

A Review Paper on Holographic Projection

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Abstract- This review paper examines the new technology of Holographic Projections. It highlights the importance and need of this technology and how it represents the new wave in the future of technology and communications, the different application of the technology, the fields of life it will dramatically affect including business, education, telecommunication and healthcare. The paper also discusses the future of holographic technology and how it will prevail in the coming years highlighting how it will also affect and reshape many other fields of life, technologies and businesses.

I. INTRODUCTION

What is holographic projection?

Holographic projection is the new wave of technology that will change how we view things in the new era. It will have tremendous effects on all fields of life including business, education, science, art and healthcare. To understand how a holographic projector works we need to know what a hologram is. Holography is the method we use to record patterns of light. These patterns are reproduced as a three dimensional image called a hologram. While Hungarian physicist Dennis Gabor invented the hologram in 1947. Today's new technology provides some outstanding advantages to not only everyday consumers but also large business corporations and governments. Three-dimensional holographic projection technology is loosely based on an illusionary technique called Peppers Ghost, and was first used in Victorian theatres across London in the 1860s. Pepper's Ghost was typically used to create ghostlike figures on stage. Hidden from the audience's view, an actor dressed in a ghostly costume would stand facing an angled plate of glass. The audience would be able to see the glass, but not the actor directly. 3D holographic projection is a rapidly growing technology. With every business desperately trying to get their product to stand out from the competitors, 3D hologram advertising and promotion is fast becoming an eye catching success. Thanks to the latest in HD projection

and CGI technology, 3D holographic projection has transformed itself from its basic Victorian origins into a futuristic audio visual display used by the likes of Endemol (Big Brother), Coco-Cola and BMW. With almost limitless holographic possibilities, from life like humans to blockbuster style special effects, as well as the continual advances in technology, 3D holographic projection has a bright

future ahead .A holoprojector will use holographic technology to project large-scale, high-resolution images onto a variety of different surfaces, at different focal distances, from a relatively small-scale projection device. With many of the latest big budget cinema releases being available in 3D, and everyone talking about the 3D future of television, many eyes are starting to focus on 3D Hologram projections without the glasses!

II. IMPORTANCE AND NEED OF HOLOGRAPHIC PROJECTION

The interest in 3D viewing is not new. The public has embraced this experience since at least the days of stereoscopes, at the turn of the last century. New excitement, interest, and enthusiasm then came with the 3D movie craze in the middle of the last century, followed by the fascinations of holography, and most recently the advent of virtual reality. Recent developments in computers and computer graphics have made spatial 3D images more practical and accessible.

The computational power now exists, for example, for desktop workstations to generate stereoscopic image pairs quickly enough for interactive display. At the high end of the computational power spectrum, the same technological advances that permit intricate object databases to be interactively manipulated and animated now permit large amounts of image data to be rendered for high quality 3D displays. Until currently, holographic data disks and holo technology drives were just a matter of research.

They were too costly and clumsy to use to be consumer markedly feasible. However, recent improvements in the availability and cost reduction of lasers, digital cameras, and optical encoding substances are helping to turn the long-expected potential of holographic data storage into a commercial reality. The first holographic information disks were marketed consumer markedly in the past year. Thus far, these holographic disks are still very costly and only Holographic Read Only Memory (HoloROM) is out. Nonetheless, rewritable holographic disks should come out in the next couple years. Further, manufacturing costs will decrease as product volume grows.

This is the same configuration of improved product advancement and affordability that happened after CDs and DVDs were first launched. Modern three-dimensional ("3D") display technologies are increasingly popular and practical not only in computer graphics, but in other diverse environments and technologies as well. Growing examples include medical diagnostics, flight simulation, air traffic control, battlefield simulation, weather diagnostics, entertainment, advertising, education, animation, virtual reality, robotics, biomechanical studies, scientific visualization, and so forth.

