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1. Introduction and Fundamentals

1. Introduction and Fundamentals:

1.1 Introduction to Holographic Technology:

- Holography is a technique that allows the light scattered from an object to be recorded and later reconstructed. The technique to optically store, retrieve, and process information. Preserve the 3-D information of a holographer subject.

- The term “hologram” was first used by the British scientist Dennis Gabor in 1947. “holos” means “whole or entirely” “gram” means “message or recording”

- Holography is the process and technique used to create holograms.

1.2 Introduction to Blue-Eyes Technology:

- The basic idea behind Blue-Eyes technology is to give the computer the human power. We all have some perceptual abilities that is we can understand each other’s feelings. For example, we can understand one’s emotional state by analyzing his facial expression. If we add these perceptual abilities of human to computers would enable computers to work together with human beings as intimate partners. The “BLUE EYES” technology aims at creating computational machines that have perceptual and sensory ability like those of human beings.

- Blue in terms of Bluetooth which enables reliable wireless communication.

- Eyes because the eye movement enable us to obtain a lot of interesting and important information.

2. History and Evolution:

2. History and Evolution:

2.1 History Holographic Technology:

Figure 1. Hologram

- Dennis Gabor coined the term hologram from the Greek words holos, meaning "whole," and gramma, meaning "message" and developed the theory of holography while working to improve the resolution of an electron microscope.

- In 1960 by Russian scientists N. Bassov and A. Prokhorov and American scientist Charles Towns with the invention of the laser, whose pure, intense light was ideal for making holograms moreover, in that year the pulsed-ruby laser was developed by Dr. T.H. Maimam which was used make light of Hologram.

- In 1962 Emmett Leith and Juris Upatnieks of the University of Michigan recognized from their work in side-reading radar that holography could be used as a 3-D visual medium. they read Gabor's paper and "simply out of curiosity" decided to duplicate Gabor's technique using the laser and an "off-axis".

- Then after, another major advance in display holography occurred in 1968 when Dr. Stephen A. Benton invented white-light transmission holography while researching holographic television at Polaroid Research Laboratories. This type of hologram can be viewed in ordinary white light creating a "rainbow" image from the seven colors which make up white light.

- In 1972 Lloyd Cross developed the integral hologram by combining white-light transmission holography with conventional cinematography to produce moving 3-dimensional images.

- Holographic artists have greatly increased their technical knowledge of the discipline and now contribute to the technology as well as the creative process. The art form has become international, with major exhibitions being held throughout the world.

2.1 History of Blue-Eyes Technology:

Figure 2. Blue-Eyes

- Paul Ekman's facial expression work gave the correlation between a person's emotional state & psychological state which described the Facial Action Coding System (Ekman and Rosenberg,1997).

- Blue Eyes is a technology conducted by the Research Team of IBM at its Almaden Research Institute (ARC) Sanjose, California since 1997.

- Blue Eyes Technology aims at creating a computer that have the abilities to understand the perceptual powers by recognizing their facial expressions and react accordingly to them.

3. Components:

3. Components:

3.1 Components of Holographic Technology

No.	Component Name	Basic Work
1	Laser	Red lasers, usually helium-neon (HeNe) lasers, are common in holography. These are coherent light source.
2	Beam Splitter	This is a device that uses mirrors and prisms to split laser beam of light into two beams, Object beam and Reference beam.
3	Mirrors	This direct the beams of light to the correct locations.
4	Holographic Film	Holographic film can record light at a very high resolution, which is necessary for creating a hologram. It's a layer of light sensitive compounds on a transparent surface, like photographic film.

Table 1. Components of Holography

3.2 Components of Blue-Eyes Technology:

No.	Component Name	Basic Work
1	DAU (Data Acquisition Unit)	The blue tooth module, which is integrated with the mobile device (DAU), provides a wireless interface between the Central System Unit (CSU) and the user or operator having the sensors.
2	CSU (Central System Unit)	The CSU mainly contains codec (PCM Codec commonly used for voice information transmission) and a wireless blue tooth module.

Table 2. Components of Blue-Eyes

4. Working:

4. Working of the Technologies:

4.1 Working of Holographic Technology:

- If you want to see a hologram, you don't have to look much farther than your wallet. There are holograms on most driver's licenses, ID cards and credit cards. If you're not old enough to drive or use credit, you can still find holograms around your home. They're part of CD, DVD and software packaging, as well as just about everything sold as "official merchandise."

- Unfortunately, these holograms -- which exist to make forgery more difficult -- aren't very impressive. You can see changes in colors and shapes when you move them back and forth, but they usually just look like sparkly pictures or smears of color. Even the mass-produced holograms that feature movie and comic book heroes can look more like green photographs than amazing 3-D images.

- On the other hand, large-scale holograms, illuminated with lasers or displayed in a darkened room with carefully directed lighting, are incredible. They're two-dimensional surfaces that show absolutely precise, three-dimensional images of real objects. You don't even have to wear special glasses or look through a View-Master to see the images in 3-D.

- If you look at these holograms from different angles, you see objects from different perspectives, just like you would if you were looking at a real object. Some holograms even appear to move as you walk past them and look at them from different angles. Others change colors or include views of completely different objects, depending on how you look at them.

- Holograms have other surprising traits as well. If you cut one in half, each half contains whole views of the entire holographic image. The same is true if you cut out a small piece -- even a tiny fragment will still contain the whole picture. On top of that, if you make a hologram of a magnifying glass, the holographic version will magnify the other objects in the hologram, just like a real one.

- Once you know the principles behind holograms, understanding how they can do all this is easy. This article will explain how a hologram, light and your brain work together make clear, 3-D images. All of a hologram's properties come directly from the process used to create it, so we'll start with an overview of what it takes to make one.

