

# 3D Television : Ready to Upgrade

DEEPAK GUPTA

Watching 3D movies at home is now possible with every TV manufacturer competing to launch its 3D TV. Sony, Samsung, Toshiba have all started working on a 3D TV, which could be watched without glasses.

It seems that everyone is talking about 3D television these days. The introduction of 3D-TV is becoming increasingly feasible because of recent technologies and breakthroughs in image processing, display design and camera development as well as an improved understanding of 3D human factors.

## Transformation of 2D to 3D

For 2D animation, everything happens on a 2 dimensional platform. Pictures are flat, without depth and offer only one perspective. Objects and characters are usually drawn without the subtle soft shadows we see in real life and colours have few varying shades. In 3D animation, everything happens on a 3 dimensional platform. Pictures have depth and offer multiple perspectives just like in real life and have soft subtle shadows casted on the objects and characters within.

In 2D, characters look cartoonish and unrealistic. In 3D, characters can look cartoonish but realistic at the same time.

Another way to think of this is to think in terms of a painting and a sculpture. 2D is a painting, and 3D is a sculpture. 3D introduces "depth perspective," so we not only see a rectangle (2D) but a CUBE (3D).

## 3D Technology

The first 3D started millions of years ago with man. Yes, we all see things in 3D. All humans have binocular vision. What that means is that we have two eyes separated by a space of 2-3 inches. This enables us to perceive depth and see the world in 3D. This separation causes each eye to see the world from a slightly different perspective. The brain combines these two images into one. It comprehends the spatial differences and uses them to calculate distance. This is how we sense depth and distance.

A simple way to understand this principle is to hold your thumb up at arms length and cover one eye



with your hand. Then try putting your hand over the other eye. As you switch between open eyes you should see your thumb "jumping" back and forth against the background.

There are different types, or flavors, of 3D. Some put 3D technology into glasses while others put it into a monitor or tech application. Computers or even the iPhone can handle 3D but require some additional active components, such as software and applications that are just now being created.

Following are some of the technical details and methodologies employed in some of the notable 3D movie systems that have been developed.

## Anaglyph

Anaglyph technology involves creating imaging that is three dimensional through the use of two images that are used with the primary colors of blue and red. The two images are created by placing two cameras side by side with the lenses about 2.5 inches apart which is the common distance between human eyes. One image is placed on the left and utilizes red color lines and is combined with



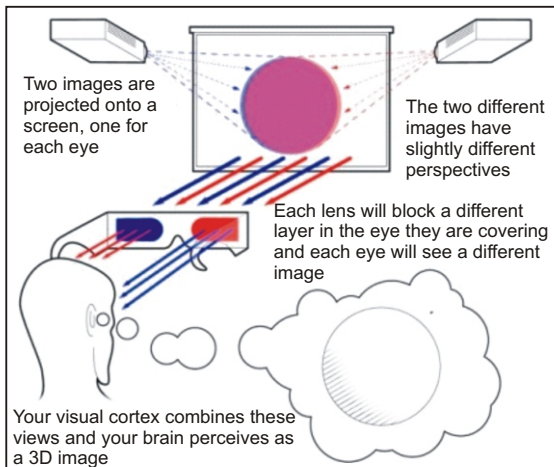
the image on the right that contains blue color lines.

As a result, the two images are made up of two color layers which are placed over one another but are slightly offset to one another to produce an illusion of depth. The human brain processes the red areas as white and the blue areas as black.

The brain then combines the images together which identifies the differences in distance between the two images. Red and blue are at the opposite ends of the light spectrum which allows the brain to process them as the colors of black and white and thus creates the stereoscopic effect.

To view an anaglyph 3D image special eyeglasses are used which contain one red and one blue lens. The red lens provides a red filter over the left eye while the right lens creates a blue filter over the right eye. Once you put the glasses on it takes a short period of time for your eyes to adjust to view the image and you may experience blurring or your eyes may cross for a brief second during adjustment.

After a few seconds the image will come into focus and viewing works horizontally, so if you turn your head from side to side you will mostly likely experience more depth to the image. Also the image will have greater depth if you view it in a room that is dark. Since the images contain two different colored filters the color coded glasses create a stereoscopic effect and the brain perceives

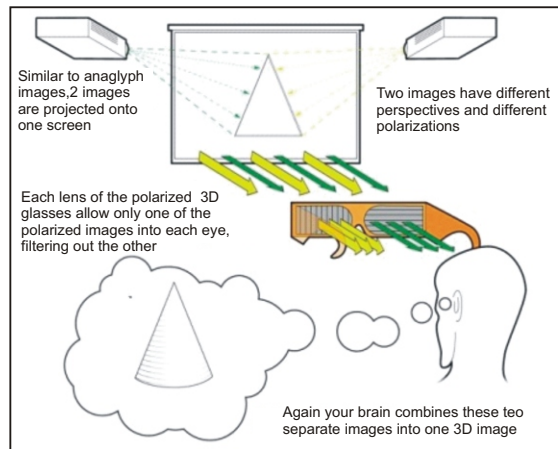


Anaglyph(red/blue glasses)

the images as three dimensional.

