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Screen less Displays – The Emerging Computer Technology

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Abstract This report discusses advent of the Screen less 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 involves the following 3 different working principles. The Visual image, Virtual retinal display, Synaptic interface. This report 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.

Keywords: **Screen less display, Visual image, Virtual retinal display, Synaptic interface.**

I. INTRODUCTION

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 [1]. 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. 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 [2]. Screen less computing systems can be divided mainly into 3 groups: Visual image, Retinal direct and Synaptic interface

II.BACKGROUND

2.1 Visual Image

Visual Image screen less display includes any screen less image that the eye can perceive as shown in figure 1 and 2. The most common example of Visual Image screen less display is a hologram.

Fig 1: Example of visual Image

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 [1].

Fig 2: Example of visual Image

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[3]. 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' behaviors in dealing with interactive movable type.

2.2 Retinal Display

Virtual retinal display systems are a class of screen less displays in which images are projected directly onto the retina as shown in figure 3. They are distinguished from visual image systems because light is not reflected from some intermediate object onto the retina; it is instead projected directly onto the retina. Retinal Direct systems, once marketed, hold out the promise of extreme privacy when computing work is done in public places because most inquiring relies on viewing the same light as the person who is legitimately viewing the screen, and retinal direct systems send light only into the pupils of their intended viewer[6].

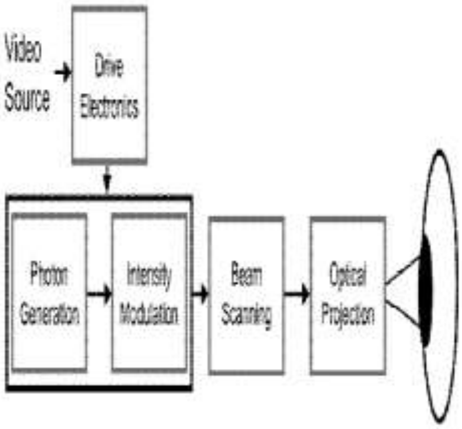

Fig 3 (a) : Retinal Display

Fig 3 (b) : Retinal Display

2.3 Synaptic Interface

Synaptic Interface screen less video does not use light at all. Visual information completely bypasses the eye and is Transmitted directly to the brain. While such systems have yet to be implemented in humans, 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 as illustrated in figure 4.

Fig 4: Synaptic Interface

III. THE WORKING PRINCIPLE

There are several new emerging ways for the technological development of the working principle of the screen less displays[4]. 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.

3.1 Creating Visual Catalog Files with Visual Image

Visual Image gives you the ability to create files in the EYE file format for use in the Visual Catalog program. These EYE files can be used to create catalogs of images in logical sub groupings: for example, you can create a catalog file in the EYE format that lists all images of building materials (brick, concrete, stone, etc.). The File, Export Project command creates an EYE file that refers to all of the images that are currently loaded into Visual Image. When you select this command, you are prompted to enter a filename for the EYE file that is to be created. If you have created any image in Visual Image that are not yet saved to disk you will be asked if you wish to include those images in the EYE file and if so, you are prompted to store those images as bitmaps. The File, Exports Editor Command in Visual Image allows you to pack and choose those image files on disk that you wish to include in a catalog EYE file [5]. When you select File in Export Editor, a file browser appears from which you can choose the image files to include. Use this browser to select images to add to a project file for use in Visual Catalog.

Additional Software and Hardware Requirements:

- To facilitate the interactivity
- To optimize the user's perceptual and cognitive capabilities
- To provide the most healthful visual environment for the user.
- Responding to a variety of user commands (using voice, hand, foot, or other signal methods)
- Providing blink cues or blinks responses
- Modifying output to compensate for changes in user's physiology or reaction time, etc. The new software and hardware will enable the user and the system to better exploit each other's capabilities and to function as a fully integrated team.