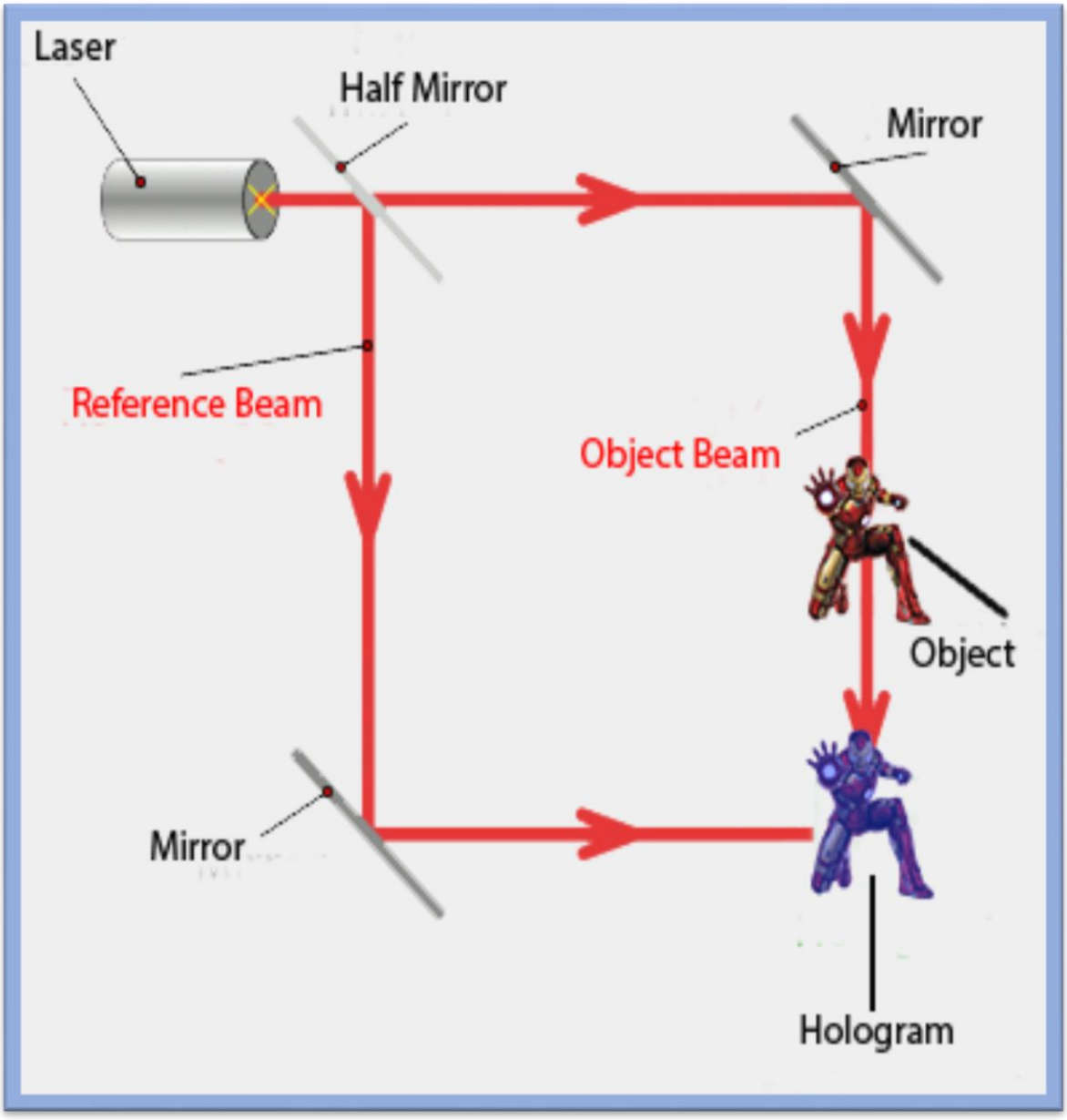

Figure 3. Working of Hologram

- A **laser**: Red lasers, usually **helium-neon (HeNe)** lasers, are common in holography. Some home holography experiments rely on the diodes from red laser pointers, but the light from a laser pointer tends to be less coherent and less stable, which can make it hard to get a good image. Some types of holograms use lasers that produce different colors of light as well. Depending on the type of laser you're using, you may also need a **shutter** to control the exposure.

- **Lenses:** Holography is often referred to as "lensless photography," but holography does require lenses. However, a camera's lens focuses light, while the lenses used in holography cause the beam to spread out.

- A **beam splitter**: This is a device that uses mirrors and prisms to split one beam of light into two beams.

- **Mirrors**: These direct the beams of light to the correct locations. Along with the lenses and beam splitter, the mirrors have to be absolutely clean. Dirt and smudges can degrade the final image.

- **Holographic film**: Holographic film can record light at a very high resolution, which is necessary for creating a hologram. It's a layer of light-sensitive compounds on a transparent surface, like photographic film. The difference between holographic and photographic film is that holographic film has to be able to record very small changes in light that take place over microscopic distances. In other words, it needs to have a very fine **grain**. In some cases, holograms that use a red laser rely on emulsions that respond most strongly to red light.

❖ Summary of Working:

1. The laser points at the beam splitter, which divides the beam of light into two parts.

2. Mirrors direct the paths of these two beams so that they hit their intended targets.

3. Each of the two beams passes through a diverging lens and becomes a wide swath of light rather than a narrow beam.

4. One beam, the **object** beam, reflects off of the object and onto the photographic emulsion.

5. The other beam, the **reference** beam, hits the emulsion without reflecting off of anything other than a mirror.

❖ TRANSMISSION AND REFLECTION:

- There are two basic categories of holograms -- transmission and reflection. Transmission holograms create a 3-D image when monochromatic light, or light that is all one wavelength, travels through them. Reflection holograms create a 3-D image when laser light or white light reflects off of their surface. For the sake of simplicity, this article discusses transmission holograms viewed with the help of a laser except where noted.