The increasing interest and popularity are due to many factors. In our daily lives, we are surrounded by synthetic computer graphic images both in print and on television. People can nowadays even generate similar images on personal computers at home. We also regularly see holograms on credit cards and lenticular displays on cereal boxes. There is also a growing appreciation that two dimensional projections of 3D scenes, traditionally referred to as "3D computer graphics", can be insufficient for inspection, navigation, and comprehension of some types of multivariate data. Without the benefit of 3D rendering, even high quality images that have excellent perspective depictions still appear unrealistic and flat. For such application environments, the human depth cues of stereos is, motion parallax, and (perhaps to a lesser extent) ocular accommodation are increasingly recognized as significant and important for facilitating image understanding and realism.

III. APPLICATION OF HOLOGRAPHIC PROJECTION

With the use of the latest HD projectors, CGI animation, specialist HD film techniques and special effects created in post production, Pepper's Ghost technology has been upgraded to the 21st century. Instead of a real object or person's reflection appearing on a plate of glass, high definition video and CGI animation is beamed directly onto a specially designed, chemically treated transparent film via a high power HD projector. Although much more expensive, this modern approach results in a much clearer, believable hologram projection. In August 2009, Endemol, the producers of the famous reality TV show Big Brother, working together with activ8-3D holographic projections, beamed housemates' friends and families into the house to deliver messages of support and encouragement.

The messages were pre-recorded using HD cameras and specifically angled lighting. A stage was rigged inside the Big Brother house task room, compiling of a HD projector, media player, lighting, and audio equipment. Each housemate entered the room in turn and took a seat in front of the stage. On cue, the housemate's family member or friend was beamed into the stage before delving their message. Although the hologram displays were difficult to judge on 2D television screens, the event was hailed as a great success, evoking brilliant reactions from the housemates which made for great TV.

In January 2009 Coco-Cola gave a holographic sales conference presentation in Prague for over 800 people. Senior directors of the company were beamed into the stage as 3D holograms before giving a presentation about how the Coco-Cola brand has evolved over the years. The content of the presentation was also in the form of 3D holographic projections.

The centre piece was a giant 3D hologram Coco-Cola branded spinning clock, representing the progression of time. A showcase of previous Coco-Cola bottles, logos, and labels amongst other objects were also projected as 3D holograms to create Prague's first 3D holographic projection display. 3D Medical Animation Studio - 3d medical illustrations, has the capability of

displaying 3d medical animations through holographic displays including the option of interactivity. Medical simulations company Tres 3d is pushing the boundaries of traditional MOA's (method of action) by creating holographic/3d animations to be viewed on holographic film without the need of special glasses.

By using film with holographic properties and creating custom 3d computer medical animations Tres3d is able to create a holographic illusion. This process enables the audience to view the 3d medical animations with the illusion of depth. "Holographic Projection and 3d Imaging is nothing new to most of us. We all remember the first few 3dmovies that required those silly paper glasses, picture a boardroom filled with top executives wearing them. I guess, that's why the technology never truly caught on." Noted David Gonzalez, President of Tres3d Computer Medical Animation Studio (medical illustration studio) Conceptual medical illustrations and education illustration medical produced by Tres3d makes the top list of many conceptual medical illustration companies providing high quality 3d medical graphics. 3D illustration medical renders from the development of high quality models. Medical illustrator specialists from Tres 3d can create and render of any scientific visualization, illustration medical for high resolution print collateral. Human anatomy illustrations, medical graphics and conceptual medical illustration. 3d visualizations through mechanism of action illustrations. Conceptual medical illustration companies do not use global illumination technology when rendering 3d illustration medical. Tres 3d provides the most realistic renders available by using simulated natural light sources. Education illustrative medical are reviewed by Specialists on each 3d medical MOA. We have worked for companies like Johnson & Johnson, Glaxo Smith Kline and Unilever. Our clients and work speak volumes of our professionalism and high quality 3d graphics and medical artwork. Tres3d produces flash animation that loads quickly, DVD's to educate and train more effectively. Stills can be generated from each MOA method of action video for print materials. For 3d illustration medical campaigns of 3D conceptual medical illustrations models would be produced. A 3D holographic projection

demonstration can be seen at The Movieum of London Museum, located in Westminster, England. The company behind it, activ8-3D holographic projections, are showcasing their large scale show and event holographic display, their medium and small size exhibition and retail hologram displays, as well as motion capture and interactive systems. For a free demonstration visit their website www.activ8-3d.co.uk or send an email to info@activ8-3d.com Real people can be filmed giving a speech, dance or presentation, for example, and then be projected as 3D holograms. Holographic special effects can be added in post-production to make a lifelike person beam into the room, Star-Trek style, or have their product appear and spin above their head at the click of their fingers.

