Not only computing – also art

JOHN LANSDOWN

Graphics in light and shade

One of the favourite ways of using the computer in art is to enlist its support in the exploration of combinations and permutations of 'tile-like' modules. The idea is to devise appropriate small images set in a square and then to arrange these in a grid. The arrangements include rotating and mirroring the modules, and then placing them either according to rule or randomly. Surprisingly, both of these placing techniques are easier to perform by computer than by hand because people can act neither completely randomly nor strictly in accordance with rules for any length of time. Many of the computer artists I've written about in these pages have used this modular approach to picture-making, including Manfred Mohr, Manuel Barbadillo and, especially, Paul Brown, who is the current editor of *PAGE*.

In a recent meeting of the Computer Arts Society (held in conjunction with the Displays Group), Paul gave a talk on his work and explained how this arose directly and naturally from his earlier drawings created by hand. Unfortunately, he has had to suspend further developments of these ideas while he earns his living and, like many of us in the CAS, is now busy using the computer for commercial graphics – something which can be no less challenging, exciting and intellectually rewarding. He caused great interest in the meeting by showing some of this new commercial work done in collaboration with his partner, Chris Briscoe. In particular, a realistic rendering of the Michelin man was used to explain briefly some of the techniques of accurate highlighting and shading.

Two forms of model shading were outlined. The first, devised by Henri Gouraud, entails setting-up, in a special way, the surface normals at strategic points on the model, computing the light intensity at these points, and then linearly interpolating the results to give the values over the whole surface. The second, devised by Phong Bui-Thong, and known as Phong shading, tries to overcome a deficiency which sometimes arises in Gouraud shading – so-called 'Mach banding'. Mach bands are lines of incorrect brightness which sometimes show on surfaces when the intensity changes too rapidly. Phong shading helps to eliminate Mach bands by interpolating not the intensities themselves, but rather the surface

normals at the intermediate points, and it is these which are used to compute the intensities over the whole surface. Both methods require a fair amount of computation; Phong demanding more than Gouraud. For smoothly curved surfaces, the intensity needs to be known for display at each pixel so that, for an object occupying, say, 50 per cent of a 512×512 pixel screen, over 65,000 calculations are needed just to determine the lighting!

Although the CAS has been in existence for 15 years, this meeting (which started in the afternoon with demonstrations of painting and animation systems) was the first we had held jointly with another Specialist Group and I am glad that Ray Earnshaw, Chairman of the Displays Group, suggested and implemented the idea. Paul stood-in for our advertised speaker, Alan Kitching (who has sunk without trace) and I am thankful that Paul was able to give his excellent presentation at such very short notice. In view of the success of the event, I hope we can arrange joint meetings with other Groups in the future.

But to return to modular drawings. I mention these not only to tell you about the meeting but also to introduce the work of a computer artist who is new to me, Miroslav Klivar of Czechoslovakia. From the small set of examples of his work he has sent me, it seems that he, too, is concerned with modular arrangements (Figures 1 and 2), although he also does some more free-form, calligraphic drawings. I know nothing about him or his methods or tools – if I find out more, I will return to him in a later column.

Fractals re-visited

Alistair Kilgour of the University of Glasgow Computing Science Department has drawn my attention (for which, many thanks) to the fact that Benoit Mandelbrot's book, *Fractals: Form, Chance and Dimension*, which I wrote about in the March 1983 issue of the *Bulletin*, is now out of print. I had totally forgotten that it had been replaced by the revised and expanded version called *The Fractal Geometry of Nature* (Freeman 1982), which I had seen but don't have a copy. Unlike the original, this newer book contains colour pictures including the one shown on the front cover of the August 1982 issue of the *Communications of the ACM*. Perhaps we might have a review of this in *Computer Bulletin* at some time?
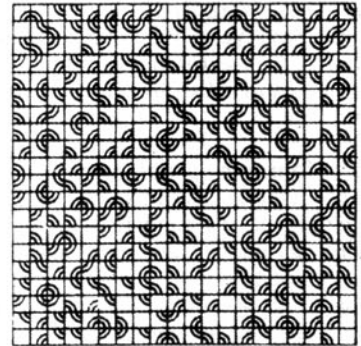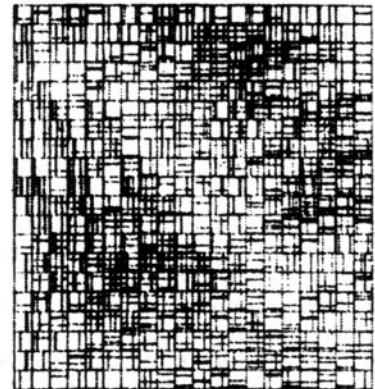

Figure 1

Figure 2

Visual impact

One of the architects' most important tasks in creating designs is to assess the visual impact of their work on the surrounding environment. The designers themselves usually have little difficulty in visualising the form and setting of the building, but clients and planning committees do not often share this facility. The outcome of this deficiency is perhaps that good designs are rejected or that bad ones are accepted: unsatisfactory results in both cases. The ABACUS Unit of the University of Strathclyde has devised a package of programs to assist in evaluating visual impact. The programs, called BIBLE and VISTA, allow the marrying of computer-generated imagery with photographs so that new structures can be superimposed on views of their sites to give accurate composites of the final situation. The sitings of structures such as power stations, factories, exhibition halls and, even, electricity pylons have been successfully examined and fine-tuned by use of their system and it is likely that more and more architects and their clients will avail themselves of such tools in the future. BIBLE can produce pictures such as that on the front cover which also shows a photograph for comparison.