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An Artificial Vision Approach For Blind Human in Emerging Scenario of Neural Network Using Neurons Activity

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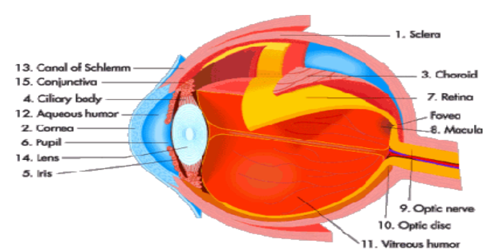
Abstract- **This paper represents the significance of Neurons in the Neural network. How it is shows its importance when any tissue or layers of retina damaged. Blindness is more feared by the public than any other ailment. Artificial vision for the blind was once the stuff of artificial neural network in the field of computer science. But now, a limited form of artificial vision is a reality .Now we are at the beginning of the end of blindness with this type of technology. In an effort to illuminate the perpetually dark world of the blind, the technology has to be emerged that is electronic-based strategies designed to bypass various defects or missing links along the brain's image processing pathway and provide some form of artificial sight. There are two methods for curing blindness that will provide or restore vision which is Artificial Silicon Retina and artificial retina component chip for the visually impaired around the world.**

Keywords **- Neural Network , Neurons ,Vision, ASR, ARCC.**

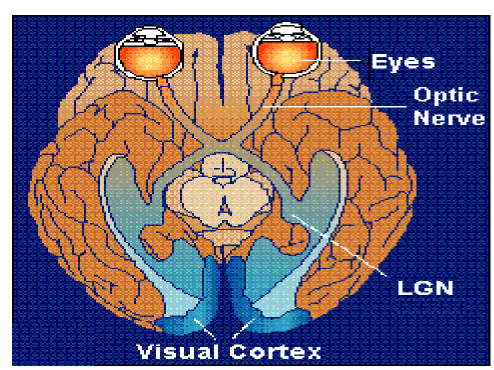
I. INTRODUCTION

The curing of blindness is the most challenging and important area. Artificial-vision researchers take inspiration from another device, the cochlear implant, which has successfully restored hearing to thousands of deaf people. But the human vision system is far more complicated than that of hearing. The eye is one of the most amazing organs in the body. Before we understand how artificial vision is created, it's important to know about the important role that the retina plays in how we see. Following points indicates the explanation of what happens when we look at an object:

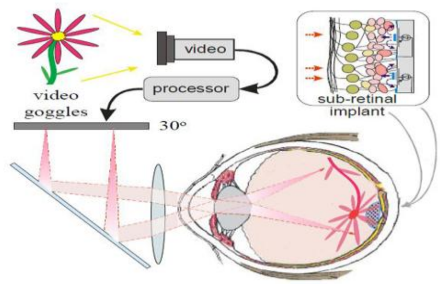
- Scattered light from the object enters through the cornea.
- The light is projected onto the retina.
- The retina sends messages to the brain through the optic nerve.
- The brain interprets what the object is.



Figures (1): Architecture of eye



Figures (2): The anatomy of the eye and its path view



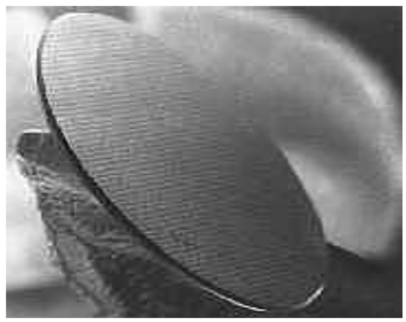
Figures (3): Neurons activity of the eye

The retina is complex in itself. This thin membrane at the back of the eye is a vital part of our ability to see[1]. Its main function is to receive and transmit images to the brain. These are the three main types of cells in the eye that help perform this function: Rods, Cones and Ganglion Cells. The information received by the rods and cones are transmitted to the nearly 1 million ganglion cells in the retina. These ganglion cells interpret the messages from the rods and cones and send the information on to the brain by way of the optic nerve. There are a number of retinal diseases that attack these cells, which can lead to blindness. The most notable of these diseases are retinitis pigmentosa and age-related macular degeneration. Both of these diseases attack the retina, rendering the rods and cones inoperative, causing either loss of peripheral vision or total blindness. However, it's been found that neither of these retinal diseases affects the ganglion cells or the optic nerve. This means that if scientists can develop artificial cones and rods, information could still be sent to the brain for interpretation. This concept laid the foundation for the invention of the artificial vision system technology.

II. HOW TO CREATE ARTIFICIAL VISION

A blind person could be made to see light by stimulating the nerve ganglia behind the retina with an electrical current. This test proved that the nerves behind the retina still functioned even when the retina had degenerated. Based on this information, scientists set out to create a device that could translate images and electrical pulses that could restore vision[2]. Today, such a device is very close to be available to the millions of people who have lost their vision to retinal disease. In fact, there are at least two silicon microchip devices that are being developed. The concept for both devices is similar, with each being:

- Small enough to be implanted in the eye
- Supplied with a continuous source of power
- Biocompatible with the surrounding eye tissue



Figures (4,5) The dot above the date on this penny is the full size of the Artificial Silicon Retina.

Perhaps the most promising of these two silicon devices is the artificial silicon retina.
The ASR is an extremely tiny device. It has a diameter of just 2 mm (.078 inch) and is thinner than a human hair. In order for an artificial retina to work it has to be small enough so that doctors can transplant it in the eye without damaging the other structures within the eye. Groups of researchers have found that blind people can see spots of light when electrical currents stimulate cells, following the experimental insertion of an electrode device near or into their retina. Some patients even saw crude shapes in the form of these light spots. This indicates that despite damage to cells in the retina, electronic techniques can transmit signals to the next step in the pathway and provide some form of visual sensation. Researchers are currently developing more sophisticated computer chips with the hope

that they will be able to transmit more meaningful images to the brain.

