

Does Holograms have a future as a Technology Worldwide

Derrick Conway, Software Development (Honors), GMIT

Abstract—In this paper we are going to discuss the future technology of holograms, its present technology. We shall discuss the preset technology used for holograms and disuses the future of this technology and show where and how it can be used in everyday life for the future and decide whether or not holograms have a further or not and does it look bright.

I. INTRODUCTION

Holograms is a technique which enables three-dimensional images (holograms) to be made. It involves the use of a laser, interference, light intensity recording and suitable illumination of the recording. the image changes as the position and agile of the viewing image changes in exactly the same way as if the object were right in front of you in the same room, this makes the image appear in a three-dimensional.

Typically, a hologram is a photographic recording of a light field, rather than of an image formed by a lens, and it is used to display a fully three-dimensional image of the holograph ed subject, which is seen without the aid of special glasses or other intermediate optics.

Holograms were invented in the 1940s by Dennis Gabor it earned him the Nobel prize in 1971, but it wasn't until the 1960s that they started making holograms with light before this it was made with electrons this is because the laser had not been invented yet. so how does a hologram actually work, we have researched this topic, and this is the best explanation WE can give from what WE have researched. To ex plane this Were going to explain it very basic to you and hopefully you will understand it. If you have a photograph to start with if you have one these, you have an object this object could be example an apple which is the subject of your photograph and a light bounce or scatters off it. This light can be the light from the sun or the light from your camera that scattered

light is going to go through a lens in your camera and then hit CCD (Charged Coupled Device) if you have digital one or if your old school a photographic plate that then is encoded on that photographic plate you have the intensity of the light that bounces off that object. Now there is another part of this process to make the hologram and thats know as the phase this is actually the distance of the light has traveled from the object, you cant capture this in a photograph but in a hologram your set up is slightly different. You start off with a laser, you then take the laser beam and you split it into two, one will be a reference beam and the second one you will bounce of the object. It's just liked a photograph, but you have a light bouncing of an object then hits a photographic plate. What you need to do now which is different from a photograph is reflect the reference beam into the same photographic plate. what happens here is an interference pattern between the two beams and that is known as capturing the phase and that is it, you have just made a hologram. To make the standing hologram you need to take the original laser and shine it into the photographic plate you have made, what this allows you to do is reverse the hole process you can recreate the light that bounced off the object and thats how if you look at a hologram it looks like its actually there in front of in full 3D.

II. BRIEF HISTORY

The history of holograms was discovered by mistake back in 1948 [4]. By a Hungarian scientist Dennis Gabor. He was working on a project to improve the quality of electron microscope imagery, (electron microscope is used to view thin specimens (tissue sections, molecules, etc) witch projects the image). When He stumbled across the idea. but wasn't until there wasn't a suitable

light source invented yet until 1960 knowing as the laser. Scientist were only able to produce a hologram no bigger than a post stamp. In 1960 onwards holograms grew rapidly, two Scientists in the University of Michigan, Emmet Leith and Juris Upatiekes, developed the basic reflection hologram. the production of holograms war made cheaply and in very large numbers in the 1970's. these holograms war know as embossed hologram. these types of holograms war used on credit cards and bank notes. don't bother asking younger generation cause wouldn't have a clue about them and probably never seen one.

III. TYPES OF HOLOGRAMS

There are a number of different types of holograms, but for now Were just going to explain laser hologram, White light reflection, Rainbow Holograms, Digital Holograms pulse hologram and 3D Hologram.

A. Types

- Laser Hologram [5] is the very first kind of hologram made, it requires a laser to record the object and then the laser reconstruct the object creating the hologram.
- White light Reflection [5] is made from a number of way but Manley and viewed with a white light, and does not need a laser so see them.
- Rainbow hologram [5] is a mixture of laser hologram and White light hologram, doing so the hologram will appear shift through the air. as in it will be moving like a static effect.
- Holographic Stereo grams [5] is made from a sequence of 2D images of a person from different angels and formed by a computer graphic images of different view of the image
- Digital Hologram [5] is a more advanced form of a hologram, the hologram can only be displayed horizontal. example would be a projector.
- Pulse Hologram [5] is a mixture of all the above it works by using a pulsed laser that put out short bursts of light in the air to see the hologram, this laser would be used to record liven beings that are moving around.
- Holographic Optical elements [5] is a hologram of an object on a lens, its just like a flat

piece of film, it will illuminate on movement like on an old bank card.

