

Artificial Neural Network Based Ocular Pressure Measurement System Using Internet Of Things

S.Lakshmipriya¹, V.Parvathy², M.Abinaya³, C.R.Suganya Devi⁴

^{1,2,3,4}Assistant Professor, Department of Electronics and Communication Engineering,
Bannari Amman Institute of Technology, Sathyamangalam

Mail id: lakshmipriyas@bitsathy.ac.in

ABSTRACT- *The typical technological growth has made the people boom in their wealth and prospective beings. The enhanced and advanced fatal features made the health of the user to a blast of pill pile boxes. The most important cause of the health issue tends to lie in the visionary problem. Later innovative period is advancing with the most recent Mobile phones, Palmtops, Laptops, Tablets and that's just the beginning. Hence the use of this profoundly modernized hardware's makes our eyes get harmed effectively and they are getting inclined to numerous ailment. The principle impact and a section case genuine harm is the Glaucoma, the expansion in high pressure in the eyes. The glaucoma makes the cornea get influenced and prompts visual deficiency when not appropriately treated. In this way the proposed framework gives a wide scope of possibility of recognizing the glaucoma at the beginning times and giving the client an extraordinary help from the most incessant ailment. The unfavourable impact on the eyes is basically because of the driven showcases splendour which causes migraine, disturbances in eyes, redness, and swellings in the retina. The proposed framework is a model based specialist to locate the visual pressure in the eyes by a customized framework that screens the eyes pressure every now and again and sends the information to the Personal computers through IoT cloud.*

Keywords: *Glaucoma; Silicone hydrogel; Photodiodes; Polymer Resins; Internet of Things; Artificial neural networks.*

1. INTRODUCTION

According to Buddha, “Every human being is the author of his own **health** or disease.” It's a dismal genuine truth that we are experiencing numerous medical problems consistently[1]. According to the innovative advancement, the majority of our endeavours on upgrading the human medical problems were gone futile.

In an on-going, study taken at a period from 2013 to 2019 the use of cell phones among individuals was radically expanded from 524.9 – 813.2million clients and the utilization of Laptops and Personal PCs were changed to around 200 - 570 million clients. As indicated by the use most normal clients are the young people and the People beneath the age of around 18-25.

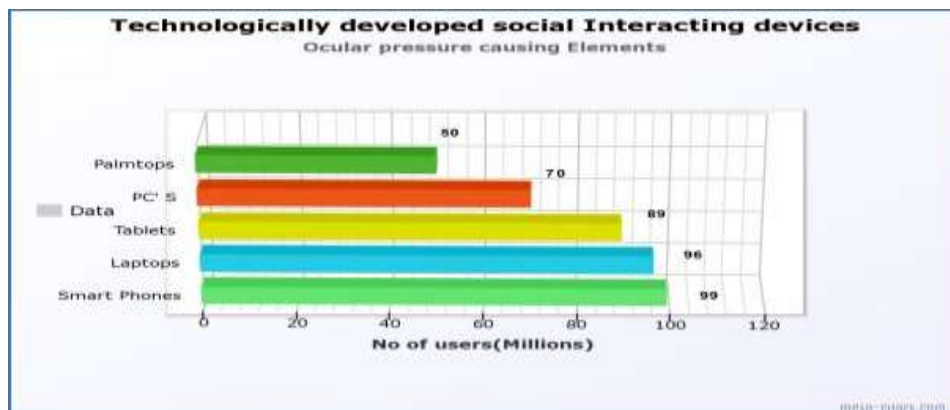


Figure.1. Bar chart showing the Ocular Pressure causing Components

As indicated by the Chart the most wild and most hurting gadgets are the advanced Mobile phones that increase the visual pressure and harm the retina and cause a serious affliction of visual deficiency [3]. The Amole display of the advanced Mobile phones and the LED screens of the Laptops were really been planned not to hurt the people vision. In any case, the screen brilliance of the framework was a sequential executioner player which works progressively proficient in harming the eyes.

The advancement in era and the scientists are creating a critical selections in converting these situation but a profound solution isn't been arrived[4]. So, the customers should be very cautious in using these superior products.

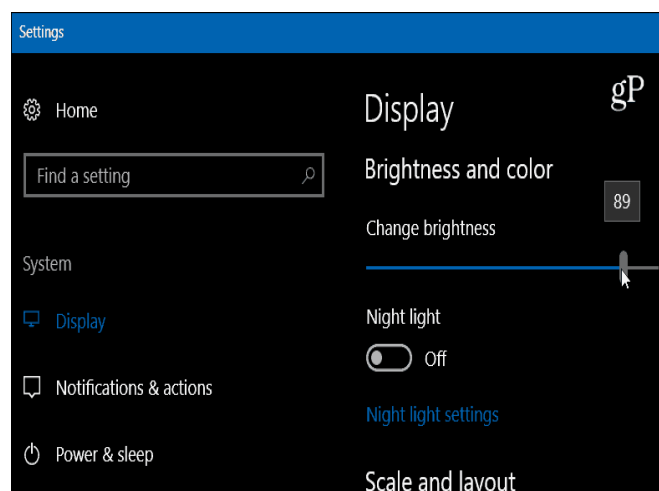
Less usage of these products may be a greater deal. But most of our works rely upon these products[5]. So there could be no other pass, so we ought to lessen the display screen brightness or we have to change the Auto brightness mode in these Products.

