Not only computing—also art

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Putting a brave face on it

We are all pretty good at recognising faces—indeed perhaps it's the thing we do best. Certainly we are capable of not only remembering the facial features of a very large number (possibly thousands) of people but we can also interpret from these quite subtle changes in such things as happiness, boredom, hostility, pain or what-have-you. CAS member Alan Kitching, working with Ulf Nottebohm-Kaiser of Swedish Television, recently exploited this facility for the TV broadcasts of the 1979 Swedish General Elections. Using his computer animation system ANTICS, he created a set of caricature faces of the party leaders (Figure 1) animated by machine in such a way that, as the results were coming in and the swing went up so did the grin and, as the swing went down, the frown became more pronounced. Apparently, this was the most popular thing seen on election TV.

The idea of using caricatures to indicate swings is not, of course, a new one and was used in Atlee–Churchill struggles in the 1950s. I remember seeing projected pictures of frowning and smiling leaders on election nights in Piccadilly Circus (this before Mackenzie's notorious swingometer). However those pictures were not animated and the Swedish efforts seem to be the first in which such computer techniques were used. This ability of ours to read quite small changes in facial expression is also being exploited in another novel way. In 1971, while working for the Office of Naval Research at Stanford University, Professor Herman Chernoff suggested that it would be possible to use pictures of the human face to represent complex multidimensional data. In his paper, *The Use of Faces to Represent Points in n-Dimensional Space Graphically* (Technical Report no 71, Department of Statistics, Stanford University) he put forward the notion that as many as 18 different sets of figures could be represented by the 18 facial features he identified, such as curvature of the mouth, angle of eyes, size of eyebrows, and so on. Herbert T. Davis Jnr of the Los Alamos Scientific Laboratory took up this idea in 1975 and suggested adding a more representational nose and ears so that the resulting pictures are now called *Davis–Chernoff faces*. My colleague George Mallen and I have been doing some work on this method of representation (Figure 2) and are encouraged by results. It does seem possible to depict and distinguish quite complex sets of data by this method. Anyone who has ever had to compare the performance statistics of companies, buildings or systems will know how difficult it is to interpret these in a synoptic, overall way. Mapping such data on to Davis–Chernoff faces is one way of assisting in this task.

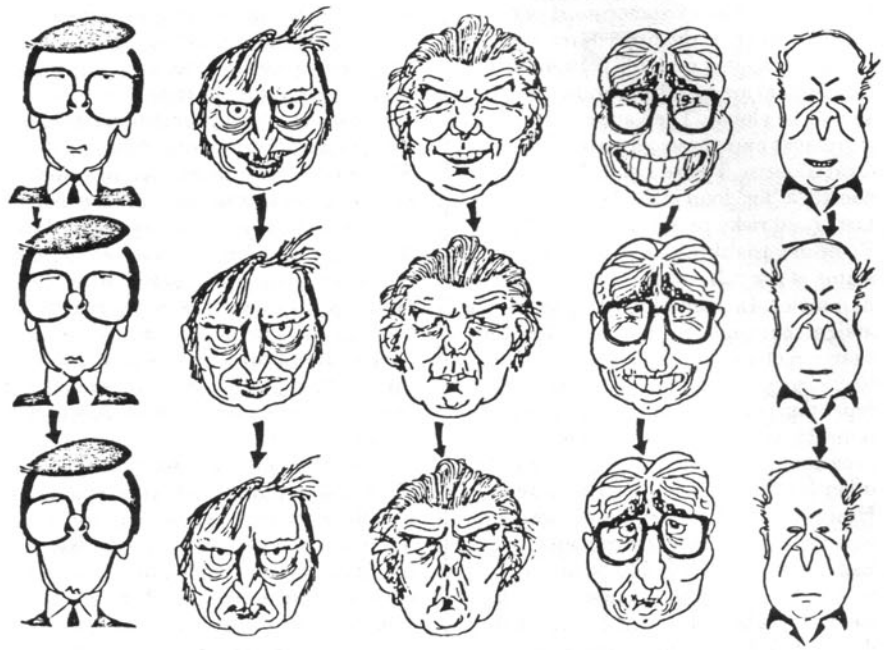


Figure 1

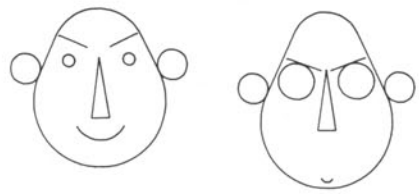
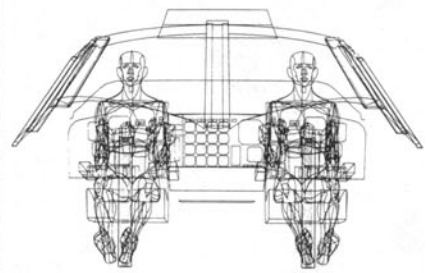


Figure 2

Whilst the technique is of interest in itself—and for those who wish to know more about it I suggest the book *Graphical Representation of Multivariate Data*, edited by P. C. C. Wang, Academic Press, London 1978—to me the most interesting thing is that it is yet another example of an idea which not only exploits the potential of the computer but, I submit, would not even have been thought of if the computer did not exist!

