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A Review on the Role of 3D Technology in the Field of Industry and Entertainment

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Abstract: In current situation, 3D technology is a technology which is growing day by day. 3D technology has a great impact on everyone's life. Now-a-days different 3D technologies are increasing and can be seen in the market. The main purpose of this study is to discuss the different 3D technologies bringing revolution in the technology industry. With the use of different 3D gadgets one can perform complex and innovative task with the ease of use. In this study we will give you overview of 3D technology and different 3D components that might be the future of image, scan & print.

Keywords: 3D Technology, 3D Advertisement, 3D Printer, 3D Scanner, 3D Movies.

I. INTRODUCTION

Today, 3D technology is increasing day-by-day, as new 3D enable gadgets are introducing in the current market. The use of 3D technology in components like printer, scanner, TVs, laptops, projector, glasses, players, cameras & other products is growing at lighting speed. One of the reason behind the growth in 3D technology is entertainment technology which includes and supports basic contents necessary for sports, movies, games, mobile phones, etc. 3D technology including entertainment is the future and it's heading towards the new revolution in many forms.

II. 3D TECHNOLOGY

3D technology is a three-dimensional technology (e.g. depth, width and intensity), having extensive opportunities today and in near future, nearly involved in our daily routine life and particularly in business and entertainment section. Whatever we see our entire world every day is three-dimensional actually. Our surroundings are naturally in a 3D manner. Both left eye and right eye catches different pictures and hence it gives signal to our brain, calculating the distance of an object from us. Due to this standard it allows us to experience the picture in 3D[14]. There are many ways through which we can achieve a 3D display. A simple principle on which most of them are based is displaying a different image to each eye to create the illusion of a 3D image known as stereoscopy. 3D technology has been around for almost 200 years and the transition from then until now has been unbelievable vast. There is a great number of benefits to having 3D technology but there is also a bunch of different problems with it such as ethical issues, security concerns and social problems.

III. THE HISTORY OF 3D TECHNOLOGY

3D photographic images can be taken using stereoscope, which was a new invention by David Brewster in 1844. A picture of Queen Victoria was taken by Louis Jules Duboscq at the Great Exhibition in 1851[1]. But according to Sensio, a Canada based manufacturer of 3D home technology, stereoscopic photography was first invented in 1838.

Different periods of 3D technology used in Movies are shown in Table 1.

TABLE I: Era of 3D Technology in Movies

1903	The first 3D film presented, called “L’Arrivee du Train”
1915	First anaglyph movie
1922	The first 3D movie for public, called “The Power of Love”
1935	The first 3D color movie
1950	Comeback of 3D technology
1960	“Space-Vision 3D”, a different technology released
1970	A new 3D technology known as “Stereovision” was developed
1980	More movies in 3D technology
1986	“Echos of the Sun” was the first 3D movie developed by Canada which was seen using Polarized glasses
1990	Many films released in IMAX 3D
2000	Big studio movies were released, using the latest HD video cameras
2010	3D Television

IV. 3D ENTERTAINMENT

3D Entertainment is available today in many forms like 3D glasses, 3D displays, 3D movies, 3D phones, 3D games and may include many more.

a) 3D Movies

3D movie shows stereoscopic vision to the audience, based on precise filming technique, delivering 2 separate pictures at the same time to eye sight. Real experience and impression of real depth has been provided to the audience through colored eye glasses, which can be even experienced on the television screen while watching 3D film.

There are different types of 3D[1,2]:

- 1) Anaglyph 3D: The beginning and the easiest way to make 3D images by separating the right and left image using red and blue color glasses.
- 2) Polarized (Passive) 3D: For Passive 3D glasses, polarized filter on the picture has been used for different polarization on/for the left and right pictures.
- 3) Active-shutter 3D: It requires to wear liquid crystal shutter glasses having inbuilt battery, which can be charged. It is known to be the best type of 3D method where it shows pictures alternatively for both eyes.
- 4) No-glasses 3D (Auto-Stereoscopic) –: In these type of technique you do not require to wear any type of glasses for experience of 3D. With the help of optics, it transfers the correct pixels into each eye, having different pixels for left eye and right eye.
- 5) Real 3D Pictures (Volumetric displays): In these type of technique, it shows 3D pictures created in 3D. For this, it uses lasers & vibrating / rotating mirrors[Fig. 1].

