**A**

**SEMINAR REPORT ON**

**“SCREENLESS DISPLAY”**

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**IN**

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**CERTIFICATE**

This is to certify that the Seminar report titled **“Screenless Display”** that is being submitted by **Mr. Sania Alex(11K81A05A2)** , in partial fulfilment of the requirements for the award of the degree of ***Bachelor of Technology in Computer Science & Engineering*** is a record of bonafide work carried out by him.

The result of investigation enclosed in this report have been verified and found satisfactory.

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**ABSTRACT**

This paper discusses advent of the Screenless display which is an emerging new technology, has become a good prospect in the near future for a wide range of applications. As the name

implies it deals with the display of several things without the use of screens using projector. It may sound like an oxymoron, but a screen-less display is a kind of technology that could be utilized in the very near future. Scientists and technology firms are finalizing a range of devices and forms of technology that allow you to view images without the use of a screen. These devices come in the form of projection devices and hologram machines, and whilst they all offer something different, they are all a part of the next generation of technology. It involves the following 3 different working principles- The Visual image, Virtual retinal display, Synaptic interface. This paper mainly illustrates and demonstrates how the screen less displays works and its applications in various fields of science.

This technology would bring about the revolution in the field of displays and monitors that are costly, huge and are proven difficult to manage the power requirements and constraints. It is also the futuristic technological innovation. Screenless display is the present evolving technology in the field of the computer-enhanced technologies. It is going to be the one of the greatest technological development in the coming future years. Several patents are still working on this new emerging technology which can change the whole spectacular view of the screenless displays. Screen less display technology has the main aim of displaying (or) transmitting the information without any help of the screen (or) the projector.

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1. **INTRODUCTION TO SCREENLESS DISPLAY**

Nowadays, advanced technologies are growing faster wherein each technology is renewed with implementation of new one. The current trending display technology most commonly used in gadgets such as tablets, smart phones, etc., is the touch-screen display, which will become outdated in the near future. Screenless display is the advanced display technology, which replaces the [touch screen technology](https://www.elprocus.com/touch-screen-technology-definition-working-types-applications/) to resolve the problems and to make lives more comfortable. Therefore, this article is intended to give an idea of the screenless display, which transmits or displays the information without using a projector or the screen. By using this screenless display technology, we can display the images directly on the open space, human retina and also to the human brain.

During the year 2013, this display came into progress by the implementation of products like virtual reality headsets, retinal displays and holographic videos. Lack of space is the major drawback for most of the screen displays. This problem can be overcome by the use of screenless displays.

Screenless display is an interactive projection technology developed to solve the problems related to the device miniaturization of the [modern communication technologies](https://www.elprocus.com/how-does-wifi-work/). The lack of space on screen based displays provides an opportunity for the development of screenless displays. As the name indicates screenless display has no screen and it can be defined as a display used to transmit any data such as pictures or videos without the help of screens.

1. **TYPES OF SCREENLESS DISPLAY**

Screen less displays have become a new rage of development for the next GEN-X. Screenless videos describe systems for transmitting visual information from a video source without the use of the screen. Screen less computing systems can be divided mainly into 3 groups:

 Visual image

 Retinal Display

 Synaptic interface

* 1. **VISUAL IMAGE**

Visual Image is a type of screenless display where the eye or the retina can recognize any screenless image. Holographic display, Virtual Reality Goggles and Heads Up Display are some present visual image screenless display examples. The display works on the principle that; light gets reflected by the intermediate object before reaching the retina. The intermediate object can be holograms, windows, or even LCDs.

Holographic messages that became popular through the ‘Star War Film’ are now becoming a truthful reality. Holographic Displays allow the display of three dimensional images by using simple components like Helium – Neon Laser, a Lens, an object, mirror and a holographic film. The laser beam used will initially create a plasma environment. When the laser and object beams coincides, a 3D image will be projected. The projected image will appear to be floating in air. Presently, MIT’s Media Lab reported a holographic color video display (inexpensive) with the resolution of TV. Latest fiction movies the ‘Iron Man’ and ‘Avengers’ have shown this technology in more advanced form. This advancement can be expected in the coming future.