4.2 Working of Blue-Eyes Technology:

- Blue eyes technology consists of,
  1. Mobile measuring device or Data Acquisition Unit (DAU)
  2. Central System Unit (CSU)

- The main objective of Blue eyes technology is to develop a computational machine having sensory and perceptual ability like those of humans. The Blue Eyes technology system is a combination of a set of hardware and software systems.

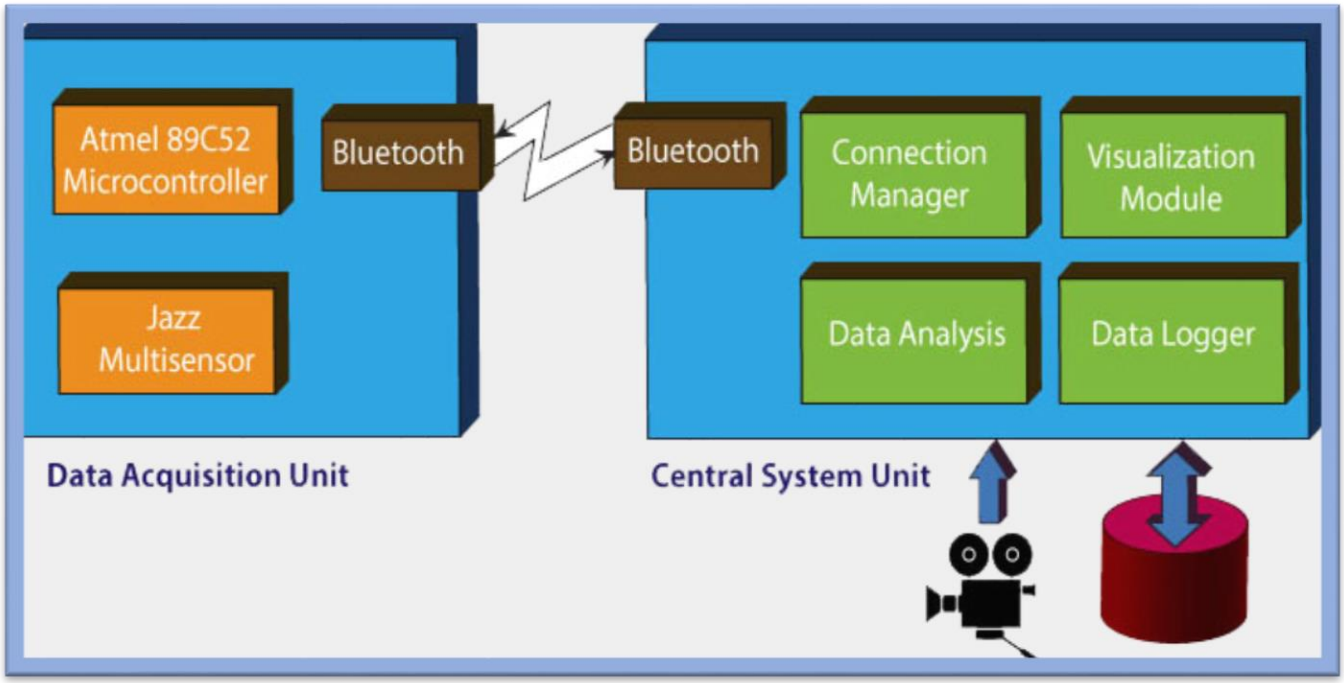

Figure 4. Working of Blue-Eyes Technology

4.2.1 Mobile measuring device or Data Acquisition Unit (DAU):

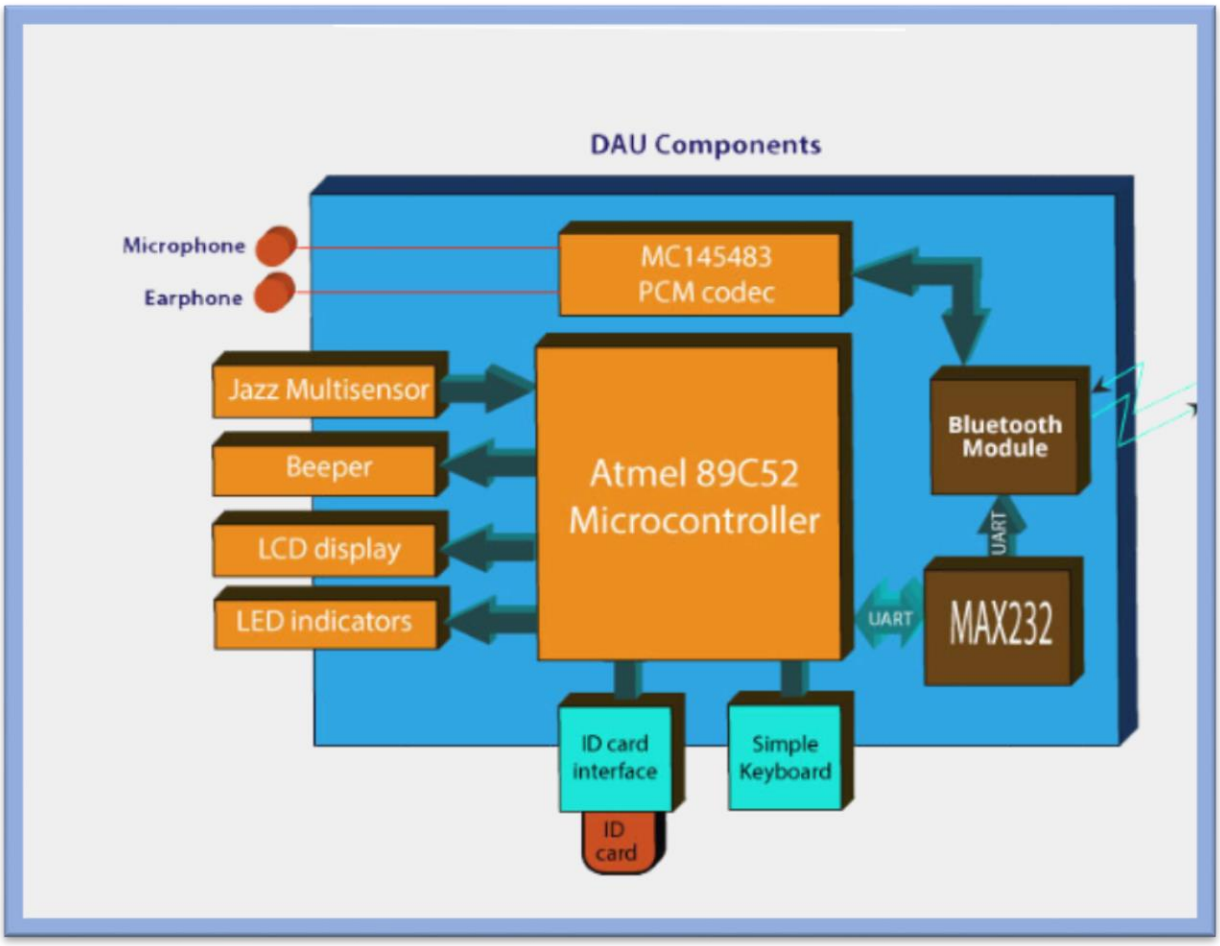

Figure 5. Working of (DAU)

- The blue tooth module, which is integrated with the mobile device (DAU), provides a wireless interface between the Central System Unit (CSU) and the user or operator having the sensors. PIN codes and ID cards are assigned to the entire operator's for authentication purposes. The device uses a five-key keyboard, beeper and LCD display for the interaction with the operators and if, any unwanted situation occurs, the machine uses these devices to inform