For Mobile Phones you can find these in the following process

Settings → Screen Brightness → Auto Brightness → ON

For Laptops you can find these in the following process

Control Panel → Display setting → Screen Brightness → Auto Brightness → ON
 Or else you can find them in the keyboard and reduce them.



(A)



(B)

Figure. 2. Screen Brightness of the (A): laptop, (B): Mobile Phone

By adjusting these settings we can lessen half of the troubles. Mostly self-focus and the specified view of the usage of these gadget need to be predominantly been availed earlier [31]. Thus the discount in utilization of these systems could be able to make a problem unfastened area.

Leonardi M. & et.al. (2009) defined the percentage of creating a contact lens and they experimented inside the pigs eyes[9]. Thus the profound paintings has been changed the view of the contact lens and their usages[32]. The intraocular pressure is been measured by means of a voltage regulator circuit and changed into transmitted through the wearable antennas. But the statistics calculated became no longer that a great deal of correctness. [2]

Bar-Sela & et.al. (2007) explained the nature of Internet of things that helped the scientific technology boons and the opposite methodological view of the reasoning's of the Internet of things. The medical machines how talk with the Internet and lots of more. [6]

Yan J. (2011) explained about how contact lens works for the glaucoma. The ocular pressure is measured through the plasma surgical methods [33]. But anyways those had been honestly so risky for the eyes. The sustainable consequences is been constantly monitored with the aid of the Personal computers. [7]

Chong G. T & et.al. (2012) explained about the image processing strategies for finding the Glaucoma and produced a deep convo on the red diseases the maximum not unusual eye disorder that predominantly quickly get infected. In their piece of labour lavishly explained about the distinctive take a look at on each the contaminants. [8]

Foster, P. J., & et.al. (2002) defined the short category of the Glaucoma, the reasons of experiencing glaucoma and the clinical strategies to find the disorder with the method to sort out the problem in a quick way. [10]

Blumenthal E. Z., & et.al. (2001) explained about the retinal layers and where the glaucoma occurs, why and how they occur [34]. The evaluation of his paper really took the research into a very nominal level and provided the proposed work a greater finishing. [20]

Kim J & et.al. (2017) explained the nature of glaucoma and the characteristic features of it. His piece of work dragged the proposed systems way properly into its track. In their work, the sensor augmentation is clearly described and how the sensors are actually working to make change in the field of medical science through the sensor actuation. [11]

Thus the proposed system is mainly used for the measurement of the ocular pressure that is the leading disease in the current era [35]. Thus the working platforms, usage of the higher end mobile phones continuously without any hassle, increases the pressure in the eyes that may leads to night blindness and even full blindness at the early stages of the humans. It should be diagnosed early or else the effect would be drastic in range.

2. EXPERIMENTAL SETUP

The pressure of the human eyes are getting higher and higher due to the radiations form the devices that we usually use and the hypertension and succession of the work pressure that endures the ocular pressure in the people [12]. The proposed system that inspects the ocular pressure of the eyes that tends to provide a great aspect of the how the pressure is been accumulated and how they can be rectified easily.

The Proposed system reveals to be the most satisfying inventions in the current era; the Contact lens provides how the eyes get irritated through the brightness of the electronic accessories through the mobile applications that were preinstalled in the users mobile [13]. The Proposed system is made of polymer resins that were preheated and formed into a normal contact lens and then the circuits are embedded into it through the Nano imprint lithography [18]. The Nano imprint Lithography is a technique used for constructing the contact lens through the UV light and to sterilize them from any other bacterial infections.

After the production of the Contact lens the circuits are embedded into the elastic and supportive contact lenses[14]. The contact lenses are used for measuring the ocular pressure in the eyes and intimate the user about the rise in pressure and prescribe the doctors nearby to check the pressure in the eyes. The Contact lens is designed with the 95% accuracy in the visible light regime and 1.5% low hazing noise in the visible light regime [15]. The Refractive index of the lenses would be about $\mu = 0.0096$. To aerate the eyes and for the good blood flow in the eyes the good aeration rate would be approximately about the range of about 12mm/mgs, the highest permeability of the lenses are about Dk of 370 U.

