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Holograms and the Interactive Holographic Displays

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Abstract: In this paper we discuss about the current technology "Holographic Display/Projection" and its interactive feature. We discuss about the holograms, their types, physics and mathematics used in it, its interactive feature of responding to finger gestures and the hand-drawn interface (electro-holography). We also discuss about the applications of Holography and the future of this technology, how will it help and what can be the advancement, and also the hypothetical suggestions that what else new can be added further in this technology. And ends with a conclusion that what have we found out in the research, what is the scope of this technology, why this should be used, and where can it be used. We will also learn that how this technology can help the humans to become futuristic and advanced.

I. INTRODUCTION TO HOLOGRAPHY AND HOLOGRAMS:

Holography is a method of recording and reconstructing the wavefront. Holography is the most popular 3D imaging technology, but it has many other uses.

Basically, you can create a hologram for any type of wave. A hologram, also known as a holograph ("full description" or "full image" in Greek), works by combining a second wavefront (usually called the reference beam) with a previously generated wavefront of interest (interference).

The physical environment created by superimposing the interference pattern in the pattern. Only when the second wavefront is illuminated, the interference pattern is bent to restore the original wavefront. Holograms can also be created by simulating and digitizing the two wavefronts of a computer.

Then, the resulting digital image is printed on a suitable mask or film and illuminated with a suitable light source to reconstruct the wavefront of interest.

II. TYPES OF HOLOGRAMS:

There are many types of holograms and different classification methods. For our purposes, we can divide them into two types: reflection type holograms and transmission type holograms.

A. Reflective Holograms

Reflective holograms allow you to watch real three-dimensional images up close. The user interface is the most common appearance in galleries. The hologram is "illuminated" by white light from a "white point" that maintains a certain angle and distance and is located on the observer side of the hologram. Reflected by the hologram. Recently, these holograms have been made and displayed in color, and their images are visually indistinguishable from the original objects. If the object is a mirror, the holographic image of the mirror reflects white light. Otherwise, the holographic image will reflect white light. If the object is a diamond, the holographic image of the diamond will "light up." Although the overall holograms like the eagle on the VISA card can be seen under reflected light, they are actually "reflective" holograms with aluminum coating on the back.

B. Transmission Hologram

Broadcast hologram lasers are used to observe typical broadcast holograms and are usually the same type of hologram used for recording. The light is guided onto the hologram from behind, and the image is transmitted to the side of the viewer. Very clear and profound. For example, for a small hologram, you can see an entire room with people in it, as if the hologram is a window. When this hologram is divided into small pieces (to reduce waste, the hologram can be covered with a piece of paper with holes), depending on the location of each fragment (hole), the entire scene will be visible through each piece. Observing that another laser beam returns through the hologram (relative to the direction of the reference beam), the real image can be projected onto the screen, which is in the original position.

C. Hybrid Holograms

Make a lot of changes between reflective and transmissive holograms. For mass production of holograms for identity verification applications, such as the use of holographic labels or anti-counterfeiting holograms on credit cards, banknotes and passports by applying 2D interference patterns on thin plastic plates. It is usually applied to photosensitive materials called photoresists. After development, the hologram consists of grooves on the surface. The hologram is coated with a layer of nickel, which then peels off and forms a metal "spacer". The former can be used to make other stamps. Character. Under the influence of high temperature and high pressure, the sealing element presses the hologram on the (adhesive) polyester composite film roll. An embossed hologram is actually a combination of many types of holograms. It can be created from a series of photos (usually transparencies) of an object. The object can be a living person, street view, computer graphics or X-ray. Usually, the camera will "scan" the object, which means that many individual images will be recorded. Each view is displayed on a laser-illuminated LCD screen and used as an aiming beam to record the hologram on the narrow vertical bars of the hologram. The next view is recorded on the adjacent track in the same way until all views have been recorded. When viewing the entire composite hologram, the left and right eyes will see different images of the narrow hologram. Therefore, a stereoscopic image is observed. Use a camcorder to record the manuscript so that computer software can be used to process the image. Holographic interferometry. The microscopic changes of objects can be quantified by simultaneous exposure. The offset of the input vector. In real-time holographic interferometry, the virtual image of the object is directly compared with the real image. It is also possible to make invisible objects (such as heat waves or shock waves) visible. There are countless technical applications. In the field of holographic measurement. If the multi-channel hologram changes the viewing angle of the light in the same hologram, a completely different scene can be observed. This concept provides huge potential for huge computer memory. Computer hologram. Mathematical holography includes three main elements: light source, hologram and image. If two elements are predefined, the third element can be calculated. For example, if we know a parallel beam of a certain wavelength and a "double slit" system (abbreviated as "hologram"), we can calculate the diffraction pattern. In addition, after understanding the details of the diffraction pattern and the double slit system, we can calculate the wavelength of the light so that after deciding on the wavelength of the hologram to be used on the computer, we can dream of any pattern we want. This computer-assisted holography (CGH) has become a fast-growing industry. For example, CGH is used to manufacture holographic optical elements (HOE) for scanning, separation, focusing and conventional laser control in many optical devices (such as conventional CD players).

