Journal of Analysis and Computation (JAC)
(An International Peer Reviewed Journal), www.ijaconline.com, ISSN 0973-2861
Volume XVII, Issue II, July-Dec 2023

A Study On Screenless Display

Harsh Singhal[1], Harsh Gupta[2], Shikha Shrivastava [3]

[1]Student, Department of Information Technology, JECRC, Jaipur, India
[2]Student, Department of Information Technology, JECRC, Jaipur, India
[3]Assistant Professor, Department of Information Technology, JECRC, Jaipur, India

ABSTRACT

This paper discusses the newly developed screenless display technology. In the near future, this technology shows potential for a wide range of applications. It deals with using a projector to display a variety of items without the use of screens, as the name suggests. There are three different operating philosophies at play: the retinal display, the synaptic connection, and the visual image. This study mainly describes and illustrates the operation of screenless displays as well as some of the scientific fields in which they are applied. This technology would revolutionise the market for pricy, enormous, and notoriously difficult to control panels and monitors.
.

Keywords- Voice, foot, hand, hologram, LCD, and screenless.

[1] INTRODUCTION

Screenless displays are a type of computer-enhanced technology that is currently in development. In the coming years, it will rank among the most significant technological developments [1]. There are still multiple pending patents for this novel, emerging technology, which has the potential to fundamentally modify the breath-taking appearance of screenless displays. Communication or data presentation without the need of a projector or screen is the fundamental aim of screen-less display technology. Devices with fewer screens are being created by the generation after X. "Screenless videos" [2] are methods for conveying visual information from a video source without the use of a screen. Three categories can commonly be used to classify computers without screens:
• Visualimage • Retinaldirect • Synapticinterface

[2] BACKGROUND

A. VISUAL IMAGE

A visual image screen-less display is any image that can be seen with the naked eye. The most common type of visual picture projection without a screen is a hologram. Holographic messaging, which was previously only seen in films like Star Wars, will soon become a reality thanks to brand-new technology that has recently arrived from Japan. It's True 3D, which was developed in 2006 by AIST and Keio University on the foundation of earlier technology. With this ground-breaking projection technique, images can be shown without a screen.

Any visual picture that can be seen without a screen as in figures 1 and 2, is considered a visual image screenless display. A hologram is the most typical instance of a visual image with no screen.

Fig1.Example of visual Image

Holograms were largely used in the telecommunications sector as a screen replacement. Holograms can be sent directly or saved in a variety of media (such holodiscs), or the image can be recovered by connecting the storage device to a holoprojector.

Fig.2.Example of visual Image

Virtual reality goggles, which feature two small screens but are sufficiently different from traditional computer screens to be referred to as screen less, and heads-up displays on jet fighters, which project images onto the clear cockpit window, are also included in the category of visual images. Each of these situations results in some light reflection. By focusing a laser beam that forms a plasma environment from the oxygen and nitrogen in the air, the device shows holographic pictures. According to Ubergizmo.com, the holographic projections seem like 3Dfloating objects in mid-air.

There is an intermediary item (hologram, LCD screen, or cockpit window) before it reaches the retina. Despite coming from the panel's rear, the light in LCD panels

nevertheless serves as a source of illumination[3]. Thanks to the new software and technology, the user will effectively be able to alter the system's layout to meet his or her particular requirements, capabilities, and preferences. They will enable the system to react to user actions when interacting, for instance, with interactive moveable type.

B. RETINAL DISPLAY

As shown in figure 3, a virtual retinal display system is a kind of screenless display that projects images right into the retina. Light is transmitted directly to the retina as opposed to being reflected from an intermediary object, which is how they vary from visual picture systems. Since most prying requires viewing the same light as the person who is legally viewing the screen, retinal direct systems hold out the promise of absolute privacy when computing work is done in public spaces after being commercialized[6]. This is because they only send light into the viewers' pupils.