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The centre piece was a giant 3D hologram Coca-Cola branded spinning clock, representing the progression of time. A showcase of previous Coca-Cola bottles, logos, and labels among other objects were also projected as 3D holograms. One can find many potential uses of holotechnology information systems in the general area of interactions and imaging. "HoloCams" will use holotechnology information storage and retrieval to store and virtually display 3D visual worlds. Holotech computer graphic interfaces and interfaces, such as gesture interpretation systems, will allow considerably more natural communication between a person and computer than can be done with

present day two- dimensional image projections and keypad/mouse.

Holotech imaging with temporal gated pulses will enable clear watching of things surrounded by light refracting matter such as body fluid or translucent atmospheres. Among the hindrances to widespread commercialization of holographic applied science is the price of integrated storage, processing, and display equipment, but prices of liquid crystal displays and digital camera chips are dropping. We are probably on the verge of widespread consumer marketization of holographic applied science. Sub-page toward lower cost holographic data storage covers additional useful information.

With the use of the latest HD projectors, CGI animation, specialist HD film techniques and special effects created in post production, Pepper's Ghost technology has been upgraded to the 21st century. Instead of a real object or person's reflection appearing on a plate of glass, high definition video and CGI animation is beamed directly onto a specially designed, chemically treated transparent film via a high power HD projector. Although much more expensive, this modern approach results in a much clearer, believable hologram projection. Due to the modern approach of projecting CGI animations and pre-recorded footage, almost anything is possible.

The "blank canvas" approach is often adopted, creating a storyboard only limited by imagination. The storyboard can then be handed over to a CGI animation team who can make it come to life using the latest 3D software such as Maya or 3ds-Max. Real people can be filmed giving a speech, dance or presentation for example, and then be projected as 3D holograms. Holographic special effects can be added in post production to make a life-like person beam into the room, Star Trek style, or have their product appear and spin above their head at the click of their fingers. Bill Gates, Chairman of Microsoft Corp, made a virtual appearance at the "World Congress on Information Technology 2008", where he was reproduced on stage as a holographic simulation.

The size of the projection was 4.6m and appeared in front of the audience of around 400 at the Kuala Lumpur Convention Centre. Apparently, the holographic image was very realistic and the crowd was impressed with the results. Gates stated

during his speech that, "There are one billion people (in the world) who have a personal computer each but there are five billion others who don't. Microsoft also wants to reach these people." After the flurry of 3D TVs we've seen over the past week or so, we've kind of got accustomed to the technology, but in China researchers have pushed those limits of 3D to another new level, we may still not be so ready for. The researchers in China have developed what they call the largest 3D holographic display. Measuring 1.8×1.3 m² the screen is touted to be perfect for a great viewing experience with its continuous natural 3D image production.

The 3D holographic display with the help of 64 digital cameras within is able to capture 3D images and with 64 projectors it is also able to recreate those images by projecting them on a holographic functional display screen at various angles. Because size of the magnification depends on the projector's ability and the camera array, there is no limit here on the holographic display, it can be used to create 3D images in any size, and still retain a high-quality image. The goal of the research team is to commercialize the display, but until then they expect to optimize the system and develop the requisite applications, software etc. In the area of marketing, holographic marketing or "holopromotion" is the application of holotechnology science to three-dimensional, high-resolution advertising. Multiple aspects of product marketing and purchasing might be put together in bidirectional holograms that both draw people's attention and sell a product in real time. Holographically interactive booths and vending machines that can project consumer-responsive images several times their size will occupy much less space than traditional kiosks and vending machines. The site on telecommunications and holographic technology for more holotech information. Many holographic information storage systems have a beam splitter that splits a laser ray into two rays. One ray, known as the object beam, goes through a Spatial Light Modulator (SLM), like a LCD, that imprints data into the ray. The object ray intersects the people can be filmed giving a speech, dance or presentation for example, and then be projected as 3D holograms. Holographic special effects can be added in post production to

