

Painting By Numbers

Three fundamental types of computer graphics and how you can create images with them

A painting is built up from thousands of brush strokes applied to a bare canvas. But how can an artist create an image using a computer?

Three main systems on microcomputers are used for graphics. These approaches to the problem of graphical design are distinguished by the degree of control that they offer over the resolution or grain of the final image. Every microcomputer uses either block graphics, pixels or high resolution graphics.

In high resolution graphics, the artist aims at controlling the individual phosphor dots on the television monitor. The only limitation is the memory size of the computer. This determines how closely the computer's screen memory models the television screen. With a 32K computer every phosphor dot has a counterpart in the computer's model of the screen.

In block graphics, what the artist loses in con-

trol over the individual dots that make up the screen, he gains in convenience. Elementary shapes are already constructed and are available through the software to build an image. They are controlled directly from the keyboard, and the pre-designed shapes are usually displayed on the front of each key. With the touch of a shift key, a typewriter-style keyboard is turned into a palette for block graphics.

Each shape is formed within a small matrix of dots, eight rows by eight columns. Some microcomputers even offer the facility to define your own block characters. A minor program is used to define the new character and add it to the computer's range.

Pixels fall between block graphics and high resolution graphics. They give the artist control over a picture cell (hence the name 'pixel') which contains more than one individual phosphor dot

The Three Resolutions



In low resolution block graphics, as little as 1 Kbyte of memory may be enough to store all the details of what should appear on the screen. If there are just 40 blocks in each row and only 24 rows down the screen, the total number of blocks is 960, just under a kilobyte (a kilobyte is actually equal to 1,024). A kilobyte of memory for the screen can therefore store up to eight bits of information (255 different combinations) for each of the blocks on the screen.

In medium resolution, the detail shown on the screen is higher so more memory is needed. Eight kilobytes of RAM could allow 65,536 dots of light on the screen to be either on or off. If the display is in colour, some of this memory will be needed to specify the colour of each dot, leaving less memory for the number of dots. If we wish the display to be in eight colours, three bits will be needed to specify the colour of each dot.

A high resolution colour display requires large quantities of memory. High resolution displays sometimes have as many as 640 dots on each line and 240 lines down the screen. This gives a total of 268,800 dots. If only one colour is to be displayed, 33,600 bytes ($268,800 \div 8$) would be adequate. Each bit would be either a zero or a one, and this corresponds to each dot on the screen being either off or on.