III. WORKING OF HOLOGRAMS

Holography is a technique that allows you to record a light field (usually the result of an object scattering a light source) and then reconstruct it when the original light field no longer exists due to the lack of the original object. Holography can be regarded as a sound recording, in which the sound field generated by vibrating materials such as musical instruments or vocal cords is encoded so that it can be performed later in the absence of existing original light matter. However, it is even more similar to Ambisonic recording, because every listening angle of the sound field can be reproduced during playback.

A. Laser

In laser holography, a laser light source with very pure colors and clean components engraved on the hologram. Different configurations and different types of holograms can be used, but all holograms involve the interaction of light from different directions to form microscopic interference patterns such as plates, films or other media. The laser is divided into two parts, one part is called the objective beam, and the other part is called the reference beam. The light beam of the object expands when passing through the lens and is used to illuminate the object. The center is where the light reaches after being reflected or scattered by the object. The edge of the center is ultimately used as a window to observe the object. Therefore, considering this fact, choose its location. The reference beam is expanded and aimed directly at the medium, where it interacts with the light emitted from the object to create the desired interference pattern. Like conventional photography, holography requires sufficient exposure time to properly affect the recording medium. In photography, the light source, optical elements, recording medium and objects must remain stationary with each other at about a quarter of the wavelength of the light during exposure, otherwise the interference pattern will become blurred and the hologram will be destroyed by biological objects and certain objects. Unstable materials can only be achieved with very strong and very short laser pulses. This is a dangerous process that is rarely or rarely performed outside of scientific and laboratory conditions. When using a continuously operating laser with a much lower power, it can take several minutes at most.

B. Apparatus

By irradiating a part of the beam directly on the recording medium and irradiating the other part on the object, so that a part of the scattered light is incident on the recording medium, an m-hologram can be created. More flexible hologram engraving devices need to direct the laser beam through a series of elements that modify it in different ways. The first element is a beam splitter, which splits the beam into two identical beams, each pointing in a different direction: the beam (called the illumination beam or the object beam) is scattered by the lens, and a mirror is used to aim the stage. Some light scattered (reflected) from the scene hits the recording medium. The second beam (referred to as the reference beam) is also diffused through the lens, but is oriented so that it does not touch the table, but propagates directly onto the recording medium. Various materials can be used as the recording medium. One of the most common films is a film very similar to photographic film (silver halide emulsion), but with a much higher concentration of photo-reactive beads, which allows it to achieve the higher resolution required for holograms. The recording medium layer (for example, silver halide) is applied to a transparent substrate which is usually composed of glass but may also be composed of plastic.

C. Process

When two laser beams hit the recording medium, their light waves intersect and interfere with each other. It is this interference pattern that is printed on the recording medium. The pattern itself looks random. It shows how the light from the scene interferes with the original light source, not the original light source. You can think of the interference pattern as a coded version of a scene that requires a specific key (or original light) to see the content. This missing key is provided later by illuminating with the same laser as the engraving hologram. When the light beam illuminates the hologram on the developed film, it diffracts on the surface pattern of the hologram. This creates a light field that is the same as the light field originally generated and spread on the hologram in the scene.

D. Comparison with Photography

Studying how holography is different from traditional photography can help you better understand holography.