**2.1.1 Hologram**

Holograms were used mostly in telecommunications as an alternative to screens. Holograms could be transmitted directly, or they could be stored in various storage devices (such as holodiscs) the storage device can be hooked up with a holoprojector in order for the stored image to be accessed. Debatably, virtual reality goggles (which consist of two small screens but are nonetheless sufficiently different from traditional computer screens to be considered screen less) and heads-up display in jet fighters (which display images on the clear cockpit window) also are included in Visual Image category. In all of these cases, light is reflected off some intermediate object (hologram, LCD panel, or cockpit window) before it reaches the retina. In the case of LCD panels the light is refracted from the back of the panel, but is nonetheless a reflected source. The new software and hardware will enable the user to, in effect; make design adjustments in the system to fit his or her particular needs, capabilities, and preferences. They will enable the system to do such things as adjusting to users’ behaviours in dealing with interactive movable type.

**Virtual Reality Goggles (VRG)** is an eyewear display device. Wearer can view and interact with a series of computer generated images. Consist display screens in front of face. Images can be projected with sound and video, allowing it more popular for entertainment applications. Presence of polarized lenses is the major feature of VRG. These lenses will show two images, one per each eye and the brain combines them to form a three dimensional image. They show an illusion of depth. Many of these goggles are accompanied by head tracking systems connected to a computer, thereby adjusting images seen by the wearer as they move around.

‘World of Warcraft’, ‘Quake2’ are some popular games that can be played using VRG. The famous ‘Oculus Rift ‘and the recent ‘Google’s Cardboard Virtual Reality Goggles’ is an evidence that VRG is on its way. Now many DIY VRG are coming out since it requires only components like a smartphone, two lenses, a rigid paper or cardboard and some tape. ‘Sony Headman’ a virtual reality headset by ‘Sony ‘is also gaining popularity now.

* 1. **RETINAL DISPLAY**

A virtual retinal display (VRD), also known as a retinal scan display (RSD) or retinal projector (RP), is a display technology that draws a [raster](http://en.wikipedia.org/wiki/Raster_graphics) display (like a [television](http://en.wikipedia.org/wiki/Television)) directly onto the [retina](http://en.wikipedia.org/wiki/Retina) of the eye. The user sees what appears to be a conventional display floating in space in front of them.

## Mechanics

In a conventional display a real image is produced. The real image is either viewed directly or, as in the case with most [head-mounted displays](http://en.wikipedia.org/wiki/Head-mounted_display), projected through an optical system and the resulting [virtual image](http://en.wikipedia.org/wiki/Virtual_reality) is viewed. The projection moves the virtual image to a distance that allows the eye to focus comfortably. In a VRD no real image is ever produced. Rather, an image is formed directly on the retina of the user's eye.

To create an image with the VRD a photon source (or three sources in the case of a color display) is used to generate a coherent beam of light. The use of a coherent source (such as a [laser diode](http://en.wikipedia.org/wiki/Laser_diode)) allows the system to draw a diffraction limited spot on the retina. The light beam is intensity modulated to match the intensity of the image being rendered. The modulation can be accomplished after the beam is generated. If the source has enough modulation bandwidth, as in the case of a laser diode, the source can be modulated directly.

* 1. **SYNAPTIC INTERFACE**

Synaptic Interface screenless video does not use light at all. Visual information completely bypasses the eye and is transmitted directly to the brain. While such systems have only been implemented in humans in rudimentary form - for example, displaying single Braille characters to blind people - success has been achieved in sampling usable video signals from the biological eyes of a living horseshoe crab through their optic nerves, and in sending video signals from electronic cameras into the creatures' brains using the same method.