The normal ocular pressure of the eyes varies from one person to the other and the ranges are about 12-22mm/Hg. The higher the pressure caused some diseases like cataract, IOP, Age borne diseases, etc., but among these the most dangerous diseases is the glaucoma, caused due to the Inter ocular Pressure (IOP) [16]. The increase in pressure may lead to a serious eye problem called blindness, to avoid these conditions it is good to find the conditions of the glaucoma earlier and rectify them. The Proposed system tries to rectify the issue by alarming the user by giving a notification of about your eye pressure is high. The dimension of the contact lens is about 9mm in diameter and the axial length is about 4mm in length.

The proposed system contains an electronic circuit which is been scaled into Nano size and embedded into the contact lens [17]. The circuit is a transparent material which is translucent by the nature. The Electronic Circuit contains the biodegradable glaucoma sensor and the antenna for the data transmission with a battery for storing the charges that could be needed for the contact lens to transmit data to the PC and then to the Mobile Application. The Data is transmitted to the cloud and stored for further analysis. Once the pressure is been identified high the system gives an alert to the user by a normal notification message through the prescribed application [19]. The data's are given to a Personal Computer where the data's are stored into the cloud through the Internet of things modules and then transferred to the Artificial neural network layers for the further processing and provide a good and accurate result analysis by the android application that is been connected to the same local host from the Personal computer.

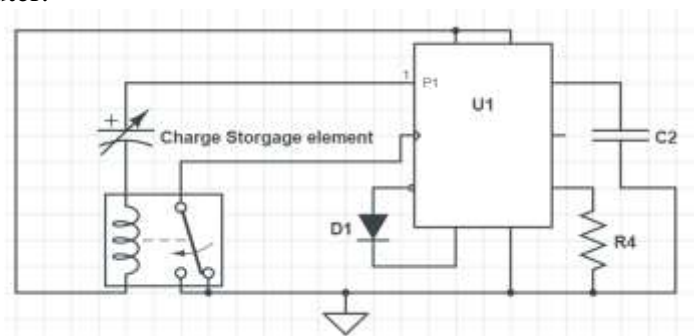


Figure . 3. Electronic Components of the Contact lens

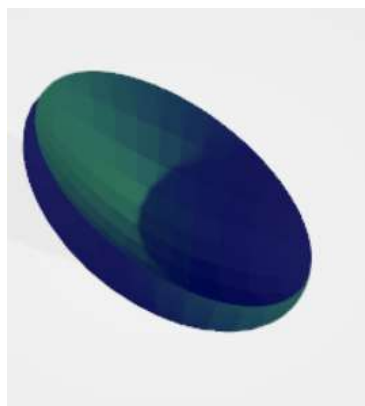


Figure .4. Poly resin Contact lens model.

The prototype model is been designed to check the elasticity and transparency of the Contact lens and the accuracy of the performance is also absorbed [20]. The Electronic circuits are placed in different transparent layers to produce a high resolution lens for the proper visionary [21]. The contact lens is been designed with adding the layers of the poly resins to fix the electronic components in the place as to not to disturb the retina and the pupil [22]. Thus according to these steps the layers of the resins can able to polymerize and gets settled in the proper places.

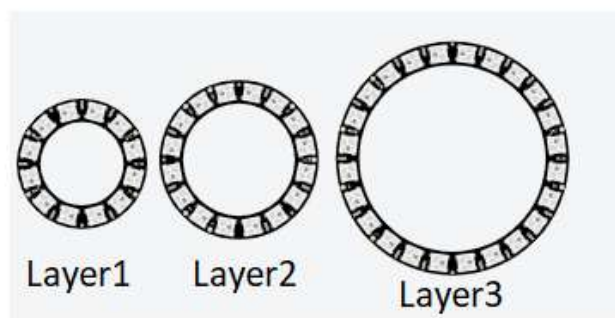


Figure.5. Different layers of the lens

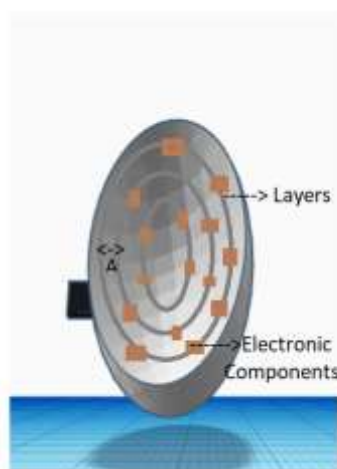


Figure .6. Typical Model of the contact lens

According to the medical evaluations of the glaucoma, the tonometry test is been performed in the eyes. The same condition is performed by our gadget also [23]. The pressure is generated into the eye that reflects the pressure in to the electronic circuits and if the voltage variations fluctuates to about more than the 5V we can identify there is high pressure in the eyes [30]. The pressure is been measured by some initial terms.