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The object ray intersects the second ray, known as the reference ray, inside optically sensitive recording media -- especially a photopolymer. The intersection of these rays, called an interference pattern, is a holographic image that is recorded in the media. When a reference beam is shown into the storage media at the same angle and wavelength used to store the holographic image, then the holographic image is recreated and the information configuration may be extracted and changed into electronic pulses. Data on holographic storage disks are expected to last as long as 50 years, while data on magnetic tape can erode in under a decade. For these reasons, uses for which archival durability is critical may increasingly switch from tape to holo disks. Linked page shape flexibility for holographic data storage also may be of interest to you.

IV. FUTURE OF HOLOGRAPHIC PROJECTION

3D holographic projection technology clearly has a big future ahead. As this audio visual display continues to get high profile credibility, we are likely to see more companies advertising their products or marketing their business in this way. Whether it be large scale, big budget product launches or smaller retail POS systems, they are likely to become a common feature in the advertising world.

The holographic projectors that are under development will be able to be much smaller and portable than image projectors that rely on conventional, incoherent light beams. Ultimately, holographic projectors may become sufficiently small to be incorporated into future generation cell phones. Holographic techniques are being used for three dimensional (3-D) rendering of medical pictures including MRI and CT pictures. Medical holotechnology imaging can enable doctors

to test the insertion of medical instruments into an artificially constructed, three-dimensional version of the surgical field before the operation. An array of micro-mirrors, whose movements are controlled by computer, may be used to divide and focus an array of laser beams to make moving, three-dimensional holographic pictures of internal anatomic features.

Holographic projectors will be able to render sharp projected images from relatively small projection devices (e.g. cell-phones) because they do not require high intensity, high-temperature light sources. Investigators at companies and universities are working toward applied science that could make television with holographic projections (holovisions) that can project moving, three-dimensional pictures outside of the screen. Genuine holographic motion picture science lets people see travelling, three-dimensional images absent special glasses. One means of creating animated holotechnology images is to send laser light by means of a lithium niobate waveguide covered by piezoelectric material. A modulator converts video impulses into vibrations of the piezoelectric material that, in turn, alters the configuration of the light beam going through it. When this ray is shone into a translucent volume, it creates a 3D travelling image. Two and three dimensional interference patterns presents some alternative perspectives.

A holographic memory device that can store as much as five gigabytes could replace flash memory for many usages. It would be a boon to handheld machines like PDAs and smart phones. Next generation smart phones may use holotechnology applied science for data storage and display projection. For memory, holographic information recording and playback could significantly increase the memory capacity of phones. For display, holo technology projection can show images, unconstrained by the tiny size of a handheld device. The idea of watching television on one's cell phone is in vogue now, but who wants to watch TV on a 2" screen? If it were possible to project a large picture from a cell phone onto a nearby wall, that would transform the use of cell phones for visual media. Also, storing data three-dimensionally with holographic storage has interesting notes on this holotechnology topic.

In the areas of telecommunications and instruction, remote conferencing and distance education technologies featuring 2D screen pictures will evolve into three-dimensional, engaging holographic projection systems. Holographic applied science is, even now, being used for "HoloCells" (holographic cell phones that record and play three-dimensional, real time pictures of the communicating parties that maybe viewed from different angles). The site three dimensional medical imaging also provides information on these topics.