Brain-computer Interfaces allows direct communication between the brain and the external device. **Brain Machine Interface**, **Mind Machine Interface**, **Direct Neural Interface** and **Synthetic Telepathy Interface** are some common names by which they are known. Can you guys imagine a computer been controlled using our mind? Then this imagination is coming to a reality through synaptic interfaces. Recently Duke University reported that by connecting the brains of two mice over the Internet, the mices were able to cooperate and perform tasks. In 2013 Harvard University reported that they established a link between the brains of rat and human.

In 2013, MIT reported that they have implanted false memory into the brain of a mouse. Now much research is taking place related to this. The advancement in the technology will make the future world in such a condition that even a blind person can drive vehicles.

**3. THE WORKING PRINCIPLE**

There are several new emerging ways for the technological development of the working principle of the screen less displays. Several software’s are merging for the GEN-X wonder view. Any computer system that can run the mudoc software can present text that has been set in interactive movable type. Most of the mudocs that are consumed in the next few years will be consumed with conventional personal computers, e-book readers, and other kinds of display and projection devices that are now in use. Very soon it appears to be a new kind of input/output system will facilitate communication and interaction between the computer and the computer user. This new human/computer interface is the telereader terminal. Visual Image is a bitmap manipulation and composition product. Bitmaps can be manipulated independently, in the Image Mode or multiple bitmaps can be composited Together in the Object Mode to create a "collage". Visual Image can create and Manipulate images of any size: the only limitation is the amount of memory resources your system has.

**4. APPLICATIONS OF THE SCREENLESS DISPLAY**

The main use of the screen less displays are used for the development of the mobile phones which are mainly used by the old and blind people. This type of the invention of the screen less displays was first done on the mobile phone named OWASYS 2CC. This model is very useful for the old, blind, and even for the people with less vision power. Application applied to mobile Technology Screen less displays technology is also implemented for the development of the screen less laptops. A laptop without an LCD can be a very useful portable solution when connected to CRT or fixed LCD monitors. Laptops without screens would also be a green solution, giving value to donated CRT monitors that would otherwise be heading for landfills. Portability means that volunteers, who don’t always have the time to travel to people’s homes, can more easily maintain this computer. Screenless displays are also widely applicable in the field of the holograms projection. Hologram projection is a result of a technological innovation that truly helps in touch less holographic interfaces. In fact, hologram projection projects 3D images of so high quality that it feels as if one can touch them. However, holographic projection is still to achieve mass acceptance as until now, conventional holograms, which offer 3D images.

Latest laser technology are also implementing the special technique of the screen less display through the presence of the several 3D scope animation or the screen provides the advantage of being combined with the Laser Valve Video projector that helps in projecting video images by the use of the laser light instead of the Xenon Arc lamps. Laser technologies have given an edge over the other technologies as the LVP gives the projector an excellent depth in the focus. Screen less display’s major working principle can also be implemented in the emerging of the new screen less TV’s. Imagine that watching the TV picture that seems to be magically appearing in the thin air. The picture just floats on in front of the viewer; this would be a latest emerging technology.

**4.1 Google Glass**

The first screen-less display that needs mentioning is Google Glass. This device has been tested for the past year, and some lucky individuals have even got their devices already. Google Glass sits on the face like a pair of glasses, and on one eye it has a block of glass that allows you to see augmented reality. Images can be displayed right in front of your eye, as well as text and information about objects and places that are in front of you. This technology is only in its early stages, but definitely shows that screen-less displays will become a natural form of media consumption in the future.

It is expected that Google Glass will become fully commercially available in 2014, and some minor changes have been made recently with the design. Namely, the bone audio system, which provides audio by vibrating the bones in your face, has been replaced with a single headphone. It is reported that this is a result of the bone audio technology producing too low a volume.

**4.2 Occulus Rift**

The Oculus Rift is an amazing piece of kit that is already available to purchase. This is a headset that completely blocks out the real world, and instead replaces what you see with a pre-programmed image. This is the ultimate virtual reality machine that displays video and appropriate sounds, and uses its accelerometer to ensure that it feels totally real. If you move your head left, you will see the image that is to the left in the virtual reality scenario. This kind of technology has a plethora of uses, and today it is constantly being updated and improved to provide you with the very best in screen-less display technology.