the operators. The 'voice' information from the user is transferred with the help of a headset, which is interfaced with the Data Acquisition Unit using a mini jack plug. DAU incorporates various hardware modules like system-core Bluetooth section, Atmel 89C52 microcontroller, EEPROM, Beeper, LCD display (HD44780), LED indicator, voltage level monitors and 6 AA batteries.

4.2.2 Central System Unit (CSU):

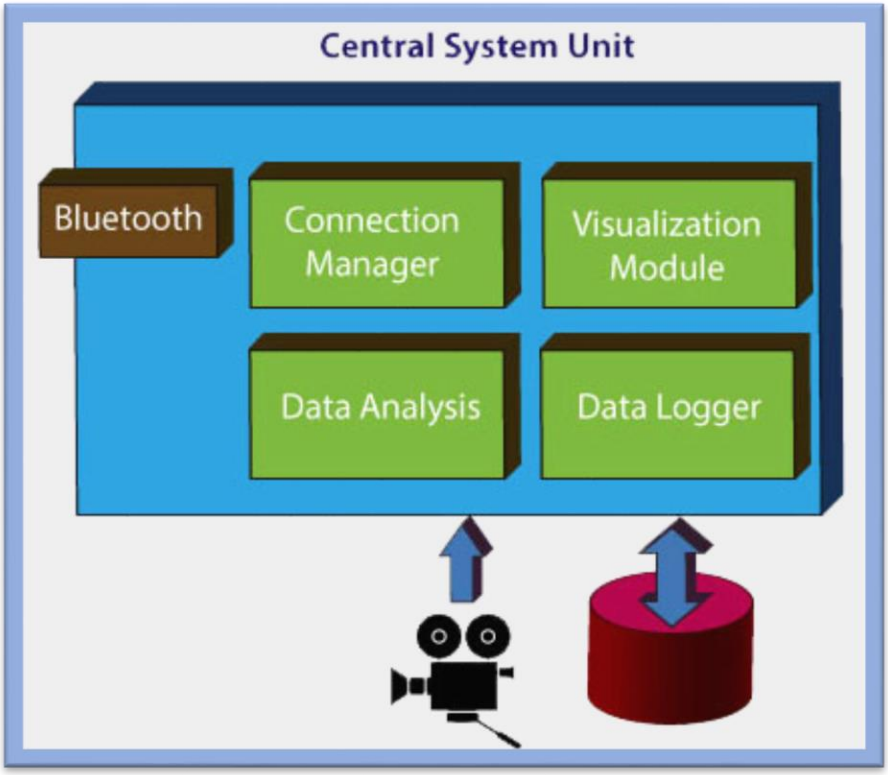

Figure 6. Working of (CSU)

- CSU is the next squint of wireless-network connection in the Blue Eyes technology. The CSU mainly contains codec (PCM Codec commonly used for voice information transmission) and a wireless blue tooth module. This CSU section is integrated to a personal computer using USB, parallel and serial cable. The mini-jack socket is used for audio data accessing. The program containing the operators personal ID is amalgamating to the personal computer through the serial and power ports. The microcontroller (Atmel- 89C2051) inside the unit handles the I2C EEPROM-programming and UART transmission.

