Not only computing – also art

JOHN LANSDOWN

Give me an 'A'

In the Autumn 1982 edition of the excellent magazine *Visible Language*, Vol. XVI (4), Douglas R. Hofstadter reviews some of Donald Knuth's work on 'Metafont', a program for designing letterforms. In Knuth's system, the shape and setting of letters is controlled by varying parameters – which can be thought of as knobs to be adjusted in order to affect such things as size, slope, thickness, length of serifs, roundness of form and so on. In this sense of parametric control, Metafont is little different from many computer art and design programs – though it is much more comprehensive.

The LORD is my shepherd;
    I shall not want.
He maketh me to lie down
      in green pastures:
   he leadeth me
      beside the still waters.
He restoreth my soul:
   he leadeth me
      in the paths of righteousness
      for his name's sake.
Yea, though I walk through the valley
      of the shadow of death,
    I will fear no evil:
   for thou art with me;
      thy rod and thy staff
      they comfort me.
Thou preparest a table before me
      in the presence of mine enemies:
thou anointest my head with oil,
      my cup runneth over.
Surely goodness and mercy
      shall follow me
      all the days of my life:
and I will dwell
      in the house of the LORD
      for ever.

Figure 1

An example of the way it can be used is given in Figure 1 where Psalm 23 is printed under the control of 28 knobs which are steadily adjusted throughout the piece. At the heart of Knuth's concept of Metafont seems to be the idea that, by the use of computing, we can look forward to the unification of all type-faces. This process will be arrived at by the exploitation of three basic ideas: (1) that, underlying all possible 'A's, for instance, is a fundamental letter encapsulating the whole quality of 'A-ness', (2) that, this fundamental quality can be represented by a finite number of parameters, and (3) that, all possible 'A's can be derived by proper setting of the parameters.

Attractive though this idea might be, Hofstadter shows that it is not achievable and that, it would be impossible, *a priori*, to predict all the parameters that would be necessary to define every conceivable future variation. He is very convincing in his arguments and he calls on a lot of interesting metaphors as well as Gödel's Incompleteness Theorem to justify his conclusions. However, he does not carry me with him all the way and does not explain, to my satisfaction at least, how we distinguish 'A's from 'B's when, in some display faces, they are incredibly distorted unless there is, in some sense, an underlying representational framework. After all, however idiosyncratic designers make their letterforms, they always design their 'A's as 'A's and not as 'P's or 'Q's. How can they do this unless there is something about each letter which is fundamental? Admittedly, when you look at the range of display faces available, it is difficult to see what this fundamental feature is – but that doesn't mean that it's not there.

Hofstadter's article is of interest to anyone who cares about design and, particularly, about computer aided design. It raises important issues about the scope and limitations of using computers in creative tasks and deserves the widest possible discussion.

The upper room

I can remember going to Italy just a few years after the end of the Second World War and being shocked at the poor state of preservation of Da Vinci's Last Supper which is painted on an internal wall of the convent of Santa Maria della Grazie in Milan. The building was bomb-damaged and it was lucky that the painting survived at all, but it appeared that old age was responsible for the greatest deterioration. I've been to Milan on one occasion since but did not have time to see the changes another 30 years has wrought, but I understand that the decline has not been arrested. You will remember that the painting is in one-point perspective with the disciples sitting at a long table and grouped either side of the figure of Christ who is framed centrally within the lines of a pedimented doorway.

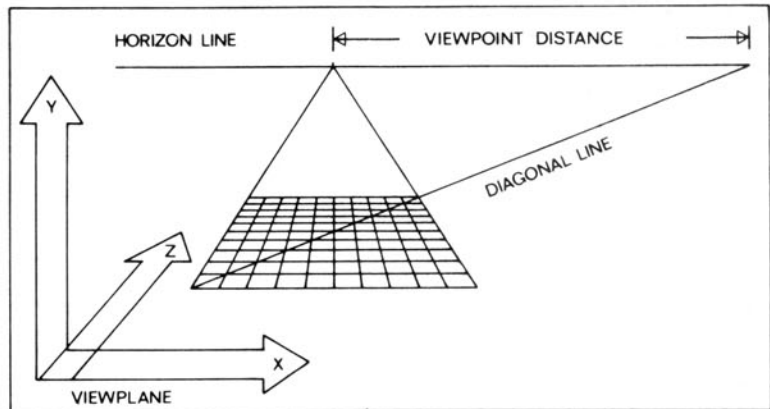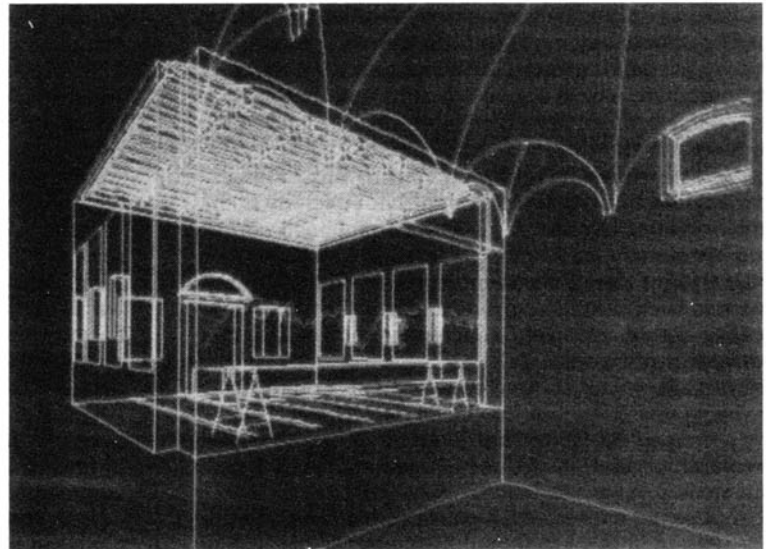*Figure 2*

Figure 3

Membership approved

JOHN LANSDOWN *Continued*

Because of the perspective, the composition draws the eye inexorably to the central character. As is common in Renaissance paintings, Leonardo did not attempt to show the figures in historically accurate surroundings but simply painted the scene as if it were set in a contemporary room. A long-time member of the Computer Arts Society, Daniele Marini of the Milan Institute of Cybernetics, has made a study of the painting using computer graphics in order to see in more detail what sort of room Leonardo had in mind. This meant working back from the perspective representation to the model of the room – a problem made more difficult by the problems of distinguishing details in the deteriorated drawing.

Perspective drawing was invented, or probably re-invented, in the first half of the 15th century by the architect, Leon Battista Alberti. It is likely that Da Vinci was aware of Alberti's laws of perspective although we cannot be sure of this. If he was, the method he would have used to set up the composition would be to divide the floor of the imagined room into a grid of squares all of whose diagonals meet at a point equal to the viewing distance as in Figure 2. These squares could then be used to position any element in the room correctly. The major question that needed investigation was whether Leonardo's room is square or rectangular. It could be either, but Daniele's study showed that, if it were assumed to be square then the imagined room was actually an extension of the dining room in which the painting is displayed (Figure 3). The extension has a raised floor in the manner of a stage and the friars using the dining room would see the figures in the painting as if they were sitting at the 'top table'.

Marini used a Computervision graphics system to do his reconstruction drawings and the study shows once again how computing can assist in the understanding of art. More details of the method can be seen in the *Computervision Journal* for June 1983.

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