- 3D holograms [5] is visible to everyone in free space and without the need of 3D glasses it can display animation and objects with a sequence of three-dimension, these animation and object appear to float in free space or air.

IV. USAGE

Usage of holograms in everyday life.

- How are holograms used in everyday life? Holograms are used to test different materials used in construction. This lets them see how well something will hold so much weight, without actually having to build the object out of real materials.
- There used in every store you go into without you even knowing its the used in all sort of items by using bar codes on items such as food and home appliances are also holograms a laser is used to read the bar code so to make sure no item gets stolen.
- Holograms are used in a lot more than the average person might think, there still used to create images of people and objects. Its also used in credit cards and driver licenses.
- There used in Medical cards medical records there put into these items to prevent forgery. There used in medical records for procedures such as a CAT scan, to provide a detailed layout of a patient.
- RED - Hydrogen one the worlds first holographic phone [6]. this phone is made by the red company that make hi end cinema cameras. the Red Hydrogen one is an amazing new android phone. this phone has hit the market in august 2018 in the us and selling for between 1200 and 1600 us dollars. it has a display of 4V holographic video the 4V allows you to watch movies and videos in 3D that allows you to see content without the need for 3D glasses. and you can move the phone around and sill have the 3D effect. this phone allows you to take photos and view them in 3D effete as well.
- Microsoft HoloLens
Microsoft HoloLens [7] is a virtual reality (VR) headset was invented by Alex Kipman

this is a new technology Microsoft have designed it to allow the user to expanse 3D holographic images through the headset. this HoloLens is the first self-contained holographic computer which allows the user to engage with the digital content and interact with the holograms in the area around you.

V. REVOLUTIONIZING THE WORLD FOR THE FUTURE

- **Military Mapping**
Holograms are being used in the military [2] by using holographic images to be used to improve military strategy by creating 3D holographic maps of the battle field for military this allows soldiers to view three-dimensional area to look around a corner and with their training. It is done by taking complex computerized images that are made into a holographic sheet. it can be seen in high quality images stored on the hologram sheet. the technology is easy to use and can be rolled up for easy storage.
- **Information storage**
Now a days we generate huge amounts of data and data storage [2] is becoming cheaper to come across. everyone has a desire to store the data and for a life time. someday holograms are going to replace CD and DVD holograms are able to store vast amount of data without getting corrupted or lose of data. it can be done by copying pages of data and can store unthinkable amounts of it. if someday you can make a hologram of a page and smash it up into tiny pieces it can be put back together unlike CD hard drives or DVD if scratched that's it its gone. the data can be stored in three dimensions like in iron man moves. researchers suggest the possibility of holographic storage in the nearer future and is likely to happen soon.
- **Medical**
Holograms could one day be used in medical area [2] by being used as visualizing patient and training students and surgeons. A company in Scotland has been successful in using this kind of data my using 3D images to do training, the advantages of this is you

don't need 3D glasses or any viewing devices. the hologram can be used so the viewer can move around the hologram and examine the different parts of the body, already this company has produced hologram images of brain liver lungs heart skeleton nerves and muscles. medical companies are investing big time in this technology.

- **Fraud and Security**
these holograms are complex devices and difficult to make [2]. example would be your bank card it displays three-dimension image which you can see when you move side to side or up and down it is easy to make but very difficult to forge. you may also see them on bank notes they have a reflective strip on them or contain images on the notes that move or change color. they are also adding holograms on wine bottle to prove there are vintage bottles and not counterfeit.

VI. ADVANCED HOLOGRAMS

new technology of holograms.