5. Types and Classifications:

5. Types and Classifications:

5.1 Different Types of Hologram:

1. Reflection Hologram:

- The reflection hologram, in which a truly three-dimensional image is seen near its surface, is the most common type shown in galleries. The hologram is illuminated by a “spot” of white incandescent light, held at a specific angle and distance and located on the viewer’s side of the hologram. Thus, the image consists of light reflected by the hologram. Recently, these holograms have been made and displayed in color—their images optically indistinguishable from the original objects. If a mirror is the object, the holographic image of the mirror reflects white light; if a diamond is the object, the holographic image of the diamond is seen to "sparkle."

2. Transmission Hologram:

- The typical transmission hologram is viewed with laser light, usually of the same type used to make the recording. This light is directed from behind the hologram and the image is transmitted to the observer’s side. The virtual image can be very sharp and deep. For example, through a small hologram, a full-size room with people in it can be seen as if the hologram were a window. If this hologram is broken into small pieces (to be less wasteful, the hologram can be covered by a piece of paper with a hole in it), one can still see the entire scene through each piece. Depending on the location of the piece (hole), a different perspective is observed. Furthermore, if an undiverged laser beam is directed backward (relative to the direction of the reference beam) through the hologram, a real image can be projected onto a screen located at the original position of the object.

3. Hybrid Hologram:

- Between the reflection and transmission types of holograms, many variations can be made.

3.1 Embossed Holograms:

- To mass produce holograms for authenticity applications such as security hologram stickers or the holograms you find on credit cards, currency and passports, a two-dimensional interference pattern is pressed onto thin plastic foils. The original hologram is usually recorded on a photosensitive material called photoresist. When developed, the hologram consists of grooves on the surface. A layer of nickel is deposited on this hologram and then peeled off, resulting in a metallic "shim." More secondary shims can be produced from the first one. The shim is placed on a roller. Under high temperature and pressure, the shim presses (embosses) the hologram onto a roll of composite material similar to Mylar. Embossed holograms are actually a combination many types of holograms.

3.2 Integral Holograms:

- A transmission or reflection hologram can be made from a series of photographs (usually transparencies) of an object—which can be a live person, an outdoor scene, a computer graphic, or an X-ray picture. Usually, the object is "scanned" by a camera, thus recording many discrete views. Each view is shown on an LCD screen illuminated with laser light and is used as the object beam to record a hologram on a narrow vertical strip of holographic plate (holoplate). The next view is similarly recorded on an adjacent strip, until all the views are recorded. When viewing the finished composite hologram, the left and right eyes see images from different narrow holograms; thus, a stereoscopic image is observed. Recently, video cameras have been used for the original recording, which allows images to be manipulated through the use of computer software.

3.3 Holographic Interferometry

- Microscopic changes on an object can be quantitatively measured by making two exposures on a changing object. The two images interfere with each other and fringes can be seen on the object that reveal the vector displacement. In real-time holographic interferometry, the virtual image of the object is compared directly with the real object. Even invisible objects, such as heat or shock waves, can be rendered visible. There are countless engineering applications in this field of holometry.

3.4 Multichannel Holograms:

- With changes in the angle of the viewing light on the same hologram, completely different scenes can be observed. This concept has enormous potential for massive computer memories.

3.5 Computer-generated Holograms:

- The mathematics of holography is now well understood. Essentially, there are three basic elements in holography: the light source, the hologram, and the image. If any two of the elements are predetermined, the third can be computed. For example, if we know that we have a parallel beam of light of certain wavelength and we have a "double-slit" system (a simple "hologram"), we can calculate the diffraction pattern. Also, knowing the diffraction pattern and the details of the double-slit system, we can calculate the wavelength of the light. Therefore, we can dream up any pattern we want to see. After we decide what wavelength we will use for observation, the hologram can be designed by a computer. This computer-generated holography (CGH) has become a sub-branch that is growing rapidly. For example, CGH is used to make holographic optical elements (HOE) for scanning, splitting, focusing, and, in general, controlling laser light in many optical devices such as a common CD player.

5.2 Types of Emotion Sensors used in Blue Eyes Technology:

1. For Hand - Emotion Mouse:

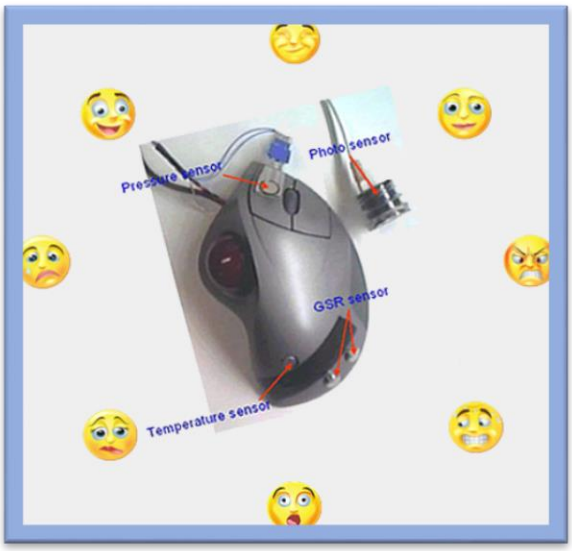

Figure 7. Emotion Mouse

- The major aim of Brain Computer Interface (BCI) is to develop a smart and adaptive computer system. These types of project must include speech recognition, eye tracking, facial recognition, gesture recognition etc. software and hardware. Similarly, in Blue Eyes technologies, we need to build a system have the ability to identify all these perceptual abilities of human beings. In Blue Eyes, the machines have the ability to identify the minor variations in the moods of human beings. Say a person may strike the keyboard hastily or softly depends on his mood like happy or in angry. The Blue Eyes technology enables the machines to identify these minor emotional variations of human beings even by a single touch on the mouse or key board and the machines started to react with the users according to these emotional levels. This is done with the guidance of intelligent devices like “Emotion Mouse”. Actually, this Emotion Mouse is an input device to track the emotions of a user by a simple touch on it. The Emotion Mouse is designed to evaluate and identify the user’s emotions such as fear, surprise, anger, sadness, happiness, disgust etc. when he/she is interacting with computer. The main objective of the Emotion Mouse is to gather the user’s physical and physiological information by a simple touch.