**4.3 Avegant Glyph**

Though some have described the Avegant Glyph as a virtual reality headset, we think that's way off the mark. And having demoed the Oculus Rift just a few hours before test-driving the Glyph, we can attest that the two are completely different products. While VR headsets like the [Oculus Rift](http://www.gizmag.com/oculus-rift-crescent-bay-hands-on-ces-2015/35528/) are designed to shut out the world around you, creating an illusion of being somewhere else, the Glyph lets you look above and below the visor to get a sense of what's going on around you.

On the plus side, it lets you do things like sip drinks and read text messages without taking off the headset. On the downside, it isn't nearly as immersive as the Rift, and is designed more for viewing stationary, single-pane content, like you would on any other screen.

Head-tracking is possible, and the company showed us a 360-degree photo that gave it a pseudo-VR effect. But, again, it's less like you're being teleported to a virtual world, and more like you're watching a TV that's strapped to your face.

Of course you could also use the Avegant Glyph in the privacy of your own home, but that's also where you likely have multiple TVs, a PC or two, and maybe even some tablets, where you could watch the same content. VR headsets like Oculus look awkward too, but they're designed exclusively for home use – and offer an experience that none of your other screens can come close to offering.

Speaking of content, the Glyph is about as versatile as can be: you can plug it into basically any device that allows for external displays (we played a game with the Glyph connected to an [iPhone 6 Plus](http://www.gizmag.com/iphone-6-plus-review/33969/) via Lightning Digital AV adapter). Developers and content-creators don't need to do a thing to make it compatible.

Its "virtual retinal display" also looks crisp and colorful, though we did have trouble keeping all four corners perfectly focused in our field of vision – the top end got a bit blurry as the headset refused to sit perfectly on the nose. And though the *seeing above and below* factor keeps you aware of your environment, we found the demo room's lighting to distract a bit from the Glyph's content.

**5. Screenless Display Advantages & Disadvantages**

The products belonging to this emerging technology bring out many **advantages** compared to the existing products with the old technology. While taking the images into consideration, the present screenless displays have the ability to present 3D images, far point images and an image with higher resolution one. Good brightness and contrast and large angle of view are the other essential advantages. With the increasing use of the screenless products, we can expect a decrease in the cost also in the coming future. Lower power consumption, light weight, and providing better privacy are some essential advantages achieved in all the smart screenless display products. The screenless displays will boost up the field of entertainment at a great stage.

**Disadvantages** faced now are basically the higher cost and limited availability of the screenless display products. Most of the technologies required for the outward of screenless display are in development stage only. Many problems related to eye sight can arise since the products require close interaction with the eye.

**ADVANTAGES**:

**Low power requirements-** Only six diodes are required and a few of a watts to deliver their images to the user’s eyes.

**Higher resolution images-** The pixels in the images projected by the diodes can be made smaller than is possible with any CRT or flat panel display, so higher resolution can be achieved. With retinal projectors, the only limitation in the resolution of visual images will be the resolving power of the users’ eyes.

**Greater portability-** The combination of diodes, lenses, and processing components in a retinal projector system will weigh only a few ounces.

**Wider angle of view-** Retinal projectors will be able to provide a wider field of view than is possible with display screens.

**More accurate color-** By modulating light sources to vary the intensity of red, green, and blue light, retinal projectors canprovide a wider range of colors – and more fully saturated colors – than any other display technology.

**Greater brightness and better contrast-** Retinal projectors can provide higher levels of contrast and brightness than any other display system.

**Ability to present 3D images-** With their capability of presenting high definition image-pairs, retinal projectors can deliver the most highly realistic stereoscopic movies and still pictorial images to their users.

**Ability to present far-point images-** The human visual system is a far-point system. With today’s desktop and laptop computers users must employ their near-point vision. The excessive use of our near-point vision in using computers, reading, sewing, playing video games, etc., is making myopia a very common impediment. The use of the far-point images that can be provided by retinal projector systems could reduce the incidence of myopia and, hence, the growing need for and use of eyeglasses.

