Not only computing – also art

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There's no business like show business

A feature of SIGGRAPH conferences is a showing, usually in the evenings, of a large number of computer animated films and video tapes. Many of these are remarkable works which push out the boundaries of what it is possible to do with computer graphics, and deserve the acclamation with which they are received. But, whereas a showbiz atmosphere is appropriate to these film evenings, it is certainly not appropriate to the conference itself. Yet, in the 1980 Seattle conference, there was a marked tendency for this to happen so that some delegates, at least, seemed to think that the object of SIGGRAPH was simply to entertain them with gee-whizz pictures. The effect of this was that some of the presentations of papers which did not contain much in the way of graphics but were otherwise of importance, were received with scant attention and much less enthusiasm than some of them deserved.

One such paper was that by Norman Badler of the University of Pennsylvania, who talked on the *Special Problems in Human Movement Simulation*. Because of my interest in computer choreography, this is a subject dear to my heart and I know how difficult it is to use the machine to simulate human movement with any realism. It was clear from Professor Badler's presentation, however, that he and his team had gone a long way towards cracking the really difficult problems (such as those of scheduling concurrent joint movements, computing linkage movements, maintaining balance and so on) that confront anyone working in this field, although he had no movie to show of his work – a fact that seemed to have been taken as a personal affront by some members of his audience. Those interested will find his important paper in the SIGGRAPH 80 Proceedings which should now be in the hands of all SIGGRAPH members.

Another worker in the same field of human movement studies (or Kinesiology), Tom Calvert of Simon Fraser University, was able to show a film of a stick figure animated to walk and dance in a remarkably realistic manner. Instructions for the movements are given to the figure by means of Labanotation, which is one of the three major dance notations that are in current use by choreographers to record details of their dances. In Professor Calvert's system, the Labanotation symbols call up movement macros which have either been derived from gait measurements taken by specially constructed joint electrogoniometers or by movements devised by a choreographer on the team. The quality of movement achieved is really excellent and, if Tom Calvert and Norm Badler could get together so that the Simon Fraser stick figure could be clothed with the University of Pennsylvania spherical body representation (mentioned in this column for December 1979), together with their new work, we'd see something astonishing!

Many computer graphics problems can be solved simply by improvements in computing power and speed and we saw examples of this at the conference – particularly an astounding sequence by Loren Carpenter of a mountain landscape generated by Fractal techniques and which received the equivalent of a standing ovation when he showed it. This two-minute or so film took over 500 hours of VAX time to produce(!) and this fact was taken by some members of the audience as something in its favour. The sort of problems that Calvert and Badler are facing with movement representation are not solvable by such means – even with unlimited free computing. Their problems require breakthroughs in understanding rather than technique and their work reveals much greater intellectual effort than their present graphics are able to manifest. The Calvert dance film was submitted to the recent Online CG80 Computer Animation Festival (for which veteran animator John Halas and myself were judges) and won the award for Technical Merit.

Pretty polyhedra

Professor Badler also gave the presentation of a paper by Kathleen Mckeown and himself on *Creating Polyhedral Stellations*. These stellations are geometrical transformations on polyhedra which generally make them into starlike objects and their discovery has a long history going at least back to the 17th Century and Kepler. Most of them are quite difficult to model in reality as anyone who has tried to follow the instructions for making the simple ones given in Cundy and Rollet's indispensible *Mathematical Models* will confirm. Thus efficient computer graphical representation of these figures is something to be desired, particularly as some are so difficult that they have never been either drawn or made. New objects are continually being discovered by workers exploring this field and are given exotic names such as triakistetrahedra and rhombictriacontahedra. The University of Pennsylvania workers were able to draw for the first time some of the 227 types of the latter object, and delightful, mysterious things they are (see front cover). This is another example of the way in which the computer can extend our imaginations.

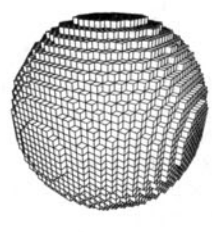

Figure 1

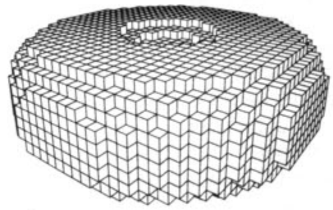

Figure 2

Blocked puzzle

An Argentinian reader, Alberto Christensen, who works for the National Research Institute for Mathematical Sciences, Pretoria has sent me some of the graphics he submitted for the SIGGRAPH 80 Proceedings cover competition (won, incidentally, by Loren Carpenter; Alberto Christensen winning the title page award). These pictures are based on representations of objects made up of a myriad of cubes (Figure 1). The models have been generated by Mr Christensen's own algorithm the starting point of which is a surface that can adopt any shape, either open or closed, and which can be described either analytically or numerically. Figure 2 shows a doughnut approximation built up of nearly 2800 faces – the sphere has 5000. The algorithm is outlined in *Questionaes Informaticae*, Sept 1979 Vol 1 no 2.