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Review of Stereoscopic 3D Glasses for Gaming

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***Abstract*— Only a decade ago, watching in 3-D meant seeing through a pair of red and blue glasses.**

It was really great at first sight, but 3-D technology has been moving on. Scientists have been aware of how human vision works and current generation of computers are more powerful than ever before. Therefore, most of the computer users are familiar with 3-D games. Back in the '90s, most of the enthusiasts were amazed by the game Castle Wolfenstein 3D, which took place in a maze-like castle, which was existed in three dimensions. Nowadays, gamers can enjoy even more complicated graphics with the available peripherals. This paper gives an overview of this 3-D Gaming technology and various gaming peripherals. This paper will also explore the functional aspects and applications of various 3-D Glasses available for the 3-D PC games.

***Keywords*— 3-D Gaming, 3-D Glasses, Stereoscopic**

1. INTRODUCTION

It seems like whole world talking about the 3D technology presently. Firstly, the question comes to the mind that What is 3D and why it is so important, right? The answer is not very complicated. 3D is how average human visualizes the word around them. Human vision requires the sense of depth of how far objects are from eyes for being able to see in 3D. this technique is used to produce and replay 3D Games and Movies artificially. For making a 3D game, all the data required to determine where each object is in 3D space is held right on the computer and can be processed in real time. The problem then arises how it can be shown to the viewer. This is where Stereoscopic 3D glasses come into the picture. 3D Glasses make the scene you are viewing look like it is happening right in front of you and making you feel that you are the part of the action which provides more realistic gameplay.

2. PC GAMING

The main cause of the rise of 3D graphics was the increasing computing power and falling off the cost of processors such as Intel 80386, Intel 80486, and the Motorola 68030 as well as the accessories like sound cards and CD-ROMs had the multimedia capability.

Early 3D games such as *Alpha Waves*, *Starglider 2* began with flat-shaded graphics and then progressed with simple forms of texture mapping such as in Wolfenstein 3D.

In the early 1990s, the most popular method of publishing games for smaller developers was shareware distribution, including then-fledgling companies such as *Apogee* which is now branded as *3D Realms*, *Epic MegaGames* (now known as *Epic Games*), and *id Software*. It enabled consumers the opportunity to try a trial portion of the game, which was restricted to complete first section or an episode of full version of the game, before purchasing it.

The cost only needed to cover the disk and minimal packaging as shareware games versions were distributed as free essentially. In the mid-1990s, increasing size of the games made them impractical to fit on floppies, and retail publishers and developers began to earnestly mimic the practice, shareware games were replaced by shorter game demos with one or two levels of the full version, distributed free on CDs with gaming magazines as well as over the Internet.

In the early 90s, Real-time strategy became a popular class of computer games with the game Dune II set the standard for the pc games. In 1996, Id Software's game *Quake* introduced the play over the internet in FPS.

Fig.1 Quake Gameplay

1. FIFTH GENERATION CONSOLES (1993–2006) (32 AND 64-BIT):

In 1993, Companies like *Atari* and *3DO* introduced *Atari Jaguar* and *3DO Interactive Multiplayer* respectively with the intentions of dominating the home console market. But 3DO failed to catch up with the sales of Jaguar because of the higher price tag. Both consoles couldn't really dominate the market and had very few sales due to the very few quality games which caused their demise.
In 1994, three new consoles named as the Sega Saturn, the Sony PlayStation and the PC-FX were introduced in Japan. Sony PlayStation crushed all of its competitors with its sale. It also had the support of many major gaming companies which proved to be its real strength. Therefore, after so many delays Nintendo finally released its flagship 64-bit console named as Nintendo 64 in 1996, but couldn't catch up with sales of PlayStation due to their choice of the hardware support causing the negative consequences on their market share. By the end of this period, Sony had become the pioneer in the video game market.

a. Transition to 3D and CDs

The fifth generation was famed for the rise of 3D games. 3D became the main focus in this period as games like *Spyro the Dragon*, *Super Mario 64*, *Crash Bandicoot* and many more were released using 3D environments as well as CDs gained more popularity in the console market, which allowed much greater storage capacity compared to cartridges.