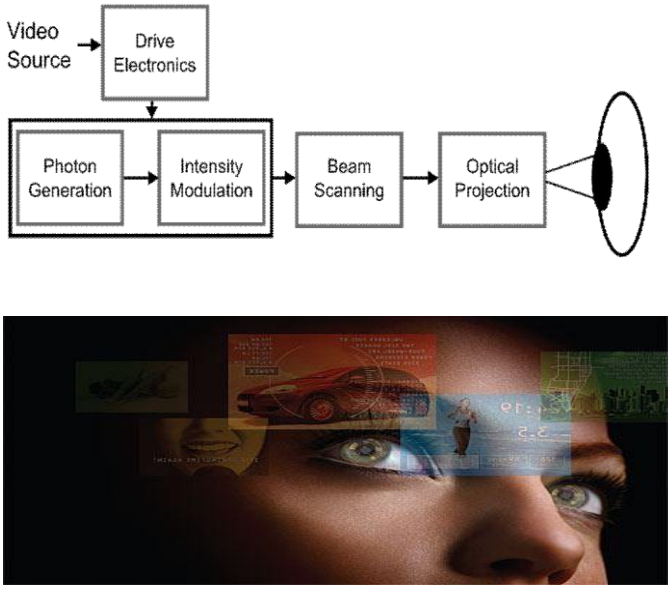

Fig.3.Retinal Display

C. SYNAPTIC INTERFACE

For its movie without a screen, Synaptic Interface employs no light. Visual information is entirely bypassing the eye and going straight to the brain. Horseshoe crabs have been successfully used to extract meaningful visual data from their biological eyes through their optic nerves and to transfer video signals from electronic cameras into their brains using the method depicted in figure 4. However, similar systems have not been implemented in people.

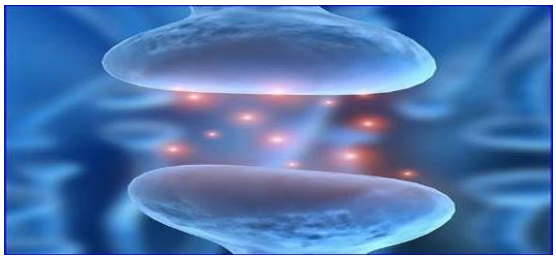

Fig.4.Synaptic Interface

[3] THE WORKING PRINCIPLE

The operating system for screenless displays is developing technologically in a number of novel, encouraging areas. Software for the GEN-X wonder vision is being put together. Any computer running the mudoc software can display text that has been set up as interactive moveable type. The majority of documents that are consumed in the coming years will be accessed using conventional personal computers, e-book readers, and other currently in use display and projection technologies. A new kind of input/output system will probably soon make it easier for the computer and the user to communicate and interact. This novel human-computer interface is called the telereader terminal. Visual Image is a name for a piece of bitmap composition and manipulation software using bitmaps.

There are several novel, cutting-edge methods being used to enhance the operating system for screen-less devices. Software for the GEN-X wonder vision is being put together. Any computer running the mudoc software can display text that has been set up as interactive moveable type. The majority of documents that are consumed in the coming years will be accessed using conventional personal computers, e-book readers, and other currently in use display and projection technologies. A new kind of input/output system will probably soon make it easier for the computer and the user to communicate and interact. This novel human-computer interface is called the telereader terminal. Visual Image is a name for a piece of bitmap composition and manipulation software. In the Image Mode, bitmaps can be individually edited or composited.

A. Creating Visual Catalog Files with Visual Image

Visual Image can create EYE file types for use with the Visual Catalogue programme. Photographs can be arranged into catalogues with logical sub groupings using these EYE files. For instance, you could create an EYE file with a list of all the images of construction materials (such as brick, concrete, stone, etc.). The File, Export Project command generates an EYE file that contains references to all of the images that are currently loaded into Visual Image. When you run this command, you are prompted to select a filename for the freshly created EYE file. If you haven't previously, you will be prompted to save any Visual Image-generated photos to disc.

B. Additional Software and Hardware Requirements

•To improve the user's perception and cognitive function

• To provide the user with the healthiest visual environment possible.

• Giving blink cues or blink replies in response to various user requests (using voice, hand, foot, or other signal modes).

• modifying the output to reflect changes in the user's physiology or reaction time, etc.

The new hardware and software will enable system and user to operate together without any hiccups

and to better take advantage of each other's strengths.

[4].VIRTUAL RETINAL DISPLAY STRUCTURE AND IMPLEMENTATION

A raster display (like a television) is projected directly into the retina of the eye using a novel display technology called a virtual retinal display (VRD), often referred to as a retinal scan display (RSD). A common display that appears to be floating in space greets the user. Similar devices have been developed that place a small "screen," usually a pair of enormous sunglasses, in front of the user's eye and display a blurry image onto it. The viewer's attention is drawn to the background, where it seems as though the screen is floating. These devices had a number of shortcomings, including a small "screen" area, hefty miniature televisions used to project the display, and an uncertain image.