1) A hologram is a record of information about the light emitted by the original scene, which is scattered in multiple directions rather than in one direction in the photo. This way, the scene can be viewed from another angle as if it is still there.
2) You can use a conventional light source (sunlight or electro-optical light) for photography, but a laser is required to record the hologram.
3) In photography, a lens is needed to capture an image, while in holography, light from an object is directly scattered onto the recording medium.
4) For holographic recording, the second beam (reference beam) must be aimed at the recording medium.
5) You can view photos under different lighting conditions, while holograms can only be viewed under very special lighting conditions.
6) After halving the photo, half of the scene will appear in each photo. If you cut the hologram in half, you can still see the entire scene in each task. Since each point in the photo is just light scattered from one point in the scene, each point in the holographic record contains information about the light scattered from each point in the scene. Think of it as the street outside your home. Go through a 4 x 4 foot window and then through a 2 x 4 foot 60 cm x 120 cm window. The same thing can be seen through a smaller window (move the head to change the perspective), but the viewer can immediately see more content through the 120 cm (4 ft) window.
7) The photo is a 2D representation that can only reproduce the basic 3D effect, and the display area reproduced by the hologram has more depth marks added than the original scene. These signals are recognized by the human brain and become the same three-dimensional perception. In 3D mode, it seems that the original scene can be seen.
8) The photo clearly shows the light field of the original scene. At first glance, the surface of the developed hologram is composed of very thin random patterns independent of the scene recorded.

IV. HOLOGRAPHIC PHYSICS

In order to better understand this process, it is necessary to understand interference and diffraction. Interference occurs when one or more wavefronts overlap. Diffraction occurs when the wavefront hits an object. The following only uses interference and diffraction to illustrate the process of creating a holographic reconstruction. It is a bit simplified, but precise enough to give you an idea of how the holographic process works.

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A. Plane Wavefronts

This is a repetitive pattern. A simple example is a metal plate whose grooves are cut at regular intervals. A beam of light incident on the grating is divided into several beams. The direction of these diffracted waves is determined by the distance between the gratings and the wavelength of the light. By placing two plane waves from the same light source on the holographic recording medium, a simple hologram can be created. A linear stripe pattern whose intensity changes sinusoidally in the vicinity. The distance between the strips is determined by the angle between the two waves and the wavelength of the light. The recorded light pattern is a diffraction grating. It can be shown that one of the waves used to generate it has the same angle as the bending wave at which the second wave originally fell. Thus restoring the second wave is holographic recording as defined above.

B. Point Source

When the recording medium is irradiated with some extent light and a standard incident plane wave, the ensuing pattern may be a wave zone plate used as a negative Fresnel lens, and its focal distance corresponds to the gap between the purpose light sources. The plane surface illuminates the negative lens and amplifies the waves that seem to deviate from the concentration of the lens. Therefore, once the recorded pattern is light by the first plane wave, a district of the sunshine is diffracted within the divergent beam like the original spherical wave, a Holographic recording of point sources is created. If the plane wave reaches associate abnormal angle throughout shooting, it'll be harder to draw the result, however it will still act as a negative lens once illuminating a fancy original object.

C. Complex Objects

For complex objects, initial split the irradiation into 2 beams. The sunshine beam illuminates the object, and also the object scatters the light onto the recording medium. As per the idea of diffraction, every point of an object is employed as some extent light source, so it is assumed that the recording medium is light by multiple point light sources at totally different distances from the medium. The purpose light can destroy the reference beam and type its own sin plate. The generated sample is that the total of these regional plates, and along they form a random (discontinuous) pattern, as shown within the figure above. When the photo is light by the first reference beam, every zone plate reconstructs a separate wave shape from the waveform of the object. Together, these individual surfaces form the complete beam of the object. The wavefront perceived by the observer is the same because the wavefront. The objects are scattered on the recording medium, that the objects still seem to exist even once erasing.

D. Mathematical Model

The mathematical model will use the imaginary number U representing the electrical or flux of sunshine waves to simulate light waves at frequencies. The amplitude and phase of the light are expressed by the absolute value and angle of the complex number. The item wave and reference wave at every purpose of the holographic system are given by the formulas U_O and U_R. Combined beam given by -U_O + U_R. The overall energy of the ray s is proportional to the square of the combined wave shape size, for instance

$$|U_O+U_R|^2 = U_O U_R^* + |U_R|^2 + |U_O|^2 + U_O^* U_R$$

Once the light-sensitive plate is exposed to 2 beams of sunshine so developed, its transmission T is proportional to the transmittance. The incident light energy is given by

$$T = kU_O U_R^* + k|U_R|^2 + k|U_O|^2 + kU_O^* U_R$$

where k is a constant.

