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Bionic Eye with A.I. for Better Vision for Blind People

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Abstract: The bionic eye is an initiative for the blind people to make them see again, with the help of this technology. But somehow there is an loophole in this technology related to the picture quality, or we can say that, we aren't able to get a natural vision . In this article we have mentioned the essential facts and details related to bionic eye, AI (artificial intelligence) ,ML(machine learning),Sensors, and some aspect of nurolink technology .As our eye adjust with the sunlight and climate changes, and it is possible for us to create a artificial intelligence which is going to adjust the brightness and contrast according to the climate ,where the sensor is used to detect the temperature of the surrounding and with the help of ML the AI will get the accurate settings for the brightness and contrast to be adjusted . Neuralink technology is used for the better pixel or higher picture resolution because of the construction of the neurachip (brain chip).

Keywords: *Bionic eye, Artificial intelligence, Machine learning, Sensors, Neuralink (brain chip).*

I. INTRODUCTION

The working of a normal eye is like light passes through the cornea, the cornea is shaped like a dome and bends light to help the eye to focus. The light enter the eye through an opening called the pupil, the iris controls that how much light should pass through the pupil. Light passes through the lens .the lens works together with the cornea to focus light correctly on the retina. When the light hits the retina the working of photoreceptors start, they turn the light into electrical signals. These electrical signal is send to the optical nerve of the brain from the retina, then the brain turns the signal into the images we see.

This (Figure1) is the natural human eye with parts mentioned in it. If somehow the visual injury occur it

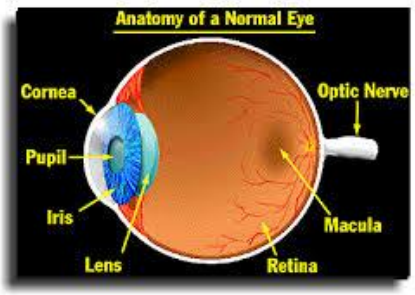


Figure 1: Human Eye

Mean that any piece of the visual pathway or retina is harmed by any injury or infection which causes visual loss.

To prevent this visual prostheses' or bionic eye (figure 2) has been introduce. The bionic eye consist of mainly three thing an external camera, transmitter and an internal microchip. The camera used to organize the visual stimuli of the environment after this emittes a high frequency radio wave , the micro chip consist of electrode ,that function as an electrical relay in place of degenerated retinal cell .

The radio wave that are transmitted by the camera and the transmitter are received by the stimulator microchip ,which fires electrical impulse .These impulses are relayed by the remaining retinal cell and are converted as normal to the nerve pathway, resulting a vision.

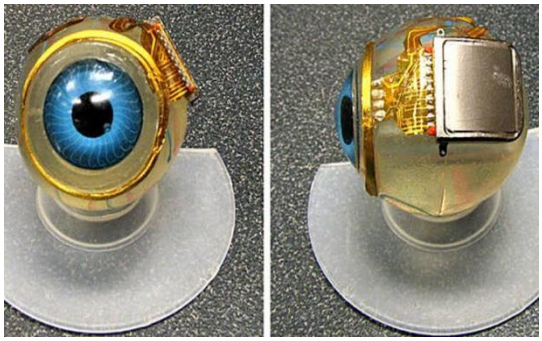


Figure2: Bionic eye

The bionic eye system runs on a battery pack that is organize along with a video processing device. This video processing device is used manually as per the required of the user. The bionic eye is implanted in the patient's head by a surgery.

At this age of technology after some more research it is possible to combine Bionic eye with A.I (Artificial Intelligence).Where A.I is just an approach to make product more think like a smart human brain, which leads to get a better vision for the patient, as the visualization of object is going to adjust more accurately with respect to environment, light, distance and other essential terms.

Bionic Eye

In the U.S(United States) there is a program know as the "Artificial Retina Project" which has truly developed a bionic eye .In 2002 the first human try was held and in 2007-8 they come with a updated version of the bionic eye .Bionic eye main parts are glass frame, camera, processor and battery, transmitter, transmitter antenna, receiver antenna, electrode array at last capsule for receives electron.

[**1**]Bionic eye work as there is a miniature camera is fixed in the glass frame which captures images of the surrounding and then send the information to the microprocessor that converts the data into electrical signal and then transmits these signals to the receiver which is fitted in the eye ,the receiver send the signals through a tiny cable to the electrode array and stimulating it to emit pulses. The artificial retina bypasses the damaged photoreceptor cells and transmits electrical signal directly to the remaining retina's viable cell. The pulses travel to the optical nerves and then to the brain, which distinguish patterns of lights and dark spot agnate to the electrodes stimulated (figure3). Where the image processor or video

processor work manually it mean that the patient have to adjust the brightness and contrast as per there requirement.

