STUDY OF HOLOGRAPHIC DISPLAY DEVELOPMENT AND APPLICATION

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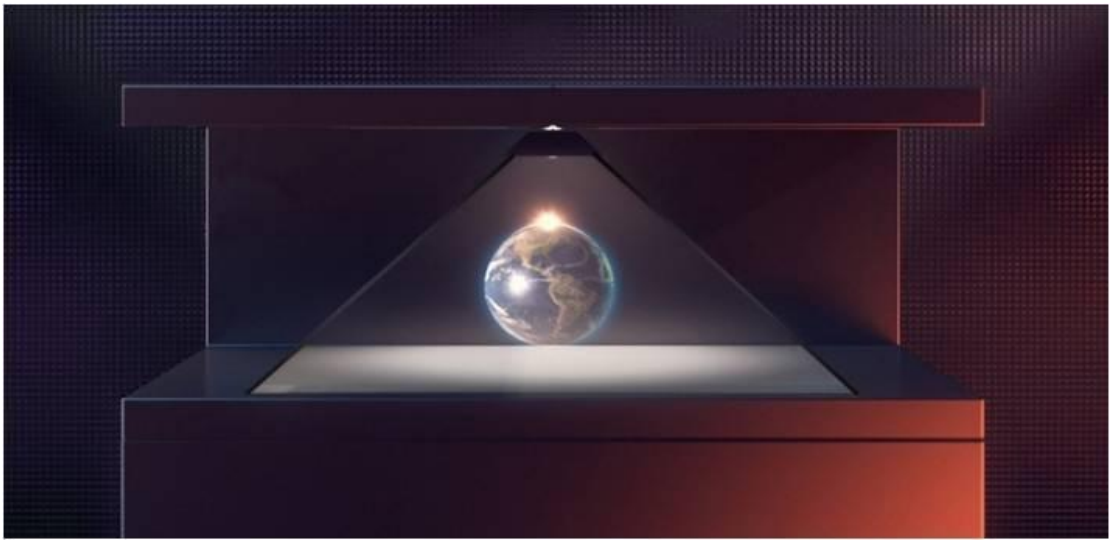

Declaration

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person or material which has to a substantial extent been accepted for the award of any other degree or diploma at any university or other institute of higher learning, except where due acknowledgment has been made in the text.

Sincerely.

Signature: _____

Yi Shen, Beijing University of Posts and Telecommunication

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Introduction

The history of Holographic display

In 1947, Hungarians Dennis Gabe in the process of studying of the electron microscopy proposed holography which is a new imaging concept at that time. Because of the holographic photography, Denis won the Nobel Prize in 1971.

In 2005, researchers at the University of Texas have claimed to create the first true holographic display.

In 2008, scientists created the first rewritable and erasable holographic systems.

In November 2010, researchers at the University of Arizona announced that they developed the fastest 3D motion hologram - which can refresh once every 2 seconds.

In June 2013, the MIT researcher Michael Bove has claimed holographic televisions could be in living rooms in the next 10 years at the price of today's two-dimensional sets because of technology being developed by Massachusetts Institute of Technology's Media Lab.

In October 2013, David Fattal was awarded Global Innovator of The Year by the MIT Tech Review for the invention of the multiview backlight technology allowing high resolution and full parallax 3D images in a wide angle of view. He became founder and CEO Of LEIA Inc which is developing an interactive holographic display for mobile devices without glasses.

The principle of Holographic display

Holographic projection technology follows the principle of interference and diffraction to recording and reproducing the real three dimensional image from the object.

The first step is to use the principle of interference to record information which is known as the filming. There is a diffuse light beam in the irradiation of the laser.

Another part of the laser is used as the reference beam to cast to the holographic film, and it interfere with the laser beam cast from the object. Then it will change the phase and amplitude in each point of the optical wave into the intensity of the variety in the space. From the contrast and interval of interference fringe, so that we can record the information of the optical wave cast from the object. The photographic plate which contains the information is developed and fixed. After that, it will become a hologram.

The second step is following the wave diffraction theory to reproduce the wave of the object. Now here is the imaging process: the hologram like a complex grating, in the irradiation of the coherent laser, the diffraction waves of a linear sine recording hologram will provide two images. Which is known as the initial image and conjugate image. The reconstruction of the image is very well in the stereo perception. The feeling of visual effect is real. Each part of the hologram is reconstructed by each point on the optical information from the object. So, in principle, each part of the hologram can be reappeared the entire image of the original object. You can also record a number of different images in the same piece of photographic plate through repeating exposure, it will display without interfering with each pieces.

The development and application

Nowadays, the holographic display technology developed rapidly. And we study the development and the application of it. For the readers from different industry, we will also discuss the application of holographic in different industry.