If the developed plate is light by the reference beam, the sunshine passing through the plate U_H is up to the transmission T increased by the amplitude of the reference beam UR, leading to

$$U_H = TU_R = kU_O|U_R|^2 + k|U_R|^2 U_R + k|U_O|^2 U_R + kU_O^* U_R^2$$

Where U_H has four terms, each represents a light beam emerging from the hologram. The initial one is proportional to U_O. This is the reconstructed object beam, though the item isn't any longer within the field of view, the viewer can see the first object through it. The second and third rays are changed versions of the guidelines. The fourth term may be an assortment of connected objects. It's a curvature opposite to the light beam of the object itself, and produces a true image of the object in the area outside the photo plate. Once the object and also the reference beam hit the holographic recording medium at totally different angles, the virtual, real and all reference wavefronts seem at totally different angles, in order that the reconstructed object is clearly visible.

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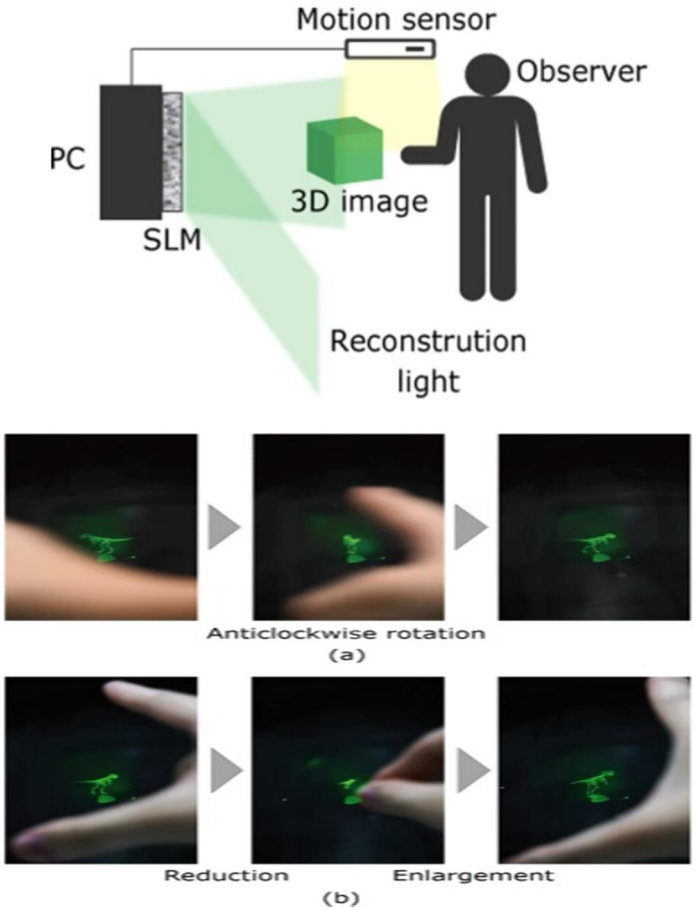
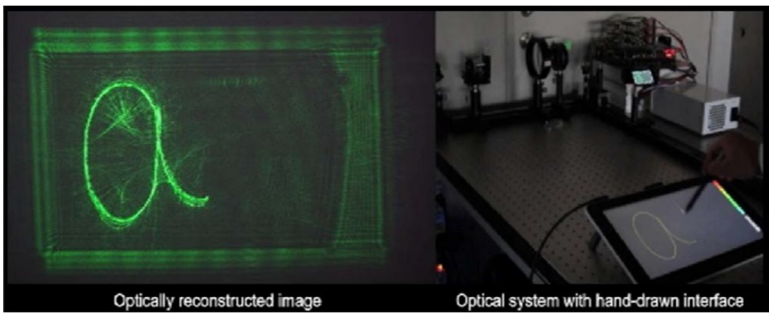
V. INTERACTIVE HOLOGRAPHIC DISPLAY/PROJECTION

Holography is a 3D imaging technology that can display natural 3D images near real objects, and does not require scanning and synchronization processing, because it uses light interference and diffraction to record and reconstruct the light waves emitted from the object. An interference fringe pattern called a hologram is formed by the object and the reference light. Since holograms are recorded on photosensitive materials, it is difficult to use classic holograms to record and reconstruct moving images. A spatial light modulator (SLM) has been proposed to overcome the previous shortcomings of classical holography. Therefore, an electronic hologram can reconstruct a 3D film that displays a computer-generated hologram (CGH), which is obtained by simulating the propagation and interference of light in a computer in each image.