2. New Era of Gaming (Seventh Generation Consoles):

This generation introduced early for handheld consoles as major manufacturers like Nintendo and Sony released *Nintendo DS* and *PlayStation Portable* respectively within a month of each other in 2004. PSP gained more popularity between veteran gamers in Japan and North America.
Microsoft also stepped into the console gaming with Xbox 360 in November 2005 and Sony followed with PlayStation 3 in 2006 with European release in March 2007. Both were formidable systems with high graphics over HDMI features which could challenge personal computers in processing power while offering their modest price.

3. EIGHTH GENERATION CONSOLES (2012-PRESENT):

This generation started with the release of the *Wii U* on November 18, 2012 as it competes with other top gaming consoles of the current generation such as PlayStation 4 and Xbox One.

Fig. 2 Wii U-First eighth generation video game console

The *PlayStation 4* is the successor of the popular PlayStation 3 announced on February 20, 2013 with more powerful hardware support. As of June 2015, it holds a market share of at the minimum 70% within all European countries.

Fig. 3 PlayStation 4

The *Xbox One* was released on May 21, 2013 as the successor of the Xbox 360 It defeated PlayStation 4 in terms of sales in that period.

Fig. 4 Xbox one

Nintendo 3DS, a handheld gaming console released in Japan in February 2011 and worldwide within a month. It uses autostereoscopic method to produce a 3D effect on-screen.

Fig. 5 New Nintendo 3DS- First eighth generation handheld video game console

4. 3D PC Glasses Overview:

3D PC glasses are designed for the serious gamer in mind. You might ask what are these specialized glasses? They are glasses which provide the most realistic gaming experience for gamers of any age. One can enjoy the gaming like never before without using any other fancy equipment.

There are many different companies which provide different types of 3D glasses which should work on all PC Games like Modern Warfare or any other game providing a whole new gaming experience.

Specially 3D Glasses are great for children which can provide the whole new way of learning experience making their educational games more interactive and more fun.

5. Stereoscopy

Stereoscopy also called stereoscopic or 3-D imaging refers to a technique for creating or enhancing the depth perception in an image by presenting two offset images separately to the left and right eye of the viewer.

Working of Human vision with perception of depth is a very complex process.

The cues that the brain uses to measure relative distances and depth in a perceived scene include the following:

- Stereopsis
- Accommodation of the eye
- Overlapping of one object by another
- Subtended visual angle of an object of known size
- Linear perspective (convergence of parallel edges)
- Vertical position (objects closer to the horizon in the scene tend to be perceived as farther away)
- Haze or contrast, saturation, and color, greater distance generally being associated with greater Haze, desaturation, and a shift toward blue
- Change in size of textured pattern detail

with the exception of the first two, all other cues are present in traditional two-dimensional images such as paintings, photographs, and television.

a. Rendering Techniques:

I. 2D + depth rendering:

This technique generates a second point of view from a single rendered image. It has an upper limit on how much parallax can be created. 2D+ can be compared to 2D to 3D conversion techniques for 3D films. This method was used in many games released for Xbox 360 and PS3.

II. Dual rendering:

This technique renders two images. It creates the best stereoscopic effect but it requires higher system specifications since it demands graphic rendering and higher production.

6. Stereoscope

Stereoscope is an instrument in which two images of the same object taken from different angles are presented simultaneously, one to each eye.

7. 3D Viewers:

There are mainly two categories of 3D viewer technology, active and passive.

I. Active:

Shutter systems:

This system works by presenting the image meant for left eye blocking the right eye's view and vice versa. It basically uses liquid crystal shutter glasses. The main drawback of this system is that it introduces a time parallax for side moving objects.

Fig. 6 LC shutter glasses

Nvidia 3D Vision

3D vision is a stereoscopic gaming kit introduced by Nvidia which consists of LC shutter glasses and driver software which allows stereoscopic vision for any Direct3D game, with compatibility of various degrees.

Fig. 7 Nvidia 3D Vision

Fig. 8 Nvidia 3D vision 2 provides brighter visuals, lightweight glasses and more

Nvidia introduced *3D vision 2* as the substantial update to its previous version of 3D gaming peripheral for PC.
It features LightBoost technology which provides brighter image quality with more detail.
There are many LightBoost certified monitors introduced in the market such as ASUS VG278H.