- **Laser-Plasma-Holograph [8]**
A company Bruton developed this laser-plasma-holographic device. a true 3D display which can produce bright dots in the air, so people can see 3D images in real 3d space. This holographic technology will be used for advertisements, entertainment industry, emergency and rescue signal during a disaster.
- **Fan-Type-Holograph.**
Fan-Type-Holographic devices are these devices that spin similar to a roof fan but in a horizontal manner. The fans propellers are merged with Sophisticated RGB-Lights (Red,Blue,Green Lights), when spinning it creates a holographic illusion or image[8]. There is a company in the UK that produces the high-quality premium class fan Holograms, known as the Kin-Mo company. This company on startup was backed up by investors Mark Cuban and Richard Branson [9]. This company has won many awards for its development in hi-tech visual solutions, among this awards war the top three British innovations of the year and was named among the worlds top ten most impressive technologies.

- **Portable Holographic Devices.**

Portable holographic devices are designed to be portable and easy to carry. Scientists from the Massachusetts Institute of Technology have invented a portable holographic device known as Holoport [11]. It is the world's thinnest hologram; it is a thousandth of an inch thick, thinner than human hair. This hologram is viewable without having to wear any glasses.

- **Another portable holograph**

Another portable holograph is known as fairy light [12]. This is an interactive light; this means you can touch it and also feel it. These lights or voxels, as there are now, can be arranged in mid-air to create moving, floating, or interactive images.

- **another portable hologram.**

Another portable hologram is the digital-holographic-tabletop [13]. That is developed by a company called Giga-Optics. It produces the first 360-degree hologram and can be viewed from any angle. This is done with high-powered multi-colored lasers.

- **Physical holograms**

Physical holograms are more sophisticated and more interactive. Two MIT students, Daniel Leithinger and Swan Follmer, designed this complicated, dynamic shape display. It is more advanced than a hologram because it expresses 3D physical properties by being able to copy the shape of people and objects. How it works is it uses a table with blocks on it, an inch by an inch with motors connected to each one. There would be about 900 of these blocks with linkages and pistons connected to them.

- **Crazy flies**

Another physical hologram is another physical hologram [14] which used hundreds of drones with LED lights. These drones fly in a coordinated manner and show 3D structures in the air. They designed to replace fireworks and stop air pollution by using them.

- **Material fused holograms**

Requires a media projector [15]. The very first material fused hologram was a smoke projector. This can be used for holographic projection. In low-budgets, you just need a

projector and a smoke tube that continuously exhales vertical smoke. It can be used for advertisement in shopping centers.

- **Gatorade water holograph**

Another material hologram that is used by an advertising company, Gatorade [15]. This hologram uses over 20,000 parts and took 5,000 hours to create. There are 208 individual LEDs that are turned on and off within a millisecond. The advert shows a figure running and jumping on a box and when landing on it, it shows its feet splashing on a puddle of water, which looks amazing. We think anyway.

- **7D holograms**

Is another material hologram. This hologram is to be designed for shopping malls. It is a 7D holographic technology. This means it is in high quality, captured in 7D with visual effects. This technology is still being developed and is expected to be released in 2020 [16].

- **Hyperspace wall**

Another material hologram. Is another material hologram made by a Chinese company, Kinomo. This hyper-vision wall is capable of producing images in HD. The wall is made up of many spinning fans and the LED is shown on it, and the wall is three meters in size. It costs 3200 dollars to build [17].

- **Table Holograms** For this to work, you will need a table. The very first hologram table is known as the Euclidean Hologram Table. The first multiple user hologram table that needs you to wear glasses to allow you to interact with it. These holograms are used to show building constructors in full before they are finished to show clients what it will look like when finished [18].

- **HoloLamp**

Is another table hologram. This HoloLamp is the world's first glasses-free holographic device that creates 3D images on your table. HoloLamp is made with Unity, which is a gaming software. It uses a touch detection technology to allow you to control the objects using your hands. [19]

- **3D Volumetric Technology**

Is another table Hologram. It is a 3D

Volumetric Technology which bring digital content to life by helping you to visualize and learn by using 3D images you don't need 3D glasses to use this hologram. It is designed to be more interactive allowing multiple users to interact with it [20].