Holograms have been made interactive by using the motion sensors, hand-drawn interfaces etc. The motion sensors detect the gestures made by the user using his/her fingers like swipe and pinch. The holograms respond to those finger gestures by wiping left or right, up or down or by zooming in and zooming out by using the pinching gestures. The holograms also respond to the hand drawn objects on the hand-drawn interfaces by detecting the object that is drawn by the user. This is also known as electro-holography. Electro-holography is a promising technology for 3D imaging systems as a result of the spatial light modulator (SLM) will totally reproduce the sunshine mirrored from the object. the big procedure necessities of the pc industry: The show of the SLM is employed to modulate the exposure with incident light. (CGH) poses a big challenge for sensible applications (e.g. interactive 3D displays for automotive navigation systems). CGH calculation ways corresponding to LUT-based methods (look-up tables), scatter-based methods in polygons, and hardware-based methods. With the event of hardware and algorithms, the computational effort has been greatly reduced and therefore the speed has been greatly improved. In the early days, analysis during this space has improved. However, to attain a sensible computing speed, high performance computers corresponding to graphics processors units (GPUs) or field programmable gate arrays (FPGAs) are still needed.



The above images show the use of motion sensor to make the holographic displays interactive by finger gestures (pinching and swiping for rotation and reduction and enlargement of the image).



The above image shows the use of electro-holography. A hand drawn interface is used to reconstruct the holographic image (optically reconstructed image).

VI. APPLICATIONS OF HOLOGRAPHY:

A. Art

First of all, the artist regarded holography as a medium and got the opportunity to create in the science laboratory. Holographic art is usually the result of collaboration between scientists and artists, although some holograms see themselves as artists and scientists. Salvador Dali claims to be the first person to use holography in art. There is no doubt that he was the first and most famous surrealist to do this, but the Dali Holographic Exhibition held in New York in 1972 and the Holographic Art Exhibition at the Cranbrook College of Art in Michigan in 1968. , And held an exhibition in New York's Vinci Academy Art Gallery in 1968 ahead of schedule... New York in 1970 attracted the attention of the national media. In the UK, Margaret Benyon began to use holography as an art medium in the late 1960s and held a solo exhibition. It was exhibited in the Nottingham University Art Gallery in 1969. Thereafter, in 1970, Leeson Gallery in London held a solo exhibition, which was called "the first exhibition of holographic and three-dimensional painting in London". A small group of active artists still incorporate holographic elements into their works. Some of these include new holographic technology. For example, artist Matt Brand used the computational design of mirrors to eliminate image distortion caused by mirror holography. The MIT Museum and Jonathan Ross have a large collection of holograms and an online catalog of art holograms.

B. Data Storage

In addition to capturing images, holography can also be used for a variety of purposes. Holographic data storage is a technology that allows information to be stored in crystals or photopolymers at high density. The ability to store large amounts of information on any medium is very important. Like many other electronic products, they contain storage devices. As modern storage methods such as Blu-ray discs reach the limit of possible data density (due to the diffraction-limited size of the recording beam), holographic storage may become the next generation of popular storage media. This type of data storage uses the volume of the recording medium, not just the volume of the surface. The currently available SLM can generate approximately 1000 different images per second with a resolution of 1024×1024 bits. For the type of media (probably polymers, not media like LiNbO3), this results in a write speed of approximately 1 gigabit per second. The reading speed may exceed this value, expert believe we can read 1 TB per second.

C. Dynamic Holography

Using a static hologram, recording, development, and reconstruction are performed one after another, and a permanent hologram is created. There are also holographic materials that do not require a development process and can etch holograms in a short period of time. This allows the use of holography to perform some simple operations in a purely optical manner. Examples of applications of such real-time holograms include phase conjugation mirrors ("light inversion" in time), optical buffering, image processing (recognizing image patterns that change over time), and optical calculations.