### Polarized glasses

The viewer wears low-cost eyeglasses which also contain a pair of different polarizing filters. Two synchronized projectors project two respective views onto the screen, each with a different polarization. Each image is projected with a polarization mutually orthogonal (90 degrees) to the other polarization. As each filter passes only that light which is similarly polarized and blocks the light polarized in the opposite direction, each eye sees a different image. This is used to produce a three-dimensional effect by projecting the same

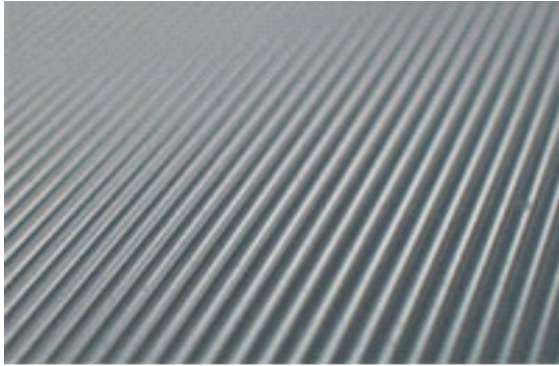


Polarized 3D Glasses

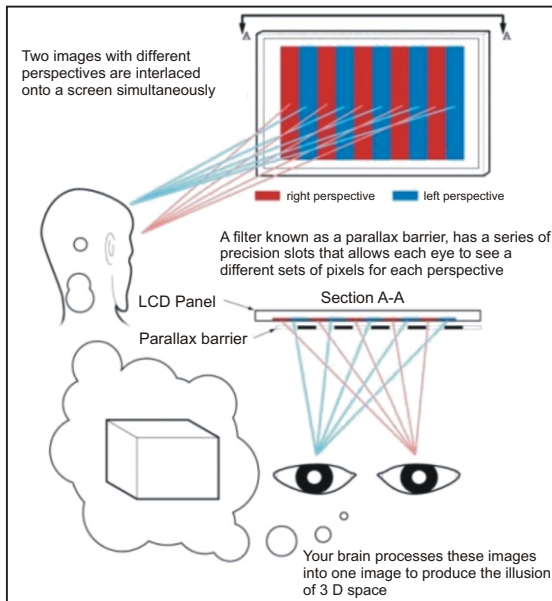
scene into both eyes, but depicted from slightly different perspectives. Although they work better than the old type red and blue glasses, this method requires two projectors in the theater and additional layers to the monitor for the technology to work properly. The onetime theater set-up expense and additional cost for the polarized glasses may make this method less appealing.

### Parallax barrier (no glasses)

A parallax barrier is a device to allow a liquid crystal display to show a stereoscopic image without the need for the viewer to wear 3D glasses. Placed in front of the normal LCD, it consists of a layer of material with a series of precision slits, allowing each eye to see a different set of pixels, This technique is called autostereoscopy and surprisingly, it has been around for a long time. Autostereoscopy relies on the use of special optical elements between the television screen and the viewer so that each eye of the viewer receives a different image thus producing the illusion of



Lenticular lenses for glass less 3D TVs



Parallax Barrier (No glasses)

depth. This can typically be achieved in flat panel displays either using lenticular lenses or parallax barriers. The image below is an example of a lenticular lensed flat panel. The unique grooved shape of the surface allows the projection of different images based on viewing angle thus enabling stereoscopic vision.

However, eye strain and headaches are usual side effects of long viewing exposure to autostereoscopic displays that use lenticular lens or parallax barriers.

### Methods of 3D Images

The secret to 3-D television and movies is that by showing each eye the same image in two different locations, you can trick your brain into thinking the flat image you are viewing has depth. There are several methods that 3D television manufacturers use to create 3D images on an LCD television;

To get 3D television in your home, you will need a 3D TV to display 3D content delivered by broadcasters. You will also need active shutter glasses which are the same brand as the 3D TV you choose. A 3D Blu Ray player will allow you to play 3D DVDs and HDMI version 1.4 cables can connect it to your TV.

some are more expensive than others, and some are more feasible than others. The three primary methods of 3-D home theater technology that are used are:

**Lenticular viewing:** This technology has been pioneered by Philips, and is available as of today. TV sets that use this technology can be watched without those funny glasses that audiences used in theaters. These televisions use a lens that can send different images to each eye. That is, your left eye will see a completely different image from your right eye, which will emulate your two eyes' use of stereopsis (the process by which your eyes discern depth). The one weakness of lenticular viewing, however, is that a viewer must sit in a very specific spot in front of the TV. This means that only a couple people would be able to comfortably watch the TV at once due to its small viewing angle.

**Passive glass systems:** Hyundai is developing this type of LCD monitor which will allow both 2D and 3D images to be viewed. To watch the 3-D images, viewers will need to wear the traditional glasses in order to watch three dimensional media. This technology is nothing new: the TV has two overlapping images and the glasses have polarized lenses. Each lens is polarized so that it can see only one of the two overlapping images. This technology is very feasible and 40 to 50 inch LCD TVs with this technology are currently available for purchase.

**Active glass systems:** This system is very similar to the passive glass system, except rather than the TV doing all work, the glasses do. The glasses synchronize with the refresh rate of the TV, then they alternate the polarization of each lens, making the wearers of the glasses see 3-D images. With this technology, people could be watching a 2-D movie comfortably, then at will switch the movie into 3-D. This type of monitor is being developed by Samsung and Mitsubishi, but the downside is that the glasses could be very expensive.