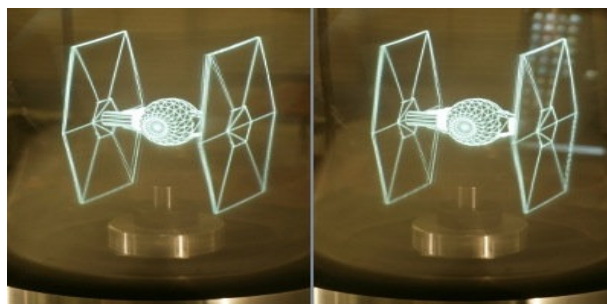


Fig. 1: Volumetric display prototype using spinning mirrors & a projector photo[3]

b) 3D Cameras

3D camera may have two or more lenses having different image sensors for individual lens, allowing the camera to simulate human binocular images[5].

c) 3D Mobile Phones

A 3D mobile phone delivers depth vision to the consumer using 3D depth techniques or it can use stereoscopy[17]. 3D experience can be get with the help of standard 3D screens which are very popular all over the world[18]. 3D mobile phone display are free of glasses due to the use of an autostereoscopic parallax barrier display technology[Fig. 2]. Consumers are experiencing 3D videos, images on the regular basis on their 3D enabled device and it's been extensively used all over the world[18]. 3D mobile phones also features 3D camera and 3D output through HDMI.



Fig. 2: 3D enable mobile phone (Source: Micromax A115 Canvas 3D)

Different companies has introduced 3D mobile phones using autostereoscopic display. Sharp introduced 3D mobile phone named “Sharp Mova SH251iS”, at the end of the year 2002 which was the world’s first commercial 3D display mobile phone[17].

3D display will have revolution in the market and will grow day-by-day. According to “DisplaySearch”, mobile phones will be the biggest 3D display application on a unit shipment basis in 2018, with 71 million units with 3D capability[17].

V. 3D PRINTING

3D printing was invented in the 1980s. It is a process of converting digital file into three-dimensional solid objects. Additive processes are used to achieve a 3D printed object. A successive layer of material is laid down to create a 3D printed object until an entire object is created. These layers can be seen by taking a slice of horizontal cross-section of the final object[6].

Few methods of 3D printing for creating layers is using metal sintering or melting and making the material even softer. The most common technologies that uses this method for 3D printing are:

1. Selective Laser Sintering (SLS)
2. Fused Deposition Modeling (FDM)

Another technology known as “Stereolithography” (SLA) that is commonly used for 3D printing, uses the method to place liquid materials that are processed with another technologies[6].

3D printing will create many new opportunities in almost every industry, a world where actual objects will be created with the touch of a button. 3D bio-printing will allow for the printing of cells placed in predetermined patterns to replicate human tissues, organs, and blood vessels. Designing and printing our own 3D objects. 3D Printing represents the first phase of replication efforts that were viewed as only mere science fiction during the era of Star Trek[Sculpteo].

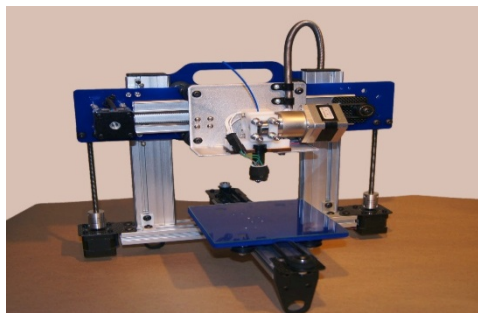


Fig. 3: An ORDbot Quantum 3D printer[8]

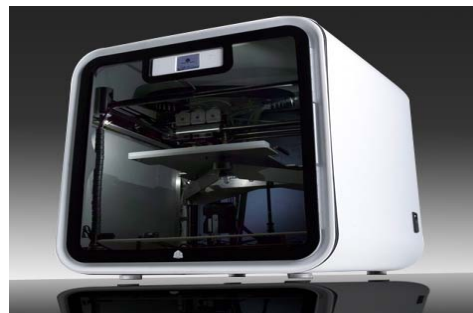


Fig. 4: Advanced 3D printer – CubePro[7]

3D printer can fall into 3 different categories:

- 1) Large, high-end 3D printers that serve the needs of industry manufacturers.
- 2) Smaller scale models, which are used by businesses.
- 3) Less sophisticated assembly kits, which are used by some consumers.

TABLE II: The Evolution of 3D Printing

1984	Technology developed
1986	Technology patented
1988	Technology available to public
1990s	Term “3D printer” first used & first low cost models released
2005	First high-definition color printer released
2006	First self-replicating 3D printer developed
2008	First self-replicating (50%) 3D printer released
2009	3D-model manufacturing for consumers
2020	Bioprinting of functional human limbs and organs
2025	Global network of industrial-scale 3D manufacturing centers – Clothing, electronics, lifestyle goods, etc.