2. For Eye - Expression Glass:

- Expression Glass is an alternative for the usually available machine vision face or eye recognition methods. By analyzing pattern recognition methods and facial muscle variations, the glass senses and identifies the expressions such as interest or confusion

of the user. The prototype used for this glass uses piezoelectric sensors.

Figure 8. Expression

6. Advantages:

6. Advantages of the Technologies:

6.1 Advantages of Holography:

- Production for the source of the holographic products would spend a lot of time & money of the manufacturer , but the cost of bulk & large amount copy for the holographic products such as the holographic stickers would become relatively cheap , This should be the main reason why the enterprises for the production of consumption goods want to select this kind of anti-imitation technology .

- It would be very difficult for the people to get the equipments & technical details for the hologram stickers large volume production , Today , Purchasing & getting for this traditional equipment has become very easy but the manufacturers for these equipments try their best to enhance the quality & security level of their products that can help them to avoid the adverse copying.

- When the people have a closer look at these hologram stickers , The holographic printing find that the holographic products such as the stickers & the labels are very different from the traditional trademark on the commodities , The forged tools such as the cameras & the printers which the forger uses have no effect for holographic copying .

- Holography not only records the reflective intensity on the object, but also the phase information is recorded, So, even if the hologram picture is left with only a small part, it still can reproduce all the scenery, it will be very convenient for the museums, the libraries & the other collections of pictures.

- Since the holographic technology is capable of recording all of the information of the object itself, the storage capacity is large enough, So, as the carrier of the storage, the holographic storage technology can be applied to the documentation of the libraries, the schools and the other institutions to save.

- You can have holographic imaging technology without wearing special polarized glasses , not only to the audience to bring the convenience , but it reduces the cost of traditional 3D display , The real-time electronic holographic (holo video) display can create a truly 3-D computer graphics image with all of the depth cues (motion parallax, ocular accommodation, occlusion, etc.) & resolution sufficient to offer the extreme realism .

- Holo video displays promise to enhance numerous applications in the creation and manipulation of the information, including telepresence, education, medical imaging, interactive design and scientific visualization.

- Electro holographic display generates a 3-D holographic image from a 3- D description of a scene , This process involves many steps , grouped into two main processes which are Computer graphics and Fringe computation.

- Computer graphics by using a camera, a sequence of images is generated, Fringe computation: 3-D description scene is converted into the holographic fringe using interference or diffraction approach, Optical modulation, where the light is modulated by the fringe using SLM and optical lens.

- The holographic technology can supply high-quality images & accurate depth cues viewed by the human eyes without any special observation devices, So, Holographic 3D display is one of the attractive approaches for creating the most authentic illusion for observing volumetric 3D objects.

- 3D Holographic display considerations are Large bandwidth, High transmission rate, Design considerations like alignment & packaging issues, Holographic bandwidth compression & faster digital hardware allow computation at the interactive rates and promise to continue to increase the speed of displayed holo video images.

- The alignment & packaging of the optical lens and the spatial light modulator is a great problem that can be removed using Infosys MHOE Technology , Micro holographic optical elements (MHOEs) are used for displaying the holographic three dimensional image of the object (e.g., received by the device in the form of a computer generated hologram via a communication network).

- Devices for displaying the holographic three-dimensional images of the objects contain the laser source, the spatial filter using a micro holographic optical element (MHOE) lens, a collimating MHOE lens, a spatial light modulator & cylindrical MHOE lenses

- Computer generated holograms can be created, sent, received & displayed using the technology, they have multiple function capability & wavelength selectivity, they offer design flexibility & ease of replication, No alignment and packaging issues, Rigid and stress resistant setup.

6.2 Benefits of 3D Hologram:

- It is very cost-effective solution to make and to hire.
- It delivers enhanced feasibility of objects including depth.
- It has higher storage capacity compare to other methods.
- They are complex patterns and hence offers security in wide applications as mentioned above.
- It offers creation of multiple images on single plate including 3D images.
- Holographic technologies can be easily combined with other technologies.
- It does not require special glasses to view and can be viewed from any angle.
- It does not require any projection screen.
- It is difficult to replicate as it is difficult to alter or transpose.

6.3 Advantages of Blue Eyes Technology:

- It supports eye monitoring by interpreting and recording human movement.
- It is widely used in new generation video games to make them more interactive and exciting.
- It helps in monitoring human behavior and physiological conditions.
- It proves to be a helpful technique in flight control centers, power plant control room, and captain bridges.

6.4 How will Blue Eyes Technology Empower Computer Systems?

- It works on an uninterrupted sensing mechanism that uses high-end microphones and video cameras to understand human actions.
- It uses various physiological parameters to notify and trigger pre-defined alarms. The parameters include heartbeat rate, eye movement, blood oxygenation, and many more.
- It works on a personal area network linking mechanism which connects all supervision system and operators.
- The operator observes the controlled systems using hearing and sight senses while the physiological parameters are taken care of by the supervising system.
- Moreover, it also uses a high-end eye movement sensor integrated with a CMOS camera to track the point of gaze and see what the operator is looking at.

7. Disadvantages:

7. Disadvantages of the Technologies:

7.1 Disadvantages of Holography:

- Most holographic products such as the holographic stickers had already been decorated with reliefs which would let the machine copying become relatively easy & cheap, so, it would be hard for the people to put a coherent distinguishing between the holographic products & the source products.