Due to their low brightness, they could only be utilised inside. Several recent developments have led to the implementation of a true VRD system. In particular, the development of adaptive optics and high-brightness LEDs has made it possible for systems to dynamically correct for eye defects, but this is not always necessary. Displays that are bright enough to be used during the day are now possible. The ultimate result is a screenless display that is significantly superior to the greatest television technologies in terms of resolution, colour range, and brightness.The VRD was developed in 1991 at the University of Washington's Human Interface Technology Lab.The majority of VRD research that has been done thus far has made use of various virtual reality platforms. A potential advantage is that VRDs in this application are probably going to be substantially smaller than existing television-based systems. However, they do have some of the same disadvantages, such as the requirement for some sort of optics to transfer the image into the eye, which is typically comparable to the sunglasses system used with prior technologies. It can also be a part of a wearable computing system. More recently, VRDs have attracted some interest as a display system for portable gadgets like mobile phones, PDAs, and various media players.

The VRD has a distinct benefit in this situation since it can simulate a full-sized monitor on a portable device. The most recent developments in mobile computing are centred on touch screen technology [6]. There will be fewer screens and touches on future mobile devices. By the year 2020, the modern mobile phone will be fully superseded by something else. We shall interact with technology directly through our senses as opposed to touching a screen thanks to technology embedded into what he refers to as "Internet Glasses."Voice was often organised in the beginning and end of sessions.

Because of the existence of threads today, several threads can operate simultaneously and never terminate. Take into account Twitter, RSS feeds, email, etc. Consequently, this is how the brain works. In the future, as seen in figure 6, telecoupling and associated gadgets will be standard, and monitors and keyboards won't even be needed. Brain wave sensor implants and laser-based displays, which direct images into human retinas, will be the two main technologies.

As a result, technological advancements will work better with human “reality vision." The forthcoming hardware revolution and cloud-based information streaming will make all of this possible and enable the user interface seen in figures 9 and 10.

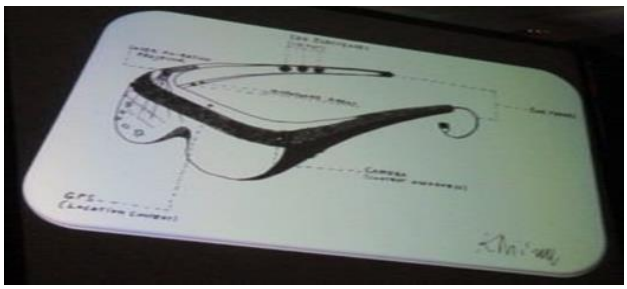

Fig.5. Virtual Retinal Display–Example.

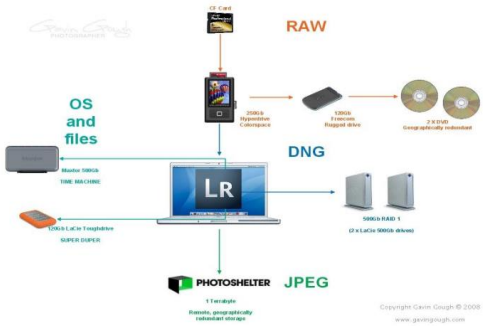

Fig.6. System Architecture

[5].APPLICATIONS OF THE SCREENLESS DISPLAY

As shown in figure 7, screen-less displays have been heavily utilised in the development of mobile phones, which are mostly used by the blind and aged. The first device to employ this kind of screen-less display was the mobile phone OWASYS 2CC. This paradigm is quite beneficial for people who are aged, blind, or even have poor vision.

Fig.7.Appliaction applied to mobile Tecnology

Screenless laptops are being developed using the same technology as screenless screens. A laptop without an LCD can be a very useful portable option when coupled with CRT or fixed LCD monitors. Laptops without displays would reuse donated CRT monitors that would otherwise end up in landfills, which is another environmentally good practise. The

portability of this computer makes it easier for volunteers who don't always have the time to visit people in their homes to keep it up to date. Holograms are frequently projected on screenless surfaces as well. Hologram projection is a scientific development that makes touch-free holographic interfaces possible. In reality, hologram projection produces 3D images with such high quality that it seems possible to reach out and touchthem. Though conventional holograms that provide 3D images have prevailed until now, therefore holographic projection has yet to gain widespread adoption.

Fig.8.Example view of holographic Projection

The most recent developments in laser technology are also employing the unique technique of the screenless display through the use of various 3D scope animation or the screen offers the benefit of being combined with the Laser Valve Video Projector that helps in projecting video images by using the laser light rather than the Xenon Arclamps as shown in figure 8. Laser technology has given it a competitive advantage. The projector has a significant depth of field thanks to LVP technology.