Featuring one of the advanced and professional 3D printer – CubePro has the feature of the largest-in-class build platform having ultra high-resolution[Fig. 4], which can be used for bigger print (i.e. 2.5 times bigger) comparing to prosumer & hobbyist desktop printers. It prints 2.5 times larger than any other desktop prosumer and hobbyist printer. The ultra high-resolution have a settings of 70 microns thin print layers. It is never been large and easy in professional quality. The new material that CubePro will support for production is nylon along with strong ABS and sompostable PLA plastic. It will be a versatile printer for an engineer or hobbyist and can create a functional prototype models.

Professionals like engineers & other hobbyist can use this multipurpose printer for creating functional prototype models. It has triple color including three materials giving thousands of options for unique color combinations. For connectivity purpose, CubePro has the feature of WiFi and can be used with color touchscreen display.

According to the survey of “Sculpteo”, the cost of 3D Printing is expected to fall within the means of most business as well as consumers. Typical 3D printer costs range from Hundred of Dollars to Hundred of Thousands of Dollars.

a) Future of 3D Printer

3D printers will be able to physically replicate most objects that we are able to scan or otherwise digitally define. However, many printed objects will not provide the same functionality as the original objects. A printed limb may not function as the original one, at least not in the immediate future.

While we may have a long way to go in terms of futuristic printing, it appears that in future incredible printing concepts literally being “brought to life.” Once functionality comes into play, the boundaries will be limitless[Sculpteo].

VI. 3D SCANNER

A 3D Scanner is a device that evaluates environment or a real world object for composing information on its shape and perhaps its visual appearance. Digital three-dimensional models can be built by using the composed information[9].

3D-scanning devices has its specific advantages, cost and limitations. 3D scanning devices can be built by using many different tools or technologies. 3D scanner resolution comes with creating a print cloud of geometric samples on the surface of the subject[9].

Featuring one of the company & product named, “Fuel3D - Scanify”, a handheld scanner that has developed a proprietary 3D scanning platform which works much like a regular digital camera – with the only difference being it can capture and scan most 3D surfaces as easily as clicking a ‘photo’. It can scan things like faces, body parts, fabrics, plants, leaves, wood, food, textured painting, and much more with low cost, high speed and high resolution. This device helps import any scanned image in a compatible software application to manipulate or tweak the scanned 3D image. It’s much fun as it can hook up to a 3D printer and print out a miniature toy. The possibilities are mind-boggling[10].



Fig. 5: Handheld 3D scanner – FUEL3D[11]



Fig. 6: Sample Scan of Sculpture[11]

Fuel3D “Scanify” is the world’s first 3D scanner having pre-calibrated stereo cameras with photometric visualization used for capturing and processing a 3D model within few seconds[11].

VII. FUTURE OF 3D TECHNOLOGY – AUTO – STEREOSCOPIC (3D WITHOUT GLASSES)

1. *3DFusion is the first company in the world to complete patent-pending technology for auto-stereoscopic 3D displays[13].*
2. *HoloVizio :*

Holographic display technology is used to display simple 3D into a high quality real life 3D image. Initially 3D light field is reconstructed in Holo Vizio. All the light beams is generated by the displays and that makes the displayed object in the 3D view which will be visible in the whole field. The pixels emit light beams or rather we can say voxels of the holographic screen emit light beams in all the various possible directions which would be of different intensity and different color[Fig. 7]. The above discussed light-emitting surface is composed of the voxels will behave as digital window or hologram. Undoubtedly this will be able to show 3D scenes[12].

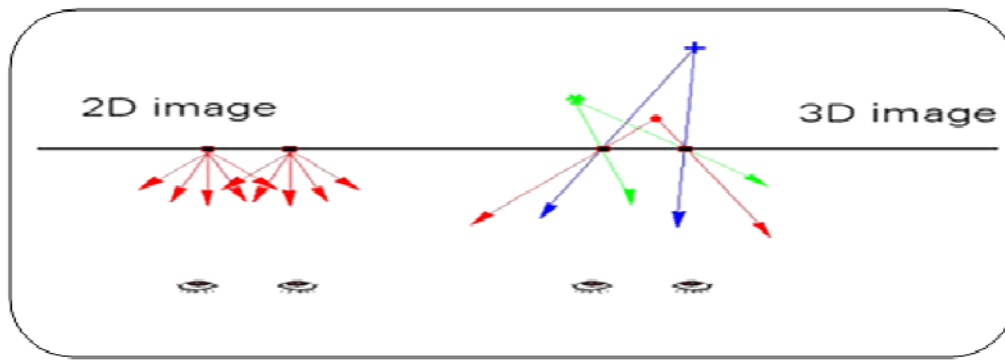


Fig. 7: Principle of the operation, the basic difference between 2D and 3D[12]

3. Dimenco 3D Display:

A complete new idea of watching 3D scenes is without using 3D glasses, a technique offered by Dimenco (Auto-stereoscopy). In this technique so-called lenticular lens and a 3D image processor is used in LCD panel [Fig. 8]. These two ensures that the left eye of the viewer receives a different image in comparison to the right eye. Due to this reason the depth is experienced in the viewer’s eye. This will provide us with an experience of impressive 3D and that also without glasses.[14].

