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WEARABLE ACTIVE DRY EYE HUMIDIFIER

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Abstract-The eye is one of the most sensitive organs in the human body. Cataract and Conjunctivitis are the most habitual eye diseases among the people. Cataract it causes a sort of clouding on the lens leading to dim vision and if kept untreated for long which leads to blindness. Conjunctivitis is also called pink eye is a condition where the conjunctiva of the eye is reddened by an infection or by an allergic reaction. It can affect either of the eyes and it leads to redness or dispense. Bacterial and viral conjunctivitis are contagious. The RGB color sensor detect whether an eye has cataract , conjunctivitis or a normal eye. This project proposes the design of a eye glass wearable humidifier for the eyes. Unlike any spectacles of moisture chamber, the proposed system is an active device. It can self-monitored according to the colorimeter value to produce gloom which can increase humidification in the eyes using medicine pump. The electromechanical relay activates the medicine pump, temperature and humidity sensor used to measure humidity and temperature level of the eye and they interfaced with an Atmel 8 bit-controller. Experiment results show the design concept and demonstrate the prototype system. Dry eye can be solved by this project wearable active humidifier will keep proper moist level using medicine pump.

Keywords- Dry Eye, RGB, Colorimeter, Humidifier, Anon Controller, Tear Film Break-Up.

I. INTRODUCTION

Tears are essential to maintain a good eye health. Each time the eyes blinked, tears are spread around the cornea, the front surface of the eye. Tears can provide lube, remove the dust from the eye, moist the eye and provide clear vision. The three layers of tears are oil, water and mucus. The outer oily lipid layer is produced by meibomian glands which helps to prevent evaporation of the water layer. The middle watery lacrimal layer is produced by lacrimal glands.The inner mucous layer is produced by goblet cells which spreads the tears evenly over the surface of the eye. The symptoms of dry eye are developed while the tears evaporate immediately and are not evenly spread across the cornea due to the dearth of any of the three tear layers. People experiencing dry eye may feel irritated, gritty, scratchy, pain and redness of the eye. Besides, the dry eye symptoms may include series of excess tears and series of very dry eye, blurred vision and also low tolerance of reading, facing the computer or any visual attention activities. Advanced dry eye may damage the cornea and caused loss of sight. Elderly people are more prone to dry eye, where as it occurs at any age . According to survey of National Eye Institute, nearly five million Americans aged above 50 years are evaluated having dry eye. Due to hormonal change during pregnancy and menopause women are likely to develop dry eye.

II. RELATED WORKS

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[4] M. Guillan, C. Maissa, "Tear film evaporation--effect of age and gender. Cont Lens Anterior Eye," vol. 33, no. 4, pp.171-175, 2010 . –Aging of the Tear film includes a significant evaporation component characterized by higher tear film evaporation for the over 45 compared to younger people .the findings have significant implications for the management of presbyopic dry eye syndrome

[5] S.P. Bojko and J.D. Byassee, "Evaporative Humidifier." U.S. Patent 5,783,117, Jul.21,2017. - The main approaches used to reduce and treat dry eye are adding tears, conserving tears and increasing tears production. However, the dry eye symptoms can be reduced through the methods which includes drinking plenty of water, blink regularly when using the computer screen for long time, it increase the humidity level in the air at work and at home.

III. EXISTING SYSTEM

Problem arises when the available artificial tear solutions and eye drops are the power to solve the symptoms of dry eye effectively. It is not easy and convenient for older adults with dry eye to apply the eye drops periodically according to specific period of time, especially those with constrained or weak hand movement. Besides, human nature tends to be lazy to apply eye drops continuously throughout the whole day and sometimes when people are busy, they will tend to forget the routine. On the flip side, children do not know how and when to apply the eye drops without the help from older adults. The artificial tear solution and eye drop is not effective for solving dry eyes. It is not easy and convenient for old people with weak hand movement. Damage the eyes and it leads to blindness.