- Conventional Holography OR Conventional optical elements record hologram of the real object using some wave interference between two laser beams with a high degree of coherence between them in a dark room.

- The system must be kept very stable since even a very slight movement can destroy the interference fringes, in which both intensity & phase information of the 3D object are contained, the device will be heavy and will have alignment and packaging issues.

- Computer generated holography (e.g., using computer generated holograms) can be used to convert 3D information to 2D for sending and receiving using existing communication networks, High cost makes them impractical for many applications, there are packaging & alignment issues, it is difficult to be implemented in smaller displays.

7.2 Disadvantages of Blue Eyes Technology:

- We become dependent upon the computer.

- Others may use technical knowledge against us.

- A very costly procedure.

- Computer viruses will pose an increasingly critical threat.

8. Applications:

8. Application of the Technologies:

8.1 Applications of Hologram:

- **Holographic Television:** A Holographic Television is a type of display that utilizes light diffraction to create a virtual three-dimensional image of an object. Holographic displays are distinguished from other forms of 3D imaging in that they do not require the aid of any special glasses or external equipment for a viewer to see the image.

- **Holographic Cinematography:** We describe several applications of cineholography to objects scattering light by reflection: single-exposure cineholograms on 126-mm films at a repetition rate of 25 holograms per second for 3-D movies and for flight simulators applications, double-exposure cineholograms for medical and industrial applications (NDT). Limitations of cineholography are also described. The light source used for cineholograms recording is a frequency-doubled pulse YAG-laser.

- **Holographic Projector:** Holographic projectors use holograms rather than graphic images to produce projected pictures. They shine special white light or laser light onto or through holograms. The projected light produces bright two- or three-dimensional images. You can view such images from different angles and see them in true perspective

- **Holographic Database:** Magnetic and conventional optical data storage technologies are approaching physical limits beyond which individual bits may be too small or too difficult to store. Holographic data storage is an approach of storing information throughout the volume of a medium—not just on its surface. With the rapidly increasing demand for increased storage capacity in a smaller space, this technology offers an economy in price.

- **Optical or Holographic Computers:** Relief-phase holograms are widely used in most security applications such as credit cards and passports. They are suitable for the emboss replication process and are easily mass-produced at a low cost. Holograms are applied to documents or products, and the presence of a hologram is intended to be a reliable indication that the document or product is valid. Modern relief-phase

- holograms contain a wide range of security and visual effects to make them hard to copy or counterfeit.

- **Games & Simulations:** Holograms can be used in eminent fields like Games or Simulations to create real environment and it can be used to provide real experience to user.

- **Using Holograms in Museums and Exhibitions with Animated Multimedia Content:** Holograms can be used to showcase 3D models like dinosaur, ancient sculpture or building etc… in the museums.

8.2 Applications of Blue-Eyes Technology:

- **Entertainment:** With the help of blue eyes technology a person can rule and control the world of entertainment through the eyes. One of the examples is video games. There are many different techniques used for the implementation which helps us to move our eyes from one side of the screen to another and then the game character will look and make the same movements the same way as we suggest to them in result to capture the eye moments of the user.

- **Advertisement:** In advertisement, it is not very far enough when blue eyes technology will make the ability to use eye tracking as a powerful technology in our near future which can even check the consumer's attention as well as responses to marketing messages. Basically, to know what people actually look at and which can help advertisers to know that the ad presented is seen by the consumer or not. In this way it is beneficial in the Advertisement world where the things will be easier and simpler.

- **Automation and Automatic Car:** Blue-Eyes Technology can be used in industrial automation and automatic Cars.

9. Scientists Project Holograms into the BLUE-EYES to Create Experiences:

9. Scientists Project Holograms into the BLUE-EYES to Create Experiences:

- One day soon you may be filling your lungs with crisp ocean air, your arms bathed in warm light as the sun sets over softly lapping waters and you may wonder, is this real? Or are scientists projecting holograms into my brain to create a vivid sensory experience that isn't actually happening? A group of researchers at University of California, Berkeley are in the early stages of testing their ability to create, edit and scrub sensory experiences from your brain, both real-time and stored experiences memories.

Figure 9. Human Brain

- Different sensory experiences show up in brain imaging as patterns of neurons firing in sequence. Neuroscientists are trying to reverse-engineer experiences by stimulating the neurons to excite the same neural patterns. At present, the steps to accomplish this are a little invasive. Scientists genetically modify neurons with photosensitive proteins so they can gingerly manipulate neurons using light. The process is known as *optogenetics.* Also, a metal head plate gets surgically implanted over the targeted area.

9.1 What The 3D Shot could do for us:

- The therapeutic potential for the device is exciting. From helping to restore sight to the blind, hearing to the deaf, to reinstating sensation in patients with peripheral nerve damage and helping amputees control prosthetic limbs.

- "This has great potential for neural prostheses, since it has the precision needed for the brain to interpret the pattern of activation," says Mardinly. "If you can read and write the language of the brain, you can speak to it in its own language and it can interpret the message much better." Mardinly is already thinking beyond therapeutic uses, towards augmenting human experience: "This is one of the first steps in a long road to develop a technology that could be a virtual brain implant with additional senses or enhanced senses."

9.2 Early Stages:

- We're still ways off before you can plan your next staycation at a 3D Shot themed resort and spa. As of now, the researchers are testing a prototype in the visual, touch and motor areas of mice brains.

- The mice are showing similar patterns of neural response correlating to sensory stimuli. The next step is training the mice so scientists can observe behavior changes that correspond to the stimulation. Studying behavioral cues is the best measure of success because you can't ask a mouse if it's experiencing the ripe, mushroomy taste of Limburger cheese as you flash holograms into its cortex.