D. Holographic Interferometry

Holographic interferometry (HI) is a technique that measures the static and dynamic displacement of an object with an optically rough surface with the accuracy of optical interferometry (i.e., the fraction of the wavelength of light). It may be wont to determine the optical path. For example, transparencies can visualize and analyze the flow of liquids. They'll even be used to produce contours that represent surface shapes or isodose ranges in radiation dosimetry. Deformation and vibration within the technical structure.

E. Interferometric Microscopy

Holograms store data regarding the amplitude and section of the field. Many holograms will contain information about a similar distribution of sunshine emitted in numerous directions. Through numerical analysis of this sort of hologram, a bigger numerical aperture is simulated, thereby increasing optical performance and magnifying resolution. The corresponding methodology is termed interference research. Recent advances in interference microscopy have created it doable to approach the quarter-wavelength limit of resolution.

F. Security

Holograms are difficult to forge because they are copied from reference hologram, which requires expensive, professional and technologically advanced equipment. They are widely used in many currencies, such as Brazilian banknotes R$ 20, R$ 50 and R$ 100; British banknotes of 5, 10 and 20 pounds; 5000, 10,000 and 50,000 won banknotes provided by South Korea; Japanese banknotes of 5000 And 10,000 yen; Indian banknotes are 50, 100, 500 and 2000 rupees; and all Canadian dollars, Croatian Kuna, Danish krone and euro banknotes currently in They can also be found on credit and debit cards as well as passports, ID cards, books, DVDs and fitness equipment.

G. Sensors or Biosensors

The hologram is made of a modified material that interacts with certain molecules and causes the band frequency or refractive index to change, which causes the color of the holographic reflection to change.

H. Other Applications

Post offices, large freight companies and automated transportation systems use holographic scanners to determine the 3D dimensions of packages. They are usually used in combination with checkweighers to measure certain quantities, such as refuel trucks, or pallets used to transport bulky goods. Holograms made of elastomers can be used as stress and strain reporters due to their elasticity and compressibility. The applied pressure and force are related to the reflected wavelength, so its color can also be effectively used for radiation dosimetry.

VII. THE FUTURE OF HOLOGRAPHIC DISPLAY

Obviously, 3D holographic projection technology has a bright future. Compared with image projectors that use traditional incoherent beams, holographic projectors under development are smaller and more convenient to carry. It is used for the three-dimensional (3-D) representation of medical imaging such as magnetic resonance imaging and computed tomography. Plastic medical imaging allows clinicians to test the insertion of medical instruments into the artificially created 3D version of the surgical area before surgery. The movement of the micromirror array is controlled by a computer and can be used to separate and focus the laser array. Emit light to create a moving three-dimensional holographic image of internal atomic elements. In the fields of telecommunications and education, distance learning and teleconference technologies with 2D screen images are becoming attractive 3D holographic projection systems. The science of holographic application has been used in "holographic telephones" (holographic telephones record and reproduce real-time 3D images of communication components that can be viewed from different angles).

Hypothetically saying that, as in Holography motion sensors and hand-drawn interface has already been implemented to make the holographic displays interactive. Further advancement in this can be voice recognition to record the voice of the user and translate it to the system so that it can respond to the voice commands of the user. And A.I. can also be used to make the interaction more effective and attractive. Machine learning can play a vital part in making the Holographic displays more interactive. As all these features have already been shown fictionally in various movies, as shown in the above figure that a person is interacting with a hologram that has an A.I. with a motion as well as the voice recognition feature, we can implement it in the real world also and become more technologically advanced. These can be some fascinating and quite helpful advancements in this technology.

