Essay on 3d technology from red cyan to polarized

[Technology](), [Internet]()

In the world of today's cinema, 3-D technology is making a comeback. No longer a kitschy gimmick used in the 1950s to bring extra ticket sales to monster movies, it has turned into a phenomenon that turns normal 2-D movies into stereoscopic blockbusters. 3-D films such as the 2009 film Avatar rule the box office, creating landscapes that pop out at the viewer and take them into a new dimension. To this day, more and more blockbuster films are adapting the Avatar model and releasing more and more movies in 3D, mostly due to new technologies and methods for delivering crisp, realistic 3D images to a moviegoing audience. In this essay, the technology behind 3D will be explored – its evolution, its mechanics, and its implications.

In order to understand 3D technology, it is important to understand how people use their eyesight to perceive the world. Seeing in three dimensions is nothing new to us, as we normally perceive depth through a process known as binocular vision. The reason we have two eyes, which are set apart from each other, is so that we can capture images in front of us from two different angles at once. Only in very rare occasions do our eyes look at different things at once, and so our eyes are constantly providing us with a binocular view of the same thing. Our brain interprets these two images into a single image that has the illusion of depth, allowing us to perceive distance and shape (Ben-Ari, 2010).

Of course, when we look at a two-dimensional image like a TV screen or movie projection, our eyes perceive it accurately, and as such extra measures need to be taken when a movie is intended to be viewed in 3D. Various technology has been created for this very purpose, and the first kind that experienced real popularity and success was the red/cyan variety. This is also known as anaglyph 3D, which was the primary kind used for 1950s films during the original 3D craze (Quittner, 2009). 3D films of any variety are often filmed in a similar way – two cameras film a single image, in much the same way as the left and right eye look at the same thing, in order to simulate that sense of binocular vision (Keegan, 2008). However, there are others which, instead of being filmed in 3D, are merely converted into 3D by altering the images and cutting out pieces, manipulating them more than others, in order to simulate the kind of shift required to form a 3D illusion (Ben-Ari, 2010).

With this method, a pair of glasses are worn while watching a 3D projected movie; one lens has red cellophane on it, and the other has cyan. Likewise, the film itself is presented in these two colors as two images, both at different angles and distances. If you were to look at this image without the glasses, you would see these two red and blue versions at the same time as a two-dimensional projection. However, with the glasses, the two images seem to combine in order to form a single, three-dimensional image.

This works by the glasses each filtering out one of the images – the cyan side only allowing the red in the image, and the red only allowing the cyan, and so on. Therefore, each eye is only getting one of the colors at a time, creating the illusion of stereoscopic vision. Our brain shifts the position of the image to its appropriate position, both of them moving in a way that implies depth. There are also other color polarizations that can be used for this particular method – cyan and yellow are often used in films, for example (Ben-Ari, 2010).

Of course, there are some flaws in this particular method – the use of two colors means the color palette for a 3D film of this kind is often limited; what’s more, it was almost impossible to synchronize the projectors for this presentation, and it was difficult to produce and exhibit these films (Keegan, 2008). Headaches and nausea were also often reported in those who viewed the movies this way, and the washed-out colors did not make for an ideal moviegoing experience (Quittner, 2009). “ Ghosting” often occurs with red-cyan methods, as you will often see the image that the other eye is supposed to see instead, making for a noticeable distortion in color and loss of 3D (Ben-Ari, 2010).

The newer, major method of 3D viewing is done through polarization. This is a process in which two different projectors present an image onto the same screen, one showing an image only meant for the left eye, the other only for the right. This projection occurs at a rate of 144 frames per second, far too fast for the naked eye to notice any flicker (Kuchment, 2010). To the naked eye, no stereoscopic image is present; however, unique polarized glasses, when placed on the head, filter between these two images to only show the proper image to each eye. This is known as spectral separation, and it allows for a complete spectrum of color in the image, which is an incredible improvement over red/cyan glasses.

Spectral separation works by presenting light at a different polarization for each eye; the filters on each lens cut out the polarization you are not supposed to see, leaving only one image of each polarization sent to a separate eye. As with red/cyan, the brain combines the two separate images it sees and connects the dots, allowing you to perceive an illusion of depth in the picture (Ben-Ari, 2010).

Even the design of the glasses are completely revolutionized from the prior red/cyan kind, which are made of flimsy, flat cardboard for more disposable usage. Polarized glasses verify that each eye gets only the image it was intended to receive, forming the same kind of illusion that red/cyan attempts, but with much higher image quality. The glasses are curved to prevent cross talk, which is the phenomenon wherein an image meant for one eye bleeds into the other, thus ruining the 3D image. This curvature also allows reflections that occur at the end of one's field of view and for color shifts (Kuchment, 2010). The gray filters, a change from red and cyan filters of old, make for no distortion of color, and the precision at which the polarities are filtered minimizes ghosting and makes sure the images are separated (Ben-Ari, 2010).

Even within polarization, there are two unique varieties: linear and circular polarization. With linear polarization, the unpolarized light is projected at a horizontal or vertical angle. It is then separated through horizontal and vertical filters found on the 3D glasses, allowing for the creation of the 3D effect. Only the vertical polarity gets through one lens, and only the horizontal polarity on the other, and that is how the two different images are delivered.

Circular polarization, on the other hand, works by polarizing an image through either left or right movement (as in, the image moves in a circular manner either clockwise or counterclockwise to the human eye). The lenses then block the polarization moving in the opposite direction than its filter, giving only the remaining image.

IMAX has also revolutionized the 3D craze as well – with the implementation of such a large screen, the addition of 3D to the mix has created a new premium movie experience that moviegoers wish to have (" Hollywood's New Lens," 2010). IMAX utilizes 70mm film to create a much larger image on IMAX screens, which often run 72 by 53 feet, offering a larger spectacle than is found on normal movie projector screens. Due to the larger size of the film, specialized equipment is used to get the film into the projector and display the image, including field flatteners and short-arc projector lamps intended to provide sufficient light for projection. IMAX theatres must be created to house these giant screens, and unique projectors are used to display this image.

While this is impressive enough, many movies are now adding 3D polarization to their IMAX experience, adding to the value and spectacle of the film. The addition of separate camera lenses and projections for left/right eye simulation is similar to those used on regular screens, but increased substantially in size for the IMAX screen. LCD shutter glasses are provided to create the same polarization effect in IMAX 3D as it does for regular polarization – linear polarization is often used for this (Ben-Ari, 2010).

In conclusion, 3D technology has come a long way in the half century or more since it was incepted. From color separation to polarization, there have been many different ways that have been discovered for creating the illusion of binocular vision or stereoscopic images. With the advent of these new technologies, moviemaking has advanced to the point where three-dimensional images can be displayed with a minimum of distortion and bleed, creating sharp, colorful images that are just like viewing a two-dimensional movie, but with this added depth. This, in combination with other innovations such as IMAX theatres, have created a moviegoing experience that emphasizes spectacle, which is the reason for this type of research and development.

Given the low ticket sales and box office draws of many movies compared to ten years ago, and the dominance of television and the Internet as many people’s primary outlets for entertainment, it is clear that 3D technology and IMAX have been developed in order to make watching films an experience that cannot be replicated at home. The business need for these technologies has facilitated their development, and it is possible to see even more innovative advancements in this field materialize in the near future. As it stands now, 3D is a unique and technologically-driven way to trick our eyes into believing that a two-dimensional image has come to life before us.

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