- The researchers plan to scale-up the device's capacity to interpret and create from a broader terrain of brain matter while scaling-down the device to make it portable enough to slip inside a backpack.

- They're also working towards capturing neural patterns inside the brain with the goal of reproducing sensory experience and playing it back through holography.

9.3 Reality Experience:

- The combination of both technologies will lead us to experience virtual but real experience.
- We will able to revise past events in present time and live it again with the help of these two technologies.

Figure 10. Microsoft

- Using special device, we can create holograms like glasses or lense and Blue-eyes sensors will read our mind and can represent what we are thinking right now.
- Microsoft Hololens is the perfect example of it.

9.4 Microsoft Hololens 2:

- Microsoft unveiled the HoloLens 2, and the first takeaway is that the AR device has a new look, a flip-up visor, and three times the comfort, according to Microsoft.

- The company outlined how the HoloLens 2 was an enterprise device for front-line workers, and noted changes such as a doubled field of view, built-in artificial intelligence (AI) tools, and direct manipulation of holographs, as you would with physical objects.

Figure 11. Microsoft Hololens 2

- Mixed reality on HoloLens 2 combines an untethered device with apps and solutions that help people across your business learn, communicate, and collaborate more effectively. It's the culmination of breakthroughs in hardware design, AI, and mixed reality development from Microsoft, designed to help you lead your industry into the future—starting today.

- HoloLens 2 offers the most comfortable and immersive mixed reality experience available, with industry-leading solutions that deliver value in minutes. And it’s all enhanced by the reliability, security, and scalability of cloud and AI services from Microsoft.

9.5 Microsoft Hololens 2 Specifications:

Table 3. Azure Kinect DK vs. Kinect for Windows V2 hardware

FEATURE		AZURE KINECT DK	KINECT FOR WINDOWS V2
Audio	Details	7-mic circular array	4-mic linear phased array
Motion sensor	Details	3-axis accelerometer + 3-axis gyro	3-axis accelerometer
RGB Camera	Details	3840 x 2160 px @30 fps	1920 x 1080 px @30 fps
Depth Camera	Method	Time-of-Flight	Time-of-Flight
	Resolution/FOV	640 x 576 px @30 fps	512 x 424 px @ 30 fps
		512 x 512 px @30 fps	
		1024x1024 px @15 fps	
Connectivity	Data	USB3.1 gen 1 with Type-C connector	USB 3.1 gen 1
	Power	External PSU or USB-C	External PSU
	Synchronization	RGB & Depth and IMU internal, external device-to-device	RGB & Depth internal only
Mechanical	Dimensions	103 x 39 x 126 mm	249 x 66 x 67 mm
	Mass	440 g	970 g
	Mounting	One ¼-20 UNC Four internal screw points	One ¼-20 UNC

Table 3. Specifications of Different Lenses

- **Display:**

- Optics: See-through holographic lenses (waveguides)
- Resolution: 2k 3:2 light engines
- Holographic Density: >2.5k radiants (light
- points per radian)
- Eye-based Rendering: Display optimization for
- 3D eye position

- **Sensors & Audio:**

- Depth: Azure Kinect sensor
- IMU: Accelerometer, Gyroscope, Magnetometer
- Camera: 8MP stills, 1080p30 video
- Microphone Array: 5 channels
- Speakers: Built-in, Spatial Audio

- **Human Understanding:**

- Hand Tracking: Two-handed fully articulated model, direct manipulation
- Eye Tracking: Real-time tracking
- Voice: Command and control on-device, Natural
- Language with internet connectivity

- Today, holographic applications can share spatial anchors between themselves, enabling users to render a hologram at the same place in the real world across multiple devices. But with Azure Spatial Anchors, a new service, HoloLens, iPhone and Android phone users will be able to work with holograms which can persist across the platforms by using a shared coordinate system. The service will provide access to a database of places that map to Wi-Fi SSIDs. Phone users will just need to download an app to be part of the shared physically and digitally blended environment.

10.Conclusion:

10. Conclusion:

- In this way, these technologies can achieve great discoveries and advances for humanity due to its multiple possibilities. Most such systems have the ability to learn, which allows people to improve their performance over time. The adoption of these technologies outside the technology sector is at an early or experimental stage. The evidence suggests that it can provide real value to our lives. AI bases its operation on accessing huge amounts of information, processing it, analyzing it and, according to its operation algorithms, executing tasks to solve certain problems. Due to the new computing architectures of the cloud, this technology becomes more affordable for any organization.

- it is clear that holograms are relatively common. This is because virtually every adult has a product carrying a hologram in his wallet or her purse. Holograms have particularly been useful to players in the financial sector due to their ability to secure credit cards. This is because financial products and transactions need to be as secure as possible. They have also been useful in other areas that require tamper-proof documents like the ID cards, driver's license and government documents. This is due to their effectiveness in securing documents which can be explained by the fact that it is difficult to forge a holographic image. The process of making a hologram depends on the quality of the holographic image required. If an image of great quality is required, the equipment for making the hologram must be carefully set up in a stable surface, and in a room whose air has been closely monitored in order to ensure that there will be minimal vibration as the production of the hologram goes on. Holography specialists may even choose to use more sophisticated equipment or use basic equipment of high quality in order to achieve better results. Holography has some shortcomings that stem out of the fact that it is expensive, time consuming, and it is not very popular. Holographic images produced for the purpose of security may not be very appealing to their viewer or user.

- Blue-eyes Technology is the way to simplify life by providing user-friendly facilities. It also helps in reducing the gap between the computer and human. Also in the future, it is quite possible to create a computer with which we can completely interact like a true buddy.

11.References:

11. References:

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