- Event holograms

Are holographic projection technology that is used for Christmas celebration or even used for Halloween to have some fun this technology is created by ATMOSFX effects. [21]

- Stage performance Holograms

This company known as MDH Holograms is a punier in holographic technology and is the world leader in holographic technology, there technology is mostly used in stage performances the best example of the Tupac hologram performance, the estimate cost to the hologram performance is in the reign of half a million to develop. you can use the technology to prod case to multiple place at once, but to do this is very expensive.

- Human Telepresence

There is a new 3-D display system developed by researchers in Canada [23], this new technology is able to transmit a full-size image that can be viewed without any 3d glasses. This technology could bring a new era of holograms. The areas where this could be used is in meeting rooms and conferences and also in concerts, the lead study about this technology is the professor Roel Veregaal at queens university in Ontario, Canada. Says you can walk round the image and see it in full 360 view

VII. CONCLUSIONS

When answering the question do holograms have a future worldwide, we can say it is posable with the information reviewed in this paper but with its unrealistic to answer with so many possibilities for this area to expand. and uncertainty of its future. Holographic technology and spectral imagining have endless applications as fare as the human mind can imagine. There has been great progress and improvements in 2018 for holograms with the RED phone just been released and the

holobord that are affordable to the consumers in advertising markets. WE feel that this technology can play a big part in our future and have great impact in certain areas such as the education sector with the hologram table it can be used in so many areas for education, military, engineering, advertising the list goes on and on. in the future holographic display will be replacing all present displays in all sizes from small phone screens to large projectors. Holographic technology is set to become a huge game changer in many industries and has the power to significantly impact our daily lives. WE have only discussed a few examples in this paper, but the potential applications are near endless. But at the same time We feel its a few years away from being ready for everyone. Holograms one day will become a part of our lifes and have a big impact in every sector.

REFERENCES

- [1] <https://www.theguardian.com/technology/2018/may/22/star-wars-holograms-3d-images-future-holochess-princess-leia>
- [2] <https://theconversation.com/five-surprising-ways-holograms-are-revolutionising-the-world-77886>
- [3] <https://www.integrat.com/resources/articles/a-medical-applications-of-holography>
- [4] <https://www.explainthatstuff.com/holograms.html>
- [5] <http://www.adjournal.net/articles/23/232.pdf><http://www.adjournal.net/articles/23/232.pdf>
- [6] <https://www.theverge.com/circuitbreaker/2018/8/1/17639752/red-holographic-hydrogen-one-phone-fcc-approval>
- [7] <https://www.techrepublic.com/article/microsoft-hololens-the-smart-persons-guide/>
- [8] <https://arxiv.org/ftp/arxiv/papers/1506/1506.06668.pdf>
- [9] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5792619/>
- [10] <http://www.techeblog.com/index.php/tech-gadget/you-won-t-believe-this-hypervsn-3d-hologram-display-is-made-from-micro-led-fans>
- [11] <https://www.kickstarter.com/projects/2029950924/holovect-holographic-vector-display>
- [12] <https://arxiv.org/ftp/arxiv/papers/1506/1506.06668.pdf>
- [13] <https://www.spiedigitallibrary.org/conference-proceedings-of-spie/10666/1066602/Design-options-for-360-degree-viewable-table-top-digital-color/10.1117/12.2309281.short?SSO=1>
- [14] <https://www.ft.com/content/afbfcbf6-e4ff-11e7-a685-5634466a6915>
- [15] <http://www.digitalbuzzblog.com/gatorade-active-water-3d-rain-installation/>
- [16] <http://ijrsrd.com/Article.php?manuscript=IJSRDV6I10033>
- [17] <http://www.retaildigitalsignageexpo.com/novadocuments/468783?v=6365930>
- [18] <https://www.artstation.com/sclong/blog/wBe4/hologram-table-update-3>
- [19] <http://hololamp.tech/blog/>
- [20] <http://voxon.co/blog/>
- [21] <http://3d-hologram-projector.com/blog/>
- [22] <https://www.mdhhologram.com/portfolio-items/tupac/>
- [23] <https://dl.acm.org/citation.cfm?id=3174096>