The development

Holographic technology is the technology to record and reproduce the three dimensional image. The recording technology had been invented in 1947. Dr.Dennis Gabor from Imperial College London invent the holographic stereo camera, and was regarded by Nobel Prize in 1971.

The reproduction of holographic technology

Although the technology of holographic stereo camera has already started, the reproduction of holographic technology which known as the second step was invented in 2001. The German Laboratory pioneered and developed the holographic film technology, makes the reconstruction of three-dimensional images come true. After the development for seven year, the holographic film has developed from the first generation to fourth generation, which thickness is only 0.2 mm and the transmittance is 97%. Relying on the thin transparent film, no matter the brilliant T - shaped stage or illusory image on the stage can be realized. The holographic film is very expensive, According to the survey, the price of holographic film whose transmittance rate is 70% has already reached 1800-2200 yuan / square meter.

The development of light source

Nowadays, the light source which is the most commonly used in holographic projection is the light from the projector. Since the brightness of the light source is relatively stable. And the projector can magnify the image of holographic display as well. As for the holographic technology, it is very practical. Holographic projection technology will bring magnificent image to audience. The audience will be taken to another world as well. Holographic projection technology to break through the traditional limitations of sound, light, electricity and image color. The contrast and sharpness of it is very high. Besides, it is owns a great sense of space and perspective. It can not only produce air phantom stereo, but also can make the phantom interact with the performers.

The 360 degree holographic projection

360 degree holographic projection phantom imaging is the most magical effect of the technology, developed by Denmark Corporation ViZoo in 2006. They built a funnel geometry model of an inverted Pyramid shape by the holographic film. The video image cast by four projectors. After a series of optical diffraction it confluent into a holographic image which looks like a image floating in the air. This system can also be matched with a touch screen. With the screen, audiences can use a variety of gestures

and movements to manipulate the 3D product model and make it of rotate or component decompose. In this way, the audience will be able to understand the performances of product deeply. Therefore, as soon as the holographic display system became available, it quickly used as a new advertisement carrier appears in various exhibition and conference frequently. In addition, this technology also can be used in the museums, it will reproduce some precious cultural relics in order to make the real object preserve properly.

Quite a lot countries are developing the homographic display

In 2008, the University of Arizona America create show brain can update the 3D holographic display screen. This is the first 3D holographic screen in the world.

Japan Broadcasting Corp (NHK) decided to launch first Holo-TV in 2020, it has been allocated 2.8 billion pounds for this ambitious project. The Japanese is very confident, and they believe they can provide a holographic broadcast to the world, and the service will be used as an important weight to host the 2022 World Cup.

The application in different industry

Besides the exhibition, advertising and other industries, in the consumer display field, holographic technology is also useful. According to a recent research from Frost Sullivan, 3D holographic display technology will be the next technology hotspot.

The application in the Industry

At present, the application of holographic in the industry has been very mature. Including designing of automotive and manufacturing of ship , designing of aeronautical and space technologies, designing of machinery and electronics, city planning and so on.

3D technology brings a revolution to the design mode and user interface. Lots of the software which is commonly used, including PROE, CAD, 3Dmax, MAYA and other tools have become essential software in the industry.

In the field of industrial design, PROE and CAD have 3D own rich of designing function, and they are widely used in engineering industry. In graphic industry, 3Dmax, MAYA has been widely used.

Medical industry

Doctors and experts can provide a real-time treatment in remote diagnosis of live to doctors and experts. In addition, the prospect of 3D technology in endoscope image display, MRI, CT, type-B ultrasonic test and virtual hospital is mind-boggling.

At present, scientists try to apply the holographic technology in more field of medicine. Some countries establish the institutions and put into a lot of manpower and material resources research. For example, high dimensional medical imaging research laboratory in Japanese Jikei University recently developed a virtual 3D system of human anatomy.

Military industry

3D display technology is widely used in the military, such as the 3D virtual military. It is through the virtual world to imitate military activities, including military exercises. The user can exercise the teamwork ability with others. It make the test of equipment without warring available

CONCLUSION

Our display allows freely moving naked eye participants to share a three dimensional

scene with fully continuous, observer independent, parallax. The image quality of our prototype is comparable to nowadays projector-based Geowall displays, with the additional advantages of not requiring users to wear any kind of viewing device. The display looks like an ideal solution for high end multi-user applications. We are currently working on exploiting it for large scale model visualization.

Besides the application mentioned above. Holographic projection is not only can be used alone, it can also be used with other multimedia devices. The meaning of its application is to provide a convenient, inexpensive technology to make people enjoy different planar media visual. It will be popularized to household media.

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