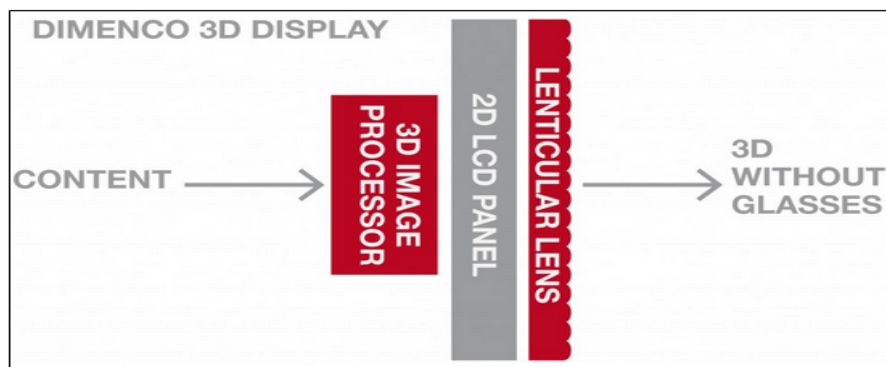


Fig. 8: Technique for Dimenco 3D display[14]

Dimenco Lenticular Lens Technology Dimenco itself develops and produces the Lenticular Lens by the use of patented Dimenco Clear View (DCV) technique. A lenticular lens is unsmooth, instead ripples are present on it. A fractured emitted light is oriented in various oriented ways due to these ripples [Fig. 9]. The most complex part which is also very important is to glue the lens to a suitable LCD panel[14].

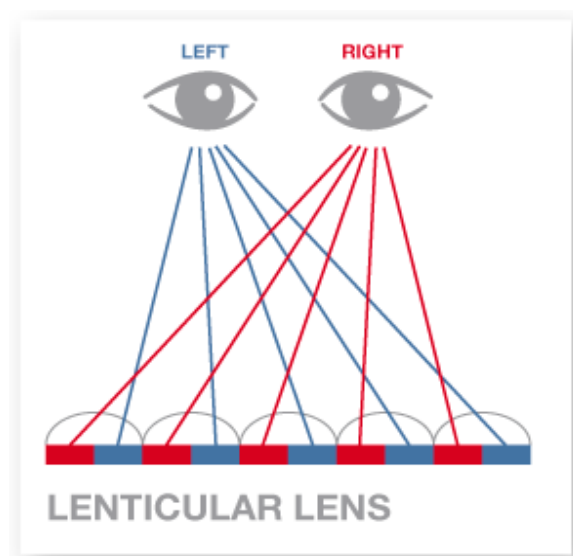


Fig. 9: Dimenco LCD Lenticular Lens[14]

4. Huge 3D Billboard Displays without 3D Glasses

Major sports events have a very attractive public screenings. Future is waiting to enjoy those public screenings in 3D [Fig. 10]. We are thankful to the Austrian scientist for this innovative invention. Different pictures are visible from different angles due to the use of sophisticated laser system, through which laser beams are sent in different directions [15].



Fig. 10: Huge 3D Billboard display showing amazing 3D effects[15]

5. 3D Advertisement[16]

3D advertising results in a 44% longer attention span, on average, making a greater impression than a 2D equivalent.

“TRIDELITY” is the provider for both landscape and portrait video walls in autostereoscopic 3D.

3D advantage over standard advertisement is; it is currently having 43% of more attentiveness, 35% of more recognizable and has great effect on sales, i.e. 30% of more sales comparing to typical advertisement.

VIII. CONCLUSION

3D technology was emerged long back a century ago. And now we are able to implement this technology in 3D entertainment in form of 3D glasses, 3D displays, 3D movies, 3D phones, 3D games and may include many more. 3D industry includes printing, scanning, advertisement, etc. in 3D. Also in recent future we are waiting to have all 3D view without 3D glasses. New and new innovations are also awaited in 3D technology.

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