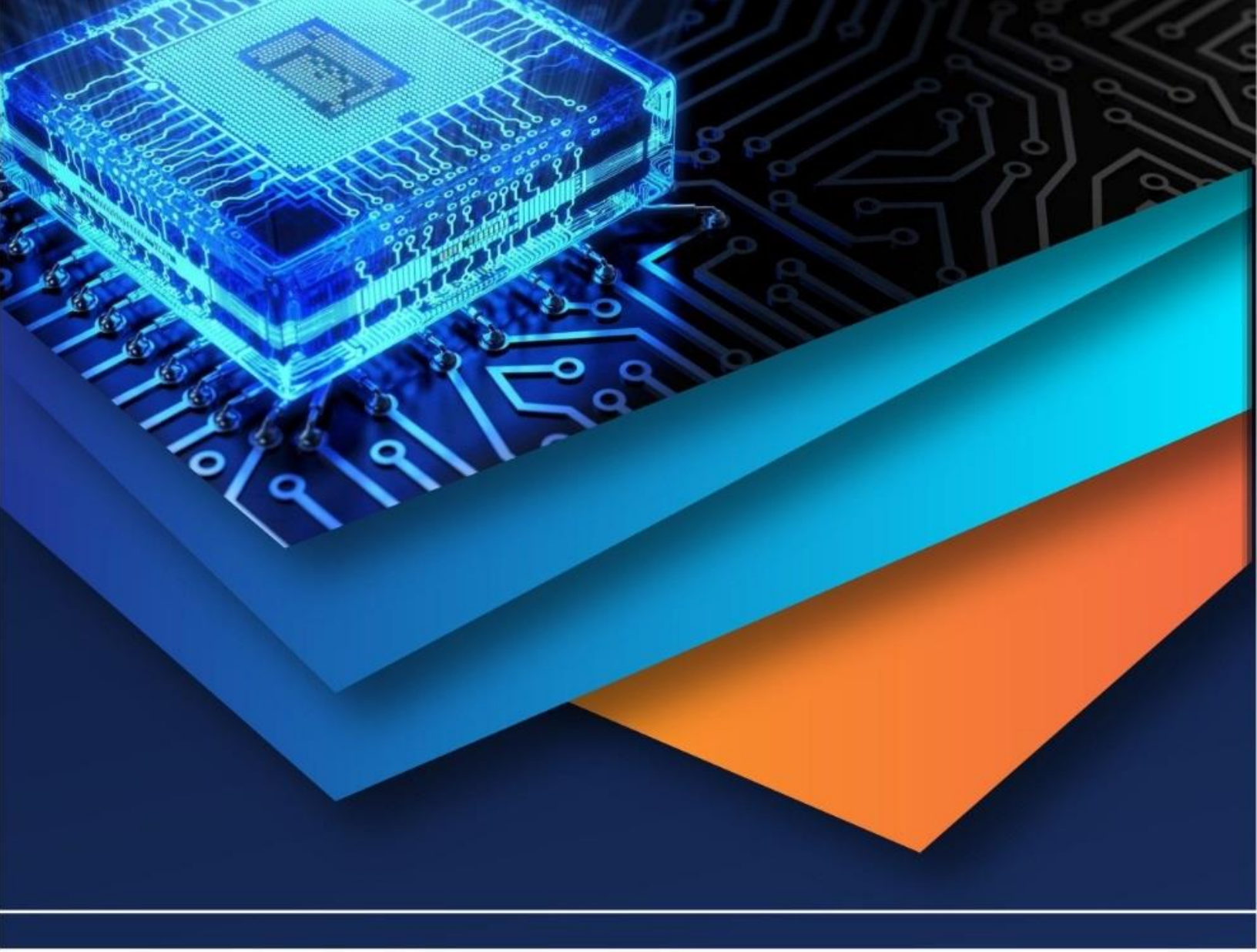
VIII. CONCLUSION

We found that holographic technology is still a very new and little known technology in the current market. However, with the development of digital technology, these topics have become more and more extensive and opened up new areas for the development of holographic technology. The focus of this research is whether holography can become a niche market. The answer to this question is yes. The real benefit of holographic technology is that you can print an image with T at the same time and copy the image in 3D at the same time. I think this is the future of photography. The holographic technology takes the reproduction of the image one step further because it makes the image come alive. If holographic technology becomes part of our daily lives in the next 15 years, then developing new methods to reduce the final cost and make it available to a large number of people is still a problem to be solved. Different forms of use: major security, museums, medicine, archaeology, art, information security; aviation. The only obstacle to using it is mainly the cost, not only the raw materials and know-how, but also because it is limited to laboratories Technology. In the process of research, I found that the development of this technology has taken exponential steps in the past 20 years. With the advent of digital technology, the possibilities for availability will only increase. I think there is a real niche market for holography in the market, and I am trying to democratize it. I think holography is the future of photography. It is easy to imagine ordinary photo shooting and reconstruct the scene into a hologram. When I first started researching, I thought that holograms were a fictitious technique that few people used. In fact, I realize that holograms are everywhere in our daily lives, whether it is a simple passport for our air tickets. It can be seen from this study that holography can provide many solutions in different fields of art and medicine, but this technology has a braking effect, such as meeting various specific parameters to ensure holographic printing (vibration, dust, light, Laser alignment...). Therefore, before mastering this technology, we must first understand the basic concepts that constitute this aspect and require superior technology in this aspect. We have introduced it (theoretically) as a technology that is easy to replicate. The domain requires minimal knowledge. In the past few years, we have seen a fast-growing company that provides ready-made assembly kits (Litiholo...). However, before this technology becomes a part of our daily lives, more research is needed, and digital holography technology opens up prospects for this field application. The artist saw the potential of holography and profit. Holographic art brings new expressions, new perspectives and possibilities, and makes creativity original. A new realm of creativity, a light realm. Every artist who makes a hologram is unique, because there will be many changes in different stages of the design, resulting in novel concepts. What surprised me most is that holographic technology has