A holographic memory device that can hold up to several gigabytes could compete with flash memory for several usages. It would be a boon to handheld machines especially smart phones and PDAs. Future versions of smart phones may use holotechnology applied science for both memory and display functions. For memory, holotechnology information recording and playback can greatly increase the memory capacity of phones. For display, holographic projection can show pictures that are not constrained by the small size of a mobile device. The prospect of watching TV on a mobile phone is in vogue now, but who wants to watch television on a 3" diagonal screen? If it were possible to project a large picture from one's cell phone onto the wall nearby, that would transform the use of cell phones for visual media. Linked page media for holographic data storage also has different information on this topic.

Holographic applied science can also create new methods for three-dimensional visual contact from computing systems to human beings. This starts with screen displays with improved 3D projection qualities and then improves to mid-air, three-dimensional computer projections that do not require a screen. Similar holotech coverage at holographic technology and navigation may be of interest. Design is central to applied science, new product development and model building, building design and construction, pharmaceuticals, biological, and nano pharmacology, biochemistry and modeling at the molecular scale, biomedical technology and prostheses, the apparel industry, the fine arts, and other areas as well. Holotech applied science can help design for: manipulation of 3D models of molecules or biological structures; assembling electronics; and other design-related

tasks. Linked page 3D imaging using micro-mirror arrays also deals with these technologies.

The quantity of realized and potential usages of holographic science in the area of interpersonal interactions is also increasing quickly. A holographic camera (holocam) records and conveys radial three-dimensional real-time pictures from a central point using holographic applied science. A holo viewer projects these images for viewing in another location. Holocams and holographic viewers will probably be integrated into internet access, television, and cell phones in the next ten years. New telecommunication networks built on holo technology science may be developed with uses in both personal and business interactions. Holographic science may also enhance the transferrable speed and channel capacity for interactions systems based on fiber optics. To continue on related topics, see also holographic communication between humans and computers .

At the present time, DVDs and CDs are still the main formats for mobile information storage media for music, video, and information. These traditional data storage media store information as distinct bits on the surface of the recording medium and the medium should be spun around to recover the information. The price of saving information is dropping but the need, however, for long-term information storage has been increasing even more promptly. Holotech information storage opens possibilities for saving information at much higher densities than CDs and DVDs by storing information three-dimensionally throughout the thickness of the recordable media. Visit also holographic data storage process .

It sounds a lot like a wacky dream, but don't be surprised if within our lifetime you find yourself discarding your plasma and LCD sets in exchange for a holographic 3-D television that can put Cristiano Ronaldo in your living room or bring you face-to-face with life-sized versions of your gaming heroes. The reason for renewed optimism in three-dimensional technology is a breakthrough in rewritable and erasable holographic systems made earlier this year by researchers at the University of Arizona. Dr Nasser Peyghambarian, chair of photonics and lasers at the university's Optical Sciences department, told CNN that

scientists have broken a barrier by making the first updatable three-dimensional displays with memory.

According to Peyghambarian, they could be constructed as a screen on the wall (like flat panel displays) that shows 3-D images, with all the image writing lasers behind the wall; or it could be like a horizontal panel on a table with holographic writing apparatus underneath.

So, if this project is realized, you really could have a football match on your coffee table, or horror-movie villains jumping out of your wall. Peyghambarian is also optimistic that the technology could reach the market within five to ten years. He said progress towards a final product should be made much more quickly now that a rewriting method had been found. However, it is fair to say not everyone is as positive about this prospect as Peyghambarian.

Justin Lawrence, a lecturer in Electronic Engineering at Bangor University in Wales, told CNN that small steps are being made on technology like 3-D holograms, but, he can't see it being ready for the market in the next ten years. "It's one thing to demonstrate something in a lab but it's another thing to be able to produce it cheaply and efficiently enough to distribute it to the mass market," Lawrence said. Yet, there are reasons to be optimistic that more resources will be channeled into developing this technology more quickly.

The Japanese Government is pushing huge financial and technical weight into the development of three dimensional, virtual-reality television, and the country's Communications Ministry is aiming at having such technology available by 2020. Peyghambarian said there are no major sponsors of the technology at present, but as the breakthroughs continued, he hopes that will change.

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