II. Passive:

Polarization Systems:
To display stereoscopic pictures, two images projected superimposed onto the same screen through polarizing filters.
Following figure shows the principle of Polarized systems.

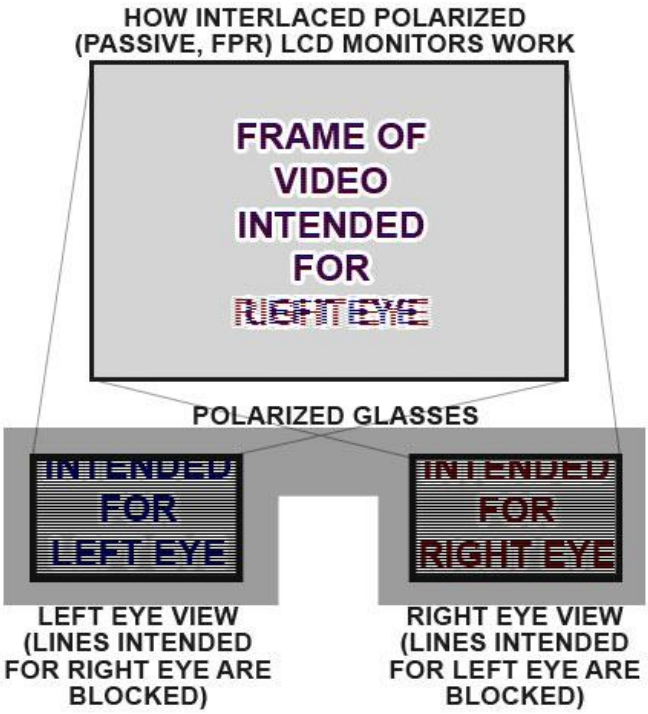

Fig. 9 Working of Polarized Systems

Fig. 10 Functional principle of polarized 3D systems

Color anaglyph systems
Anaglyph 3D is the stereoscopic effect achieved by encoding the image of each eye using mainly red and cyan color filters. Since human vision processing systems use red and cyan comparisons to determine the color of the objects.
When viewed through these glasses, both images are reached to one eye exhibiting a stereoscopic image.

Fig. 11 Anaglyph 3D glasses

❖ **Other display methods without viewer:**

a. AUTOSTEREOSCOPY

It is a method of displaying stereoscopic images without the use of glasses on viewer side. It is also called as "glasses-free 3D".
Various examples of autostereoscopic displays technology include parallax barrier, volumetric display, lenticular lens, holographic and light field displays.
As mentioned before, Nintendo 3DS uses parallax barrier technique to display a 3D image.
Following figure shows the comparison between parallax barrier and lenticular techniques.

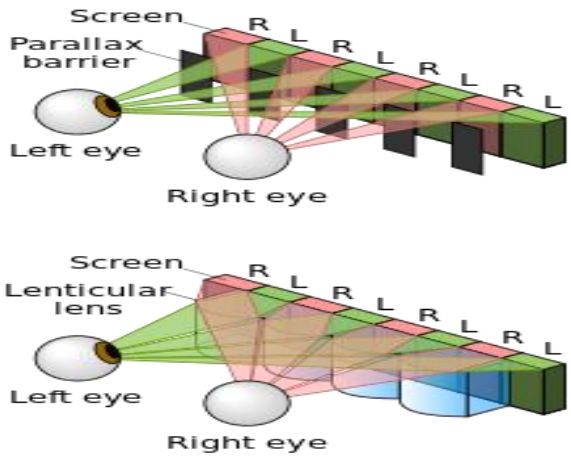

Fig. 12 Comparison between parallax barrier and Lenticular displays.

❖ **AMD HD3D technology:**

HD3D is a stereoscopic 3D API introduced by AMD which enables 3D display capabilities of supported systems and hardware.

Fig. 13 AMD HD3D

8. CONCLUSION

The 3D mania is gaining more popularity recently in the 3D gaming world and many different vendors are getting involved in this field by introducing the various peripherals using the technologies which are still quite new and expensive compared to other gaming peripherals. But there is still a long way to go and more to be explored and has a lot of scope for the development in the 3D gaming world.
With the newer versions, peripherals will support more powerful graphics which will bring the whole new gaming experience that can amaze the whole world.

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