A. Virtual Retinal Display Structure and Implementation

A virtual retinal display (VRD), also known as a retinal scan display (RSD), is a new display technology that draws a raster display (like a television) directly onto the retina of the eye. The user sees what appears to be a conventional display floating in space in front of them. Similar systems have been made by projecting a defocused image directly in front of the user's eye on a small "screen", normally in the form of large sunglasses. The user focuses their eyes on the background, where the screen appeared to be floating. The disadvantage of these systems was the limited area covered by the "screen", the high weight of the small televisions used to project the display, and the fact that the image would appear focused only if the user was focusing at a particular "depth".

Limited brightness made them useful only in indoor settings as well. Only recently, a number of developments have made a true VRD system in practice. In particular, the development of high-brightness LEDs have made the displays bright enough to be used during the day and adaptive optics have allowed systems to dynamically correct for irregularities in the eye (although this is not at all needed in all situations). The result is a high-resolution screen less display with excellent color range and brightness, far better than the best television technologies. The VRD was invented at the University of Washington in the Human Interface Technology Lab in 1991. Most of this research into VRDs to date has been in combination with various virtual reality systems. In this role VRDs have the potential advantage of being much smaller than existing television-based systems. They share some of the same disadvantages however, requiring some sort of optics to send the image into the eye, typically similar to the sunglasses system used with previous technologies. It can be also used as part of a wearable computer system. More recently, there has been some interest in VRDs as a display system for portable devices such as cell phones, PDAs and various media players. In this role the device would be placed in front of the user, perhaps on a desk, and aimed in the general direction of the eyes. The system would then detect the eye using facial scanning techniques and keep the image in place using motion compensation. In this role the VRD offers unique advantages, being able to replicate a full-sized monitor on a small device. The most recent innovations in mobile computing have been based around touch screen technology [6]. The future of mobile devices is both touch less and screen less.

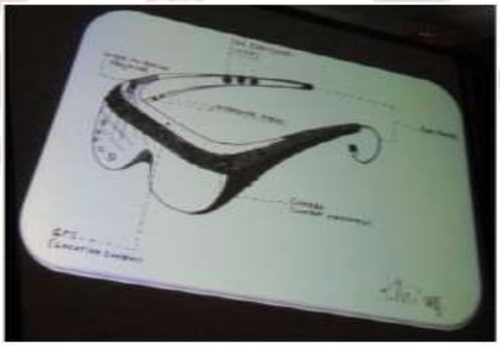

Fig 5 : Virtual Retinal Display –Example.

By 2020 the mobile phone as we know it today will disappear and something very different will take its place. Instead of touching a screen, we will interact with technology directly through our senses, through technology embedded in what he is calling "Internet Glasses". Voice was always organized in sessions with a beginning and an end. Today we have threads, i.e when a thread is started it never ends and we have many continuing in parallel. Think of your email, RSS feeds, Twitter, etc. So this is how our brain works. The hone of tomorrow will be telecoupling and related machines and future is bypassing screens and keyboards altogether as in figure 6. The two key technologies will be laser based displays, which display images directly onto our retinas and brain wave sensing implants as shown in figure 5. This will allow technology to integrate with our 'reality vision' much more seamlessly. We are on the verge of a hardware revolution that will make this all possible, as well as the cloud-based information streaming that will enable the user interface to become a reality as shown in figure 9 and 10.

Fig 6 : Sytem Architecture

B. 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 as shown in figure 7. 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.

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.

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Fig 7 : Appliaction applied to mobile Tecnology

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.

Fig 8 : Example view of holographic Projection

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 as depicted in figure 8. 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 in the future as depicted in figure 9.

Fig 9 : Magical display in air

Fig 10 : Virtual screens

IV. ADVANTAGES AND DISADVANTAGES OF THE TECHNOLOGY

4.1 Advantages

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

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 can provide 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 see figure 10.

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 [4].

4.2 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.
- The VRD technology is still under progress and Development.

V. FUTURE ENHANCEMENTS

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.
- CUBIT is being developed for the future use of the multi Touch use of the program.
- 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.

VI. CONCLUSION

The report has elaborately discussed screenless displays which is one of the most emerging computer technologies and has become a new exciting rage for the up coming 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 process for the development is still under the 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. Screenless displays promises the cost effective aspect and also brighter future in the computer technology.

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