been around for more than 60 years. For many years, only a few companies on the market today are unaware of technological progress. However, in the past 10 years, especially in the past 5 years, holographic communication seems to have increased exponentially. In order to democratize and attract new industries, the auto industry tries to use it in advertising campaigns to showcase all the parts that make up a car (such as parts from Lancia or BMW). You can display each component and communicate more closely with customers. This research makes me feel gratified that I want to make a decision by investing in holography in the near future. The goal is to come up with new ideas for use, attract the audience, and come up with concepts that everyone can use.

REFERENCES

[1] Nakshatra Sharma, Kausar Ali, “A Review Paper on Holographic Technology Three-Dimensional Visualization” ISSN: 2278-0181 Published by, www.ijert.org V-IMPACT - 2016_2 Conference Proceedings.
[2] Takashi Nishitsuji, Takashi Kakue, David Blinder, Tomoyoshi Shimobaba and Tomoyoshi Ita, “An interactive holographic projection system that uses a hand-drawn interface with a consumer CPU”, Article number: 147 (2021).
[3] Shota Yamada, Takashi Kakue, Tomoyoshi Shimobaba, Tomoyoshi Ito, “Interactive Holographic Display Based on Finger Gestures” Article number: 2010 (2018).
[4] Dr. Devesh Katiyar et al. “A Study Of Cloud Computing & Load Balancing Algorithms”, International Journal for Research in Applied Science and Engineering Technology (IJRASET), ISSN: 2321-9653,Volume: 08 Issue: IV | April -2020 ,2115
[5] Dr. Devesh Katiyar et al. “Face Unlock Based Security On Smartphones”, International Journal of Scientific Research in Engineering and Management (IJSREM),ISSN: 2582-3930,Volume: 04 Issue: 04 | April -2020

[6] Dr. Devesh Katiyar et al. "The Future With The Technology Of Screen less Display", International Journal of Scientific Research in Engineering and Management (IJSREM),ISSN: 2582-3930, Volume: 04 Issue: 09 | Sept -2020
[7] Yamamoto, H., Tomiyama, Y. & Suyama, S. Floating aerial LED signage based on aerial imaging by retro-reflection (AIRR). *Opt. Express* 22, 26919–26924 (2014).
[8] Fan, Z., Weng, Y., Chen, G. & Liao, H. 3D interactive surgical visualization system using mobile spatial information acquisition and autostereoscopic display. *J. Biomed. Inform.* 71, 154–164 (2017).
[9] Igarashi, S., Nakamura, T. & Yamaguchi, M. Fast method of calculating a photorealistic hologram based on orthographic raywavefront conversion. *Opt. Lett.* 41, 1396–1399 (2016)
[10] Adhikarla, V. K., Sodnik, J., Szolgay, P. & Jakus, G. Exploring direct 3D interaction for full horizontal parallax light field displays using leap motion controller. *Sensors* 15, 8642–8663 (2013).
[11] Shimobaba, T., Shiraki, A., Ichihashi, Y., Masuda, N. & Ito, T. Interactive color electroholography using the FPGA technology and time division switching method. *IEICE Electron. Express* 5, 271–277 (2008)
[12] Shimobaba, T. *et al*. Lensless zoomable holographic projection using scaled Fresnel diffraction. *Opt. Express* 21, 25285–25290 (2013)



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