(Figure3: The veiw of bionic eye)

Artificial Intelligence

A.I (artificial intelligence) is an approach to make a product think like a natural human brain .Learn from the previous data and predict the result of the given query or problem .It is just a way to learn that how human brain think, learn and work when it tries to solve a problem and applied it on the software system . [**1**]A.I (artificial intelligence) is many focused on **Reasoning, Learning, Problem solving, Perception, Linguistic Intelligence.** [**2**]A.I can be used other field of technology or with gadgets just like sensors or in other word there is a list of application of A.I working with different types of sensors and these sensors have different names some of the sensors are as follow pressure sensors, position sensors, temperature sensors , optical sensors and many more .[**3**]A.I is of four different type **Reactive machines, Limited memory, Theory of mind, Self –awareness .**

A.I (Artificial Intelligence) is like a water whatever temperature ,shape or color we can make it that's how an A.I works after a layer of coding and with a right data we canimplement or we can achievean artificial intelligence as per our required . So, it is possible for the us to merge the bionic eye with A.I.

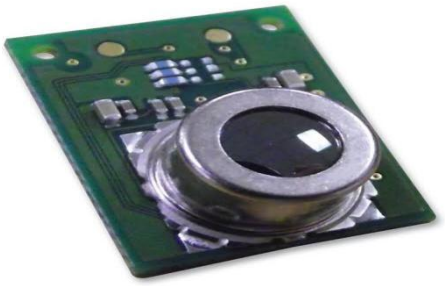
Machine Learning

[**1**]As we know that machine learning is a subfield of artificial intelligence (A.I). basically M.L(Machine Learning) is a method to analysis the previous data and fit the give data as per the requirement of model. [**2**]in M.L(machine learning) task are classified in different categories, as per how the learning is received or how the feedback or data is give in learning to develop to system. [**3**]There are two methods which are mostly used **supervised learning** (This type of learning is used when the input is labeled with their desired output.) ,**unsupervised learning**(This type of learning is used when the data is unlabeled so the learning algorithm is left to find commonalities between input data.)

For our purpose supervised learning can be useful because we are going to provide data (temperature, distance, light direction, wavelength) with suitable output(brightness, contrast) for learning .and these output be the input of the A.I system.

Sensor

[**1**]Sensors are widely used in association with measurement system. It basically means an element that produces signal related to the quantity being measured, or in other words a sensor is a device that provide the usable output with respect to element to being measured.[**2**] while choosing a sensor we met remember some criteria such as type of sensing, operating principle, power consumption, accuracy, environmental conditions, cost, resolution and range, calibration and repeatability.[**3**]the sensors are of different type like acoustic, electric, magnetic, thermal, mechanical and optical, these are the major types in which the sensors are dived.(Figure:4) it's a type of infrared thermal sensor.

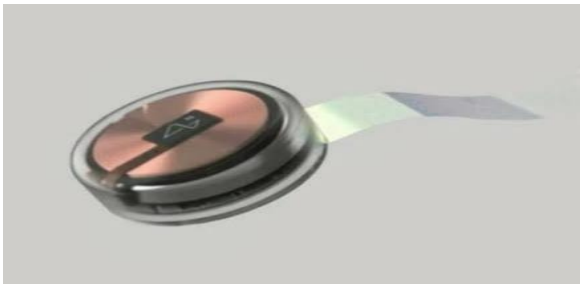


(Figure4: Infrared thermal sensor **)**

[**4**]It is possible for us to merge different types of sensors together as per our requirement in other words the raw - data of a sensors is computed or combined with the raw – data of the other sensor, this process is known as sensors fusion and with help of A.I (artificial intelligence) it is more easier, as compare to the classical algorithm because A.I can easily help in monitoring the data of the sensors .

Neuralink (Brain chip)

The fonder of this Neuralink is Elon Musk. It was firstly introduced at July 2016 and the try runs are still going on, if we talk about the size it is actually a size of a one cent(US currency) and it consist of 1024 miniature electrode which is going to connect with the brain or we can say this these electrode that penetrate the outer layer of the brain, as it can also be connect with the A.I as per Elon Musk.(Figure5).



(Figure5: Brain chip)

It can also be used to monitor the brain activity or may be also detect the optical nerves signal

Result

In the previous model of bionic eye (2002) and bionic eye(2007), the major difference between them is the number of electrodes used in the miniature chip . In bionic eye (2002) the number of electrodes are 16 and in bionic eye (2007)the number is increase from16 to 60 .Which mean that the bionic eye (2007) is more connected with the retinal cell as compare to the previous model .these electrodes are use to transmit electrical pulse to the retina cells and increasing the number of electrodes will provide better visualization power to the patients. It is also helpful in reduce the stress of the retinal cells.

CONCLUSION

After a long period of research, the idea of combining bionic eye with A.I can be implemented by making some major changes, but firstly we have to create an A.I (artificial intelligence) which is going to collect all the data from the sensors and operate the video processor which means that the video processor is going to be automatically adjust the brightness as per the climate changes or there is any change in

light source and in the direction of light. A data base is also required for M.L to get a proper output for the data which is provided by the sensors. The frame also required some more modification like adding some more sensors (temperature, ultrasonic, light, color,) which going to collect the raw data from the surroundings and send it to the M.L through A.I which means there will be nothing in the panel which needs manual control. As we know that the bionic eye contains a miniature chip which consist electrodes, in 2002 model there are 16 electrodes and after that in 2007 model of bionic eye there are 60 electrodes. These electrodes help to commune with the retinal cells by changing the miniature chip with the Neuralink chip (brain chip) which consist approx 1024 tiny electrodes have help us to communicate with retinal cell in a appropriate way and helps the patience to get a better visualization.

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