Screenless Aerial 3D Display

Sunad Kumar A N
Computer Science and Engineering,
BGS Institute of Technology,
BG Nagar, Karnataka

Jaswanth Gowda
Computer Science and Engineering,
BGS Institute of Technology,
BG Nagar, Karnataka

Abstract — **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 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.**

I. INTRODUCTION

Screenless display is nothing but a display which can be shot at any place wherever the user wishes to have the screen. It can be at any direction or place such as on the wall or in the open space. Nowadays the technology is changing very rapidly in the existing machines and in the tools in order to solve the problem at the high level. It would be not wrong in saying that the Screenless display technology would be a life-changing concept and also one of the most interesting topics for the research. This technology also solves the problem of the space of display in one place. Screenless display technology is the present evolving computer-enhanced technologies. It will surely be the one of the greatest development in the field of technology in the upcoming future. Several patents are still researching on this new technology which can change the whole view of the displays. Screenless Display Technology was such an excellent thought that had come into many experts in order to solve the major problems related to the size of the device. For less space taking screen displays have made the need of Screenless displays more than ever. Screenless, by the word clearly means „no screen‟. So, Screenless Displays can be defined as a display which helps to display and even transmit any information without the help of screens.

There are many types of Screenless display that are under development which are described below-

- Visual Image display
- Retinal Direct display
- Synaptic Interface.

II. *METHODOLOGY*

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 Modoc software can present text that has been set in interactive movable type. Most of the Modoc 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.

A. Creating Visual Catalog Files

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.

B. 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.

III. IMPLEMENTATION

VISUAL IMAGE

Display The Visual Image Screenless display includes any image that is visible to the naked eye. The common example of the Visual Image Screenless display is the hologram. Holograms were used mostly in telecommunications as another to screens. Holograms they must be transferred directly, or they must be stored in numerous storage devices (such as holodiscs) the storage device can be attached or hooked with the holo projector, so that the stored image can be accessed .Virtual retinal display systems is a class of screen less displays in which the images are directly projected onto the human retina. They can be identified from the visual image systems because the light is not reflected from some of the intermediate object onto the retina; so it is instead projected directly onto the human retina.

Fig.1 The 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]. 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 tousers' behaviors in dealing with interactive movable type.

Working of hologram

To create a hologram, you need an object (or person) that you want to record; a laser beam to be shined upon the object and the recording medium; a recording medium with the proper materials needed to help clarify the image; and a clear environment to enable the light beams to intersect.

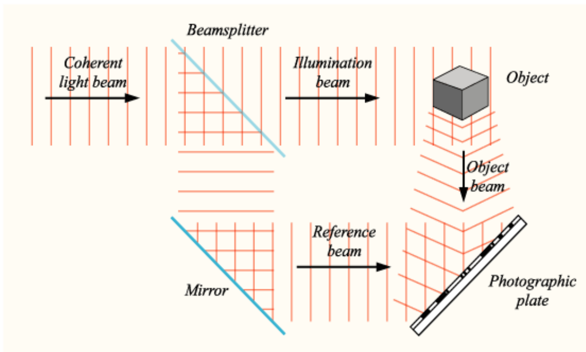


Fig.2 Recording a hologram

A laser beam is split into two identical beams and redirected by the use of mirrors. One of the split beams, the illumination beam or object beam, is directed at the object. Some of the light is reflected off the object onto the recording medium.

The second beam, known as the reference beam, is directed onto the recording medium. This way, it doesn't conflict with any imagery that comes from the object beam, and coordinates with it to create a more precise image in the hologram location.

The two beams intersect and interfere with each other. The interference pattern is what is imprinted on the recording medium to recreate a virtual image for our eyes to see.

