later work exploits the considerable contribution the performers can make to the interpretation of more general computer-produced instructions. A dance based on the Japanese Noh play (see Figure 1) illustrated this point and showed how well creative performers could interpret a computer-devised



Figure 1

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script with its mock-Japanese text and generalised instructions for movement.

Graphic art

At the IFIP congress, a number of papers on computer art were given, among which were three concerned with the graphical aspects of computer art.

Leslie Mezei, Martine Puzin and Pat Conroy of the University of Toronto gave examples of the way in which computer graphics can be used to simulate the sort of patterns and textures that occur in nature, such as organic cells, soap bubbles, honeycombs, cobwebs, tree bark, and fur. The authors showed how most of these patterns can be derived from a very simple basic algorithm which relied on the same sort of stochastic procedures which characterised a great deal of early computer art. Virtually all textures, too, could be generated from a small number of what the authors called 'signs' such as circles, squares, squiggles and hatches distributed over the surface in a dense uniform random distribution. They concluded that these simulations were of more aesthetic value than many intentional productions of computer art.

I. Gumowski of Switzerland and C. Mira of France dealt with some very striking designs which could be derived from graphs of computer-produced point-sequences. The authors started from the premise that, if a pattern formed from a point-sequence is to be pleasing, it must have a sufficient amount of both complexity and regularity; complexity to avoid the impression of obviousness and regularity to ensure the presence of some underlying unity. For convenience on computation of the sequences, the authors decided to use recursive functions in which the coordinates of the point being calculated at the present time depended on some function of the coordinates of the previously calculated point. Mathematically this could be expressed as

$$\begin{aligned} X_{n+1} &= F(X_n, Y_n), \\ Y_{n+1} &= G(X_n, Y_n) \quad n = 0, 1, 2, \dots \end{aligned}$$

For suitable choices of the functions F and G , patterns of great and unexpected beauty could be obtained and it is clear that the authors have suggested a technique which adds considerably to the graphical armoury of the computer artist.

Dr Florentino Briones of the Centro de Calculo, Madrid, dealt with the way in which the centre aids painters in the visualisation and creation of 'modular' paintings in which Spanish computer artists seem to specialise. Modular paintings are those built up from a set of elementary figures which are combined and manipulated in various ways and, for some years, the centre has held weekly seminars between artists and computer personnel to discuss the aesthetic and practical problems of devising such works. Briones showed the sort of operations one could perform on an alphabet of two modules. One module could be rotated, complemented (that is to say, black areas could be made white and *vice versa*) or mirrored whilst the set-theoretic operations of union, intersection and or-exclusion could be performed on two or more modules to make up what might be called 'macromodules'. If, as the artist Manuel Barbadillo frequently does, one wished to build up a modular picture using combinatorial rules, one soon finds that the number of possible configurations grows to an unmanageable degree making it impossible, even with computer aid, to make a visual selection of the valid ones. As an example, Briones showed a net of 4×4 regular squares together with four black and white Barbadillo modules which, by the permitted operations, allowed 44 different possibilities for each square and hence 2×10^{26} possible pictures.

Programs incorporating rules of compositional symmetry were devised to reduce the possibilities to 4 million pictures and further conditions on the permitted interrelationships between contiguous modules reduced the possibilities to a fraction of this figure. Even so, the remaining number is still very high but the artists clearly find these and other programs enormously useful in enabling them to explore unexpected and interesting configurations.

From the evidence of these conferences we can see that, all over the world, artists and computer experts are cooperating to produce exciting work not only in the conventional areas of graphics, animated film and painting but, more importantly, in the new area of cybernetic sculpture. The development of the trend of using dedicated computers to control art works is likely to continue particularly with the growth of low-cost microprocessors and, certainly by the next IFIP

Congress, we will see a further breakdown in the barrier between science and art exemplified in works of art which could not have existed without the use of computers.

Titles of papers

Towards a computer animating production tool
N. BURTONYK and M. WEIN

Human figure computer graphics development for multiple applications
WILLIAM A. FETTER

Art and cybernetics
EDWARD IHNATOWICZ

Writing programs to dance to
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Simulation of patterns of nature by computer graphics
LESLIE MEZEI, MARTINE PUZIN and PAT CONROY

Generation of aesthetically appealing point-sequences by means of two-dimensional recurrences
I. GUMOWSKI and C. MIRA

Computer painting with some subjective data
FLORENTINO BRIONES

About the Author

John Lansdown is an architect who has been using computers in his work since 1964. Long-time secretary of the Computer Arts Society, he is in touch with most of the leading computer artists in the world and has lectured extensively on the impact of computers in the arts. His own computer art work is in the fields of music and dance and a group of his dances were performed at last year's Edinburgh Festival. He is currently working on further dances to be given in London during October.