Fig.9.Magical display in air

New screenless TVs can be created using the basic functioning principle of screenless displays. Imagine watching a TV image that appears to appear out of nothing. The newest coming technology in the future is seen in figure 9, where the image merely floats in front of the observer.

Fig.10.Virtualscreens

[6]. ADVANTAGES AND DISADVANTAGES OF THE TECHNOLOGY

ADVANTAGES:

Low power requirements: Only six diodes and a few milliwatts are required to transmit their images to the user's eyes [3].

Because the pixels in the images that the diodes project may be made smaller than those on any CRT or flat panel display, images with higher resolution can be created. The resolution of visual images created by retinal projectors will only be limited by the viewers' eyes' ability to resolve detail improved portability. When all of a retinal projector system's diodes, optics, and processor parts are assembled, it will only be a few ounces heavy.
A wider field of vision Retinal projectors can provide a larger field of view than display screens. Increasing color accuracy with light modulation Compared to other display technologies, this one offers a larger spectrum of colors and more fully saturated colours.
Higher contrast and brightness levels than those of any other display device are possible with retinal projectors.

Display 3D images- Retinal projectors are able to provide their customers with the most realistic stereoscopic movies and still images possible because of their capacity to display high resolution image pairs.
Since the human visual system is a far-point system, it can display images that are far away. Today's desktop and laptop users need to have good close-up vision. Because we frequently utilise our near-point vision for computer use, reading, sewing, playing video games, etc., myopia is a pretty common impediment. Because we frequently utilize our near-point vision for computer use, reading, sewing, playing video games, etc., myopia is a pretty common impediment. The utilisation of retinal projector systems' far-point pictures has the potential to reduce the prevalence of myopia and, consequently, the increased need for and use of spectacles (see figure 10).
cheaper costs These days, retinal projector systems are expensive. Low-cost systems will soon be available, despite the fact that there are no insurmountable manufacturing challenges with mass-producing and affordable components. Due to the fact that they were not constructed with potentially dangerous chemicals like lead, phosphorous, arsenic, cadmium, or mercury, these tiny delivery devices will have low environmental and disposal costs [4].

DISADVANTAGES:

- The main drawback is that there aren't many substantial numbers of Virtual Retinal Displays (VRD) presently.
- Prototypes and unique experimental versions are now being built, although they are expensive per unit.
- The VRD technology is continually being developed and improved.

[7]FUTURE ENHANCEMENTS

In order to advance the development of this innovative technology, a number of well-known IT sector firms and other top laboratories are managing the screenless displays project.

In 2001, Microsoft began developing a concept for an interactive table that fuses the physical and digital worlds.
• Users can execute computations on hardwired devices that employ multi-touch human computer interaction technology without the need for conventional input inputs.

CUBIT is currently being developed for future use with numerous Touch devices.

• A more sophisticated and futuristic view of displays without screens is also made possible by advancements in micro vision. This micro vision technology is very well utilized in the features of the artificial retinal display.
• Smart glasses that can remember where a person last put their keys, handbags, iPods, and cell phones have been developed by Japanese researchers.
• With the help of a brand-new portable video camera that Smart Google is developing, the information the viewer wants will be directly visible through the glasses in situations when there is no screen or projector present.
With the use of electron beam lithography, several labs are developing advanced improvements for the screenless display of the future.
• Adobe Systems is creating and deploying a number of cross-platform programmes that are meant to be viewed without a screen.

[8] CONCLUSION

The essay goes into great detail on screenless displays, one of the most recent computer innovations that has become a new exciting fad for the next generation as a sector of futuristic technology. The screenless demands a considerable degree of knowledge to create, design, and code, and the development process is constantly being enhanced because to its potential for a number of benefits. Future technologies with screen-free displays could take over the planet and increase technological empowerment in the field of computer technology. It is predicted that screenless displays would be affordable and that computer technology will have a brighter future.

REFERENCES

[1] Retrotransmissive Optics Head Mounted Projector without a Screen Jyunya WATANABE, Ryugo KIJIMA

[2] Using hyperbolic half-silvered mirrors, Kiyokawa, K., "A Wide Field-of-View Head Mounted Projective Display," Procs of ISMAR

[3] "Resolution characteristics of afocal array optics," Okano, F. and Arai, J. [3].

[4] The SPE Annual Technical Conference and Exhibition took place in New Orleans, Louisiana, from September 30 to October 3, 2001. Videos.mitrasites.com/screenless-display.html

[5]www.technologyreview.com/blog/mimssbits/25623

[6] Telecoms.cytalk.com/.../why-screenless-touch-is-the-future-of-mobile