Thus the application calculates the value and gives an alert notification to the user. The final analysis of the rating of the pressure is been first abducted by the Artificial Neural network which takes multiple clinical trials of the sample and compare them and produce the optimized result [24][36]. All this process occurs in the Personal Computer and the data is been stored in the cloud and then a notification is send.

The clinical trials of about two to five samples are collected by the ANN through the command given to the IC that is been prefixed within the circuit [25]. The ANN process will be carried out by the Personal computer to give a proper and accurate result to the user.

Most probably, in the proposed system we have used the Neuroph software to run the application to give a better performance[26]. The Neuroph takes two to five samples from the contact lens through the antenna. Thus starts to evaluate the analysis.



Figure .7. Neural Network analysis

The evaluation results are been stored in the IoT cloud to produce better results to the system. The emphasis techniques make the system more reliable and possible to control the effectiveness of the contact lenses [27]. The histogram of pressure variation is been detected by the mat lab through the Neuroph networking is been given in the Figure: 8.

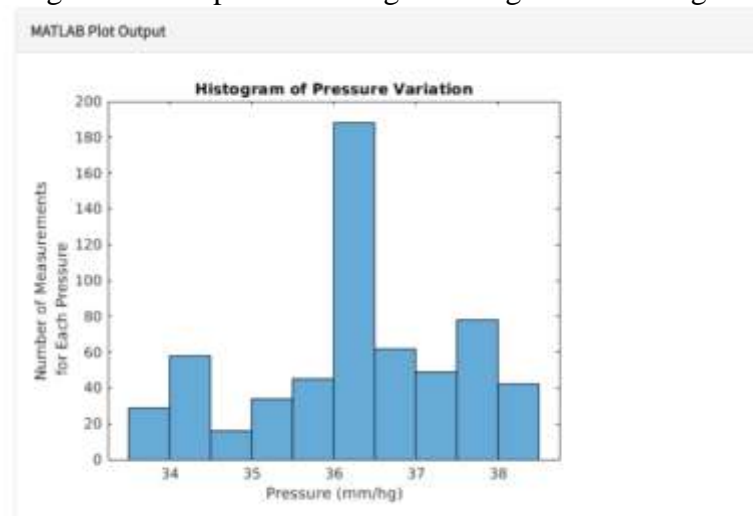


Figure. 8. Histogram of Pressure Variation.

The pressure gets increased at a point due to some work acquaintance or constant usage of the mobile phones for unwanted times and thus the system will adhere to the sense

and send a pop up message to the users registered mobile number by identifying the pressure increment and the message would contain the following details as shown in the figure: 9

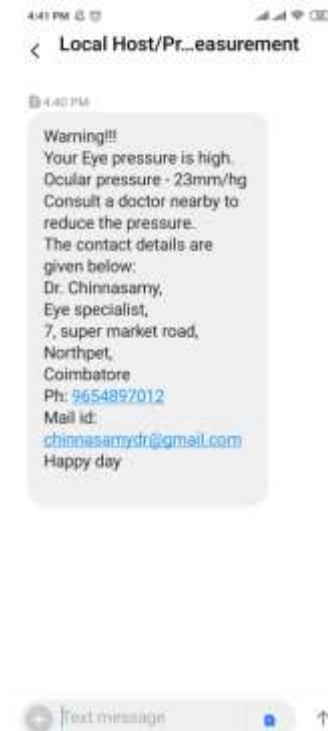


Figure.9. Warning Alert of High Pressure

The Host responds a message of alerting the user by saying the pressure measurement details and then recommends a doctor nearby the location of the user by providing the contact details of the doctor. This is how the host works [28][29]. Thus the technologies are getting more updated and the human cannot upgrade himself due to the biological conditions. In order to upgrade him all these inventions were pertaining to reproduce all these facts of verses.

3. CONCLUSION:

Thus the major factor in our biological reasoning's is the eye and it is the most prominent part of all. Without the eye no human can survive as possible as he can. It is important to prevent our eyes to be damaged by the harmful radiations from the customized used products of the current era. So it is naturally been evaluate that most of the eye diseases are affected by the constant usage of the highly sophisticated products. We cannot live without these sophistications but we can limit the usage of these products by a warning alert. Thus the proposed model aims to warn the user by intimating that their eyes are the important part of all and it should be protected at some cause. The paper strongly adheres to the less usage of all the sophisticated products to lessen the cause created by them. the overall experiment went out at good cause.

4. ACKNOWLEDGEMENT:

I thank Bannari Amman Institute of Technology for given us a platform to work with the contact lens in the Nano scale regions and thus the measurements were of in the experimental area. The measurements were taken at the experimental setup and not as deceiving as the real

one. The concept was derived by an original mean as such my sister in law is affected by the ocular pressure which leads to insomnia. In order to reduce the imbalanced life situational pressure of my sister in law, I derived this product.

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