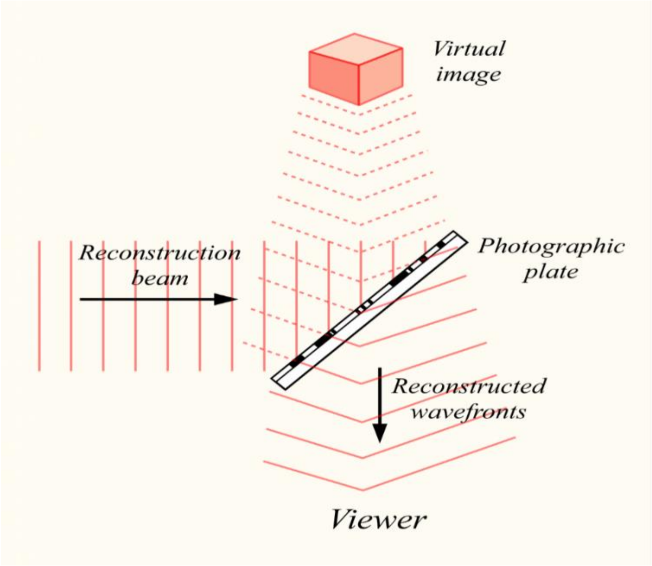


Fig.3 Reconstructing a hologram

The diffraction grating and reflective surfaces inside the hologram recreate the original object beam. This beam is absolutely identical to the original object beam before it was combined with the reference wave. This is what happens when you listen to the radio. Your radio receiver removes the sine wave that carried the amplitude- or frequency-modulated information. The wave of information returns to its original state, before it was combined with the sine wave for transmission. The beam also travels in the same direction as the original object beam, spreading out as it goes. Since the object was on the other side of the holographic plate, the beam travels toward you. Your eyes focus this light, and your brain interprets it as a three-dimensional image located behind the transparent hologram. This may sound far-fetched, but you encounter this phenomenon every day. Every time you look in a mirror, you see yourself and the surroundings behind you as though they were on the other side of the mirror's surface. But the light rays that make this image aren't on the other side of the mirror they're the ones that bounce off of the mirror's surface and reach your eyes. Most holograms also act like color filters, so you see the object as the same color as the laser used in its creation rather than its natural color.

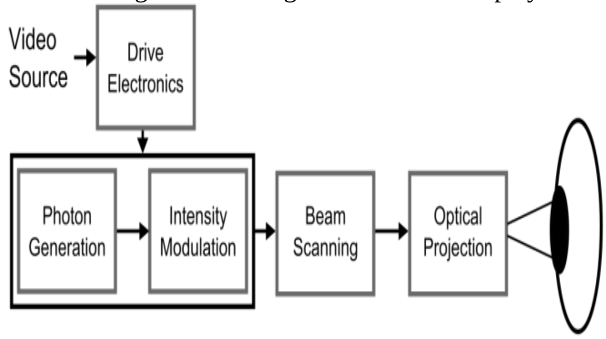
This virtual image comes from the light that hits the interference fringes and spreads out on the way to your eyes. However, light that hits the reverse side of each fringe does the opposite. Instead of moving upward and diverging, it moves downward and converges. It turns into a focused reproduction of the object a real image that you can see if you put a screen in its path. The real image is pseudoscopic, or flipped back to front it's the opposite of the virtual image that you can see without the aid of a screen. With the right illumination, holograms can display both images at the same time.

Your brain plays a big role in your perception of both of these images. When your eyes detect the light from the virtual image, your brain interprets it as a beam of light reflected from a real object. Your brain uses multiple cues, including, shadows, the relative positions of different objects, distances and parallax, or differences in angles, to interpret this scene correctly. It uses these same cues to interpret the pseudoscopic real image.

RETINAL DISPLAY

Virtual retinal display systems are a class of screen less displays in which images are projected directly onto the retina. 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.

Fig.4 Block Diagram of Retinal Display



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) 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.

The resulting modulated beam is then scanned to place each image point, or pixel, at the proper position on the retina. A variety of sean patterns are possible. The scanner could be used in a calligraphic mode, in which the lines that form the image are drawn directly, or in a raster mode, much like standard computer monitors or television. Our development focuses on the raster method of image scanning and allows the VRD to be driven by standard video sources. To draw the raster, a horizontal scanner moves the beam to draw a row of pixels. The vertical scanner then moves the beam to the next line where another row of pixels is drawn.

After scanning, the optical beam must be properly projected into the eye. The goal is for the exit pupil of the VRD to be coplanar with the entrance pupil of the eye. The lens. and cornea of the eye will then focus the beam on the retina, forming a spot. The position on the retina where the eye focuses the spot is determined by the angle at which light enters the eye. This angle is determined by the scanners and is continually varying in a raster pattern. The brightness of the focused spot is determined by the intensity modulation of the light beam. The intensity modulated moving spot, focused through the eye, draws an image on the retina. The eye's persistence allows the image to appear continuous and stable.