III. HOW DOES ARTIFICIAL SILICON RETINA WORKS

The ASR contains about 3,500 microscopic solar cells that are able to convert light into electrical pulses, mimicking the function of cones and rods. To implant this device into the eye, surgeons make three tiny incisions no larger than the diameter of a needle in the white part of the eye. Through these incisions, the surgeons introduce a miniature cutting and vacuuming device that removes the gel in the middle of the eye and replaces it with saline[3]. Next, a pinpoint opening is made in the retina through which they inject fluid to lift up a portion of the retina from the back of the eye, which creates a small pocket in the sub retinal space for the device to fit in. The retina is then resealed over the ASR.

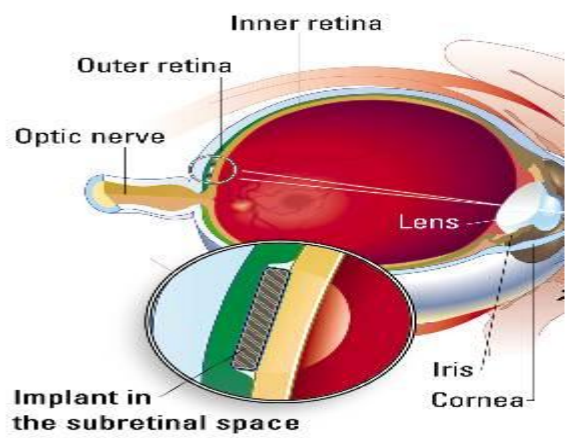


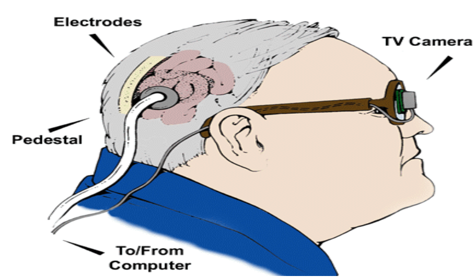
Figure (6) :Here you can see where the ASR is placed between the outer and inner retinal layers.

For any microchip to work it needs power, and the amazing thing about the ASR is that it receives all of its needed power from the light entering the eye. This means that with the ASR implant in place behind the retina, it receives all of the light entering the eye[4]. This solar energy eliminates the need for any wires, batteries or other secondary devices to supply power.

Another microchip device that would restore partial vision is currently in development called the artificial retina component chip, this device is quite similar to the ASR. Both are made of silicon and both are powered by solar energy. The ARCC is also a very small device measuring 2 mm square and a thickness of .02 millimeters (.00078 inch). There are significant differences between the devices, however. According to researchers, the ARCC will give blind patients the ability to see 10 by 10 pixel images, which is about the size of a single letter on this page. However, researchers have said that they could eventually develop a version of the chip that would allow 250 by 250 pixel array, which would allow those who were once blind to read a newspaper.

IV. WORKING OF ARTIFICIAL VISION SYSTEM

The main parts of this system are miniature video camera, a signal processor, and the brain implants. The tiny pinhole camera, mounted on a pair of eyeglasses, captures the scene in front of the wearer and sends it to a small computer on the patient's belt. The processor translates the image into a series of signals that the brain can understand, and then sends the information to the brain implant that is placed in patient's visual cortex. And, if everything goes according to plan, the brain will "see" the image.



Figures (7,8) Artificial Vision System.

Light enters the camera, which then sends the image to a wireless wallet-sized computer for processing. The computer transmits this information to an infrared LED screen on the goggles[5]. The goggles reflect an infrared image into the eye and on to the retinal chip, stimulating photodiodes on the chip. The photodiodes mimic the retinal cells by converting light into electrical signals, which are then transmitted by cells in the inner retina via nerve pulses to the brain[6]. The goggles are transparent so if the user still has some vision, they can match that with the new information - the device would cover about 10° of the wearer's field of vision.

The patient should wear sunglasses with a tiny pinhole camera mounted on one lens and an

The electrodes stimulate certain brain cells, making the person perceive the specks of light. The shifting patterns as scans across a scene tells him where light areas meet dark ones, letting him find the black cap on the white wall, for example. The device provides a sort of tunnel vision, reading an area about the size of a card 2 inches wide and 8 inches tall, held at arm's length.

The electronic eye is the latest in high-tech gadgets aimed at helping millions of blind and visually impaired people. Although the images produced by the artificial eye were far from perfect, they could be clear enough to allow someone who is otherwise blind to recognize faces. The first useful artificial eye is now helping a blind man walk safely around and read large letters. Several efforts are now underway to create vision in otherwise blind eyes. While technically exciting, much more work in this area needs to be completed before anything is available to the majority of patients. Research is ongoing in two areas: cortical implants and retinal implants. There is still an enormous amount of work to be done in developing artificial retinas. In recent years, progress is being made towards sensory distribution devices for the blind. In the long run, there could be the possibility of brain implants. A brain implant or cortical implant provides visual input from a camera directly to the brain via electrodes in contact with the visual cortex at the backside of the head.

ultrasonic range finder on the other. Both devices communicate with a small computer carried on his hip, which highlights the edges between light and dark areas in the camera image. It then tells an adjacent computer to send appropriate signals to an array of small electrodes on the surface of patient's brain, through wires entering his skull.

V. CONCLUSION

The applied methods and technique will be helpful for the blind person to gain the vision artificially from the innovative ideas.

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AUTHOR PROFILE

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