Double Vision

Most people think that we will have to wait for some major breakthrough before we get 3-D television. This is not so. With your computer, you can already produce quite respectable three-dimensional images on a perfectly normal colour television.

Admittedly, they are not in full colour, and you will only be able to show the edges and corners of an object, but you can certainly perceive true depth.

It should be made clear that the term 'three-dimensional' is a description often applied to commercially available programs. But in almost all cases, this is less than accurate: the product on offer is in reality an ordinary 'flat on the screen' game, to which has been added some perspective or shading.

The genuine three-dimensional display, however, adds a third direction of motion, in-out. This is achieved by using a pair of 'two-coloured' spectacles, where one lens is red, and the other is cyan (greenish-blue). It is also used in picturebooks and certain sensational movies.

The way to tell whether you are looking at 'fake' 3-D or not is by colour. Any true three-dimensional display will not make much sense if viewed without the glasses, since it will consist largely of lines drawn in two different colours, red and cyan. These will result in a confusing mess of intersecting lines.

An image that contains any colours but these, and in particular, one that is easily comprehended, is not likely to be truly three dimensional. Even if it says so on the packaging, there will be no true depth to the game. Motion will only be possible in two planes, up-down and left-right.

It is quite simple to produce an image that will persuade your eyes and brain that you are looking at a truly three-dimensional scene, though the mathematics can be a little involved.

The first necessity is to provide a slightly different image for each eye. Since the eyes will view the scene from separate positions, the two images are drawn with slightly different perspectives and angles. These images must not interfere with each other, even though they are both on the same screen. This is done by drawing one in red, and the other in cyan.

If the picture is viewed through a pair of two-coloured spectacles that have the cyan filter in front of the left eye, the red image (intended for the right eye) will become almost completely invisible to the left eye. The reverse applies to the cyan image (intended for the left eye). By this process, we can isolate the two pictures. The result will be a fairly convincing three-dimensional image.

The disadvantage of this system is that, though we have used colour to isolate the images from each other, the picture is effectively monochrome. Adding red to cyan will produce a more or less white image, which is what your brain perceives.

Another small problem becomes apparent when we consider what must happen when an object has to move 'into' or 'out of' the screen. An object at a distance of three metres will not appear twice as large as something that is six metres away. The sizes must be calculated by trigonometry, which can be done by using the tangent function (TAN in most BASICS).

Calculating values and converting them into coordinates for screen-drawing involves several calculations with decimal numbers. This is quite slow, so there is a limit to how complicated a display can become, or how fast it can move. Too many displayed objects and associated calculations can slow things up to the point that the motion becomes unpleasantly jerky and slow.

Another problem is that the resolution of the average computer screen is fairly low. In other words, there is a limit on how small an object can be before it collapses into a shapeless blob. At this distance the object has effectively reached infinity, and cannot be moved any deeper.

Not only that, but in order to isolate the two images, one must be displaced from the other by at least one dot, so that they can have different colours. Moving too 'deep' into the screen will produce the same values from the calculations for each image, and so the two will superimpose. When this happens, the object will lose all 'solidity' and become a flat object.

An important element in the production of high-quality, three-dimensional images is the quality of the screen display. The best results will be obtained with a monitor rather than an ordinary television. This is because the colours will be clearer and have sharper edges on a monitor. For more information, refer to the feature on monitors on page 132.

There are not many programs that use this technique. Owing to the limitations of the system, in particular the lack of colour and the need to wear the spectacles, it is unlikely to attain wide popularity. However, within these limits, very effective and entertaining displays can be produced.

Solid Gold
Perhaps Mike Singleton has spent so much time wearing red and green spectacles while developing 3-D games that his brain is now processing their coloured images as normal ...In any event, he has really opened up a new dimension for home computer games players with his application of a 30-year old comic-book technique to computer graphics

TONY SLEEP/LAURIE-RAE CHAMBERLAIN