The body beautiful

I have mentioned in these columns previously the geometric problems in modelling the human body by computer. Pioneering work in this direction was done by William A. Fetter when he was at the Boeing Company (Figure 3). The very realistic, but outline, figures he created there were hinged and articulated to represent the way in which



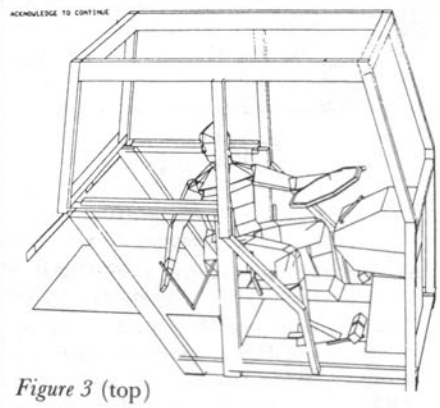


Figure 3 (top)

Figure 4 (above)

aircraft pilots move and the whole system was used to help design the 747 cockpit layout. Parallel to the Boeing work, a major British development has been SAMMIE (Figure 4), the brainchild of M. C. Bonney and his team at the University of Nottingham. Whilst not as pretty or visually realistic as the Boeing man, SAMMIE is much more versatile in that, unlike the Boeing man, all his joints move and he can take up standing as well as sitting attitudes. In addition, the man-model is embedded in a complete system enabling the relevant surrounding environment (lorry cabs, workplaces, buildings and so on) also to be easily modelled and seen either from the point of view of an observer or of SAMMIE himself. One other advantage of SAMMIE worth mentioning is that he is generally available via Compeda Ltd, the software being written in machine independent Fortran IV and Gino-F.

More recently, Bill Fetter, who is now at the Southern Illinois Research Institute, has been engaged in even more realistic body modelling, and his latest effort (Figure 5) is the outline of a figure which will ultimately derive animation in several forms of display including a shaded colour system. The results will be applied to the work of a number of researchers in the sciences, the humanities and the arts. An interesting resumé of some of the current body modelling work has been published by N. L. Badler and S. W. Smoliar in *Computing Surveys* 11, 1 (March 1979) under the title, Digital Representations of Human Movement.

The Queen of the Arts

To someone like me who has spent nearly the last 20 years trying to encourage and develop the use of computers and rational techniques in architectural design, it is vastly gratifying to see the recent mild, but definite, upsurge in the numbers of architectural practices buying and using computers. Despite the severe depression besetting the construction industry, a number of new (and, in some cases, influential) architectural practices are now using computers, and I am regularly being asked to advise others on likely systems. Here again it is possible to see the computer allowing thought processes not normally generated by conventional means. Building Design Partnership, for example, has recently used the BIBLE perspective program (Figure 6) devised by the ABACUS unit of the University of Strathclyde not just to examine the buildings (which, of course, they could have done by using their normal drawing techniques) but, more interestingly, to help assess quickly the significance of self-shading on the thermal performance of the blocks before running a detailed environmental analysis program. Such a task would have been difficult without computer assistance. The effect of this examination, I am sure, will be a better set of buildings more responsive to the needs of occupants.

The power and quality of computer drafting systems now challenge the drawing capabilities of even the best draughtsman. Witness Figure 7, drawn with the GDS General Drafting System of Applied Research of Cambridge. The design is by Paul Richens, the proportions by Vignola, and the details by Palladio. Who said that computer systems would restrict architects to designing glass boxes?

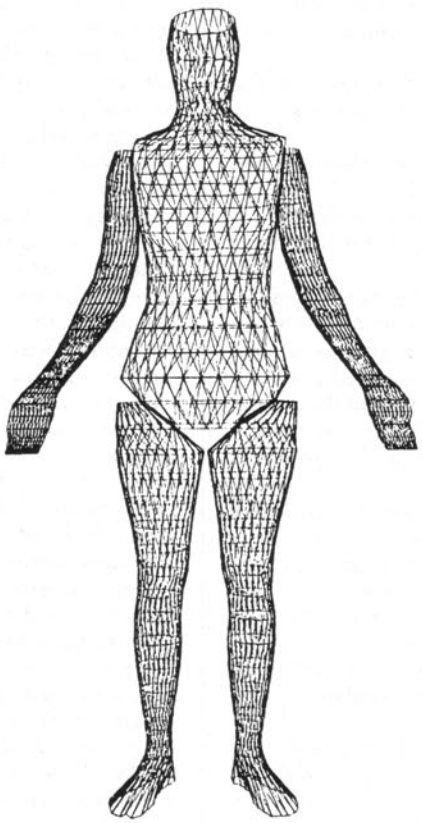


Figure 5 (left)

Figure 6 (below)

Figure 7 (bottom)