**Lower costs-** The present cost of retinal projector systems is high. Nevertheless, there are no hard-to-overcome manufacturing problems in mass-producing and low-cost components, so inexpensive systems will soon become available. Environmental and disposal costs of these tiny delivery devices will also be minimal because toxic elements such as lead, phosphorus, arsenic, cadmium, and mercury are not used in their manufacture .

**DISADVANTAGES:**

 The principle disadvantage is that Virtual retinal display (VRD) is not yet available in the significant number.

 Prototypes and special experimental models are now being Built, but their cost per unit is high.

**6. Future scope of Screenless Display**

Screenless Displays is on the way of progress. Technological experts are taking great efforts in researching the topic day by day, so we all can expect a great revolution in the field of displays. Many IT companies and the best labs in the world are trying to bring out many products. The coming era will surely be a virtual world more than our expectation. In 2001, Microsoft Company has started their project on Interactive Table. Many innovations are coming out in the near future related to this. Google is researching more on screenless tablet computers and smartphones, eventhough they have proposed a system based on the concept of virtual image. Also, Google is developing a compact video camera which uses this new advancing technology.

Its said that the electronic beam lithography will surely help the future screenless display. So many labs are under research to bring out more advancement. For Artificial Retinal Displays, the technology of microvision must be enhanced. Microvision technology can bring out many exciting screenless display products. So, the technology is under research and development for the better future of screenless display. Companies are working out to bring more screenless mobiles, TV’s, cameras and laptops for the coming generation. Intelligent Glasses that can translate foreign text while reading is a current innovative product brought out by Japan. The product will allow the wearer manipulating virtual images in their field of view. More advancement is taking place with the product, so that the size, weight and battery life can be improved. Adobe Systems are working to bring out more innovations. Its said that by 2020, the world will become a virtual one and more exciting.

For the future development of this emerging new technology, several researches are being conducted and the several renowned IT sector companies and other best labs present in the world are handling over the project of screenless displays.

 Microsoft in 2001 began the work on an idea for an Interactive table that mixes both the physical and the Virtual worlds.

 Multi touch is a human computer interaction technique and the hardwires devices that implement it, which allows users to compute without conventional input devices.

 Development of the enhancement of the micro vision also Gives the improved and the futuristic view of the screen less displays. This technology of the micro vision is the very well useful in the Artificial Retinal Display properties.

 Japanese scientists have invented the pair of intelligent Glasses that remembers where people last saw their keys, Handbags, iPod, and mobile phones.

 Smart Google is developing the compact video camera which films everything the wearer looks at the information what the viewer wants will be directly being seen in through the glasses where there is no screen or projector present.

 Several laboratories are working under progress on the electron beam lithography which includes the advanced enhancement of the futuristic screen less display.

 Adobe systems are also working out for the development and deployment cross platform of the several applications which are to be viewed without the actual screen.

**7. CONCLUSION**

The paper has elaborately discussed screenless displays which have become a new exciting rage for the upcoming generations as a field of the futuristic technology. Due to the ability of having several advantages which are involved in the making, designing, coding of the screenless , this needs plenty of knowledge and the process of development is still under improvement. May be in the future the world may be dominated with the screen less display technologies and this enriches the world of technological empowerment in the field of the computer technology. A screenless display promises the cost effective aspect and also brighter future in the computer technology.

Screen-less display has many advantages and it can be used for many beneficial purposes including security systems, secure communications, [education](http://www.useoftechnology.com/cloud-technology-reform-education/), commercial purposes, planning and broadcasts. Although cell phones help us a great deal but we cannot use them for cumbersome tasks- tasks that include a lot of typing- since the keypad and screen are really small, and thus we have to refer back to our laptops for important assignments. However, with the screen-less display in the market, this problem can easily be overcome with a person being able to access information and use the display keyboards for all the important work.

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