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Finally, the drive electronics synchronize the scanners and intensity modulator with the incoming video signal in such a manner that a stable image is formed.

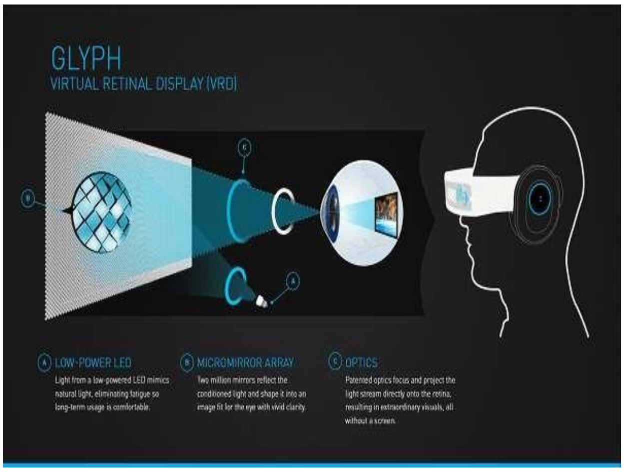

Fig.5 Retinal Display

VRD STRUCTURE

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. 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 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, is 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. The future of mobile devices is both touch less and screen less. 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 when a thread is started it never Gends 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. 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 4.1. 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.

SYNAPTIC INTERFACE

Synaptic Interface screen less video does not use light at all. 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.

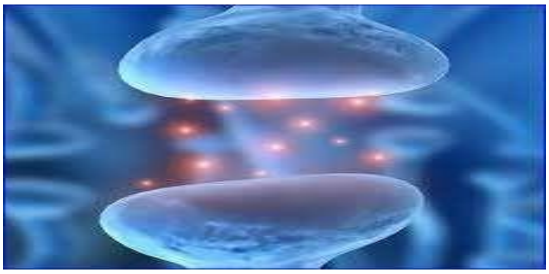

Fig.6 Synaptic Interface

IV. *APPLICATIONS OF SCREENLESS DISPLAY TECHNOLOGY*

- **Medical field**: By allowing the physician to view a virtual X-Ray of infected areas information that is concerning that patient during surgery. Virtual images produced by VRD could be laid-down with the patient bytracking the view of the physician in relation to the position of the patient.

- **Manufacturing field**: The same concept as that is used in medical field can be used in manufacturing environment by viewing virtual blue print that uses C3 images to identify parts placement and operation information.

- **Transportation system**: It can be beneficial in any transportation system by proving the display that can project virtual map of the surrounding area therefore in siding vision of providing reference state train characteristics and craft instrumentation.

Some other Applications of the Screenless Display technology

Fig.7 The Application applied to mobile technology

Application applied to mobile Technology Screen less displays technology is also implemented for the development of the screen less laptops. A laptop that is without an LCD can be a very helpful, portable solution when connected to CRT or fixed LCD monitors.

Fig.8 The Laptops without screens

Screenless laptops 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 on daily basis to travel to people's homes, can more proper way and easily maintain this computer. Screenless display technology is also widely applicable in the field of holograms projection.

Fig.9 The Hologram Projection

Hologram projection is result of a technological innovation that is truly going to helps in touch less holographic interfaces. In fact, a hologram projection projects 3D image of so high quality that it will feels as if we can touch them. However, holographic projection is still under progress acceptance as until now, the 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(LVV)that helps in projecting video images by the use of the laser light instead of the Xenon Arc lamps. Laser technologies have given a peak over the other technologies as

the LVP gives the projector an outstanding depth in the focus.

Fig.10 The Virtual screen

It is implemented in the emerging of the new screen less TV"s. Imagine that while watching the TV picture will be magically appearing in the thin air. The pictures will just floats in front of the viewer; this is going to be a latest emerging technology.

Fig.11 The Magical display in air

V. *ADVANTAGES & DISADVANTAGES*

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

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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.

- **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.
- The VRD technology is still under progress and development.

VI. 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.

VII. CONCLUSION

The paper has elaborately discussed screenless displays which is one of the most emerging computer technologies and has 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 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 promise the cost effective aspect and also brighter future in the computer technology.

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