

THE ART OF COMPUTER GRAPHICS—COMPUTER GRAPHICS IN ART

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Computer Graphics as a part of Computer Science has already proved to be a science in itself. Although started by scientists it has now been accepted not only as a tool but also as a powerful medium for the artist.

The possibility of manipulation or painting space in unlimited ways adds a new dimension to the creativity of an artist. The scope ranges from line drawings to patterns and 3D shaded pictures. Visualizations of 3D models with shading is possible, including reflection, refraction, shadows and lens effects. Painting can be effected with numerous brushes and an access to a great variety of colours. Manipulation of pictures and photographs using image processing techniques such as minning, maxing, greyscale, pseudocolour, arithmetic operations on different colour channels, filtering, convolutions and other effects can also be simulated.

The film industry in particular has taken advantage of computer graphics and integrated computer animated scenes into movies, soon the first 1.5 hr movie entirely made by computer will be released.

DEVICES

Output can be generated on a screen or on different hardcopy devices such as plotters, cameras, thermoprinters, etc. On screens it is possible to draw lines or to paint areas, depending on the type of the screen.

Picture 1 shows a line drawing which has been produced on a Tektronix storage tube, where an unlimited number of vectors can be drawn, but no selective erase is possible. The picture was drawn on paper by a 4-pen plotter.

A raster screen offers more possibilities, but less resolution and it requires usually more computer power to create a picture because a large amount of storage has to be accessed. The colour screen used for pictures 3-5 was a De Anza providing 512*512 pixels (picture elements) and each pixel can be given one of 16 million colours, which cover the entire visible spectrum.

To enter data into the computer several interactive devices can be used. A lightpen allows the artist to draw on the screen, pick items, etc. But it does not usually appeal to most users. The most frequently employed method of entering graphical data is by using a pen or a "mouse" on a data tablet. A menu can be attached to the tablet or displayed on the

screen. In the latter case moving the pen or the "mouse" could move a crosshair or a cursor on the screen and selections from the menu (like "move" or "draw") could be made by pressing a button. Thumbwheels, trackballs and joysticks may be used to move a cursor or crosshair.

To realize an artist's ideas programs of various sophistication may have to be used. A simple example would be a painting program which allows the user to paint on a screen just like on canvas, with different brushes and different colours.

Picture 1 was done using a simple program where the result is obtained by a creative dialogue between computer and artist. Up to 20 parameters vary the size and shape of a polygon in numerous iterations. The program works entirely in two dimensions, although the created imaginary objects have a three-dimensional appearance. The final object is done in several steps, where each stage can be interpreted as an answer from the computer to the input made by the artist who cannot easily predict the interaction of many parameters ahead of time. This program makes use of very inexpensive computers, picture 1 was generated by a microcomputer.

For pictures 2-5 a fairly sophisticated modelling program was used. This was actually designed for scientific purposes, but very often art and science go hand in hand in computer graphics.

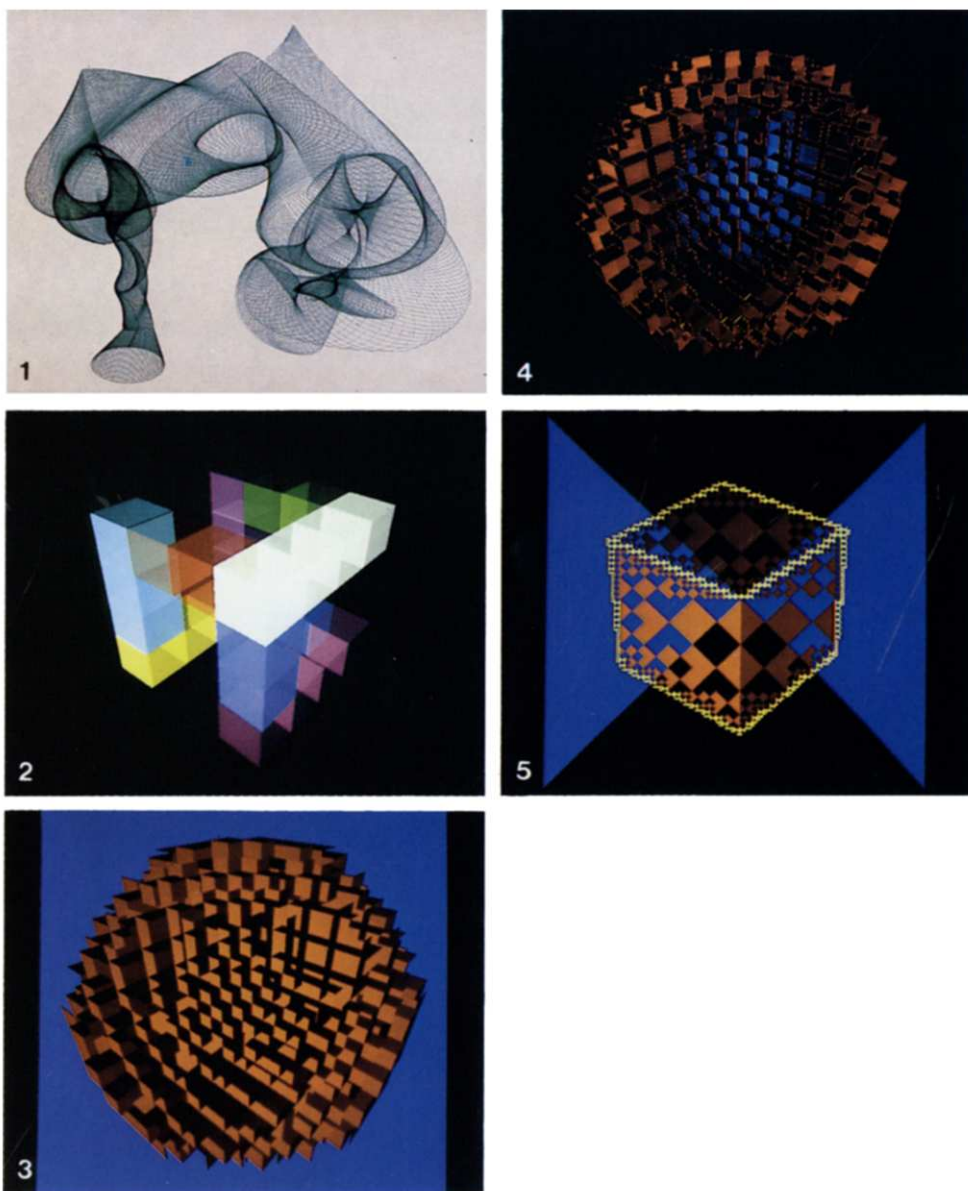
Picture 2 shows a structure of blocks in transparent display mode. Pictures 3 and 4 show a spherical model. Interactive pseudocolouring has been applied to picture 4. Using a trackball to modify the lookup table each colour channel (red, green, blue and black and white) can be selected.

Picture 5 explains how three-dimensional objects can be represented by two-dimensional pieces.

These very few examples give an impression of the wide range of computer graphics and the ample possibilities an artist has to enhance his (or her) creativity.

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Figs. 1–5.