IV. METHODOLOGY

The proposed system comprises sensors and control unit. The humidity level is the main element in reducing dry eye disease and is temperature dependent. In this work, we utilize a humidity and temperature sensor to measure ambient temperature and humidity level. The sensor consists of a capacitive humidity sensor and a thermistor. 0.1 degree Celsius is the sensitivity of the sensor and to humidity level 0.1 %. Temperature and humidity level is measured repeatedly every seconds. The optimum temperature and humidity for the human eyes are 37 ℃ and 40 % respectively. Below the range, the atmel 8 bit controller will activate the relay . The medicine pump is controlled by the microcontroller using a relay it will spray the medicine. The RGB color sensor is used for detect the redness of eye. It serves as the main control unit for the sensors. It reads the ambient temperature and humidity level and eye redness. If the eye is pink color is detected and it will activate the medicine pump is attached to the glasses. It will able to self-regulate according to the ambient relative humidity. For a start, we restrict to indoor application. The system if capable of constantly tracks the dryness of the eye using the humidity sensor and RGB (colorimeter) sensor.

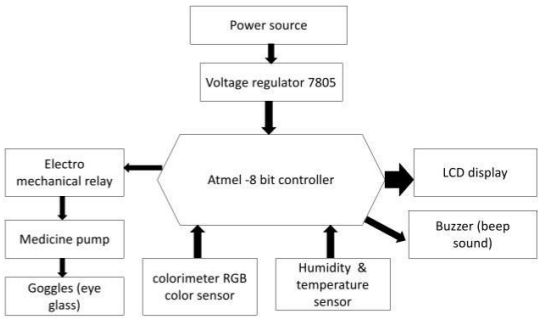

Fig 1: Proposed system block diagram

V. SYSTEM ARCHITECTURE

The design of any system consists of Hardware requirements and Software development. Hardware requirement is focused on the components which are used for designing the project and Software development is focused on the coding which is loaded into the hardware.

HARDWARE DEVELOPMENT

The dry eye humidifier system consists of Atmel 8 bit Microcontroller,Ic Voltageregulator, Humidity Sensor,RGB sensor,Relay and Medicine Pump.

5.1 ATMEL 8 BIT MICROCONTROLLER

The Atmel 16-bit AVR RISC-based microcontroller consists of 8KB of programmable flash memory, 1KB of SRAM, 512K EEPROM, and a 6 or 8 channel 10-bit A/D converter.

5.3 HUMIDITY&TEMPERATURE SENSOR

Humidity Sensor is the devices that can be widely used in consumer, industrial, biomedical, and environmental etc. applications for measuring and monitoring humidity.

Fig 2: humidity sensor

5.4 RGB COLOUR SENSOR The color sensor detects the surface of the color, usually in the RGB scale. The color sensor can discriminate between the colors and measures the intensity of the reflected light.

Fig 3: RGB sensors

5.5 RELAY

A relay is a switch which is electrically operated. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts.

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5.2 IC VOLTAGE REGULATOR Voltage regulators constitute a class of widely used ICs. Regulator IC units contain the chip for reference source, reference amplifier, control device and single IC.

Fig 4: relay

5.6 PUMP

The water pump which uses the principles like mechanical as well as hydraulic all through a piping system and to make enough force.

VI. ADVANTAGE OVER EXISTING METHOD

- It will be able to self-regulate according to the ambient relative humidity level.
- The system if capable of continuously monitoring the dryness of the eye using the colorimeter (RGB) sensor.
- It is more effective than using the artificial tear.
- It is easy and convenient for old people with weak hand movement.

VII. EXPERIMENTAL RESULTS

This prototype model is developed in such a way so that the required amount of voltage for the components will get boosted using 7805 voltage regulator .The medicine pump and the electro mechanical relay are interconnected so that the medicine is sprayed into the respective persons eye. Humidity and RGB sensor are connected to the main unit micro controller. The goggles are developed with a capacitive combination of sensor. This active setup ensures the solution for the people with dry eye and also for the people with weak hand movement. Results are shown in the fig 6 and fig7.

Fig 5: Prototype model result for dry eye

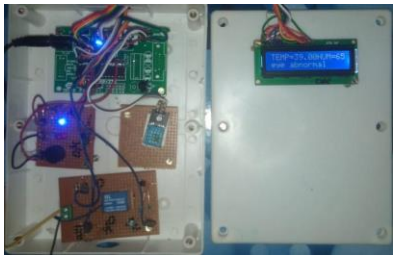

Fig 6:Prototype model result for abnormal eye

VIII. CONCLUSION

The development of the wearable eye humidifier project is successful with the completion of the final prototype model. The objectives of the project are achieved where thorough study on the dry eye disease and different humidification systems are made prior to the development of the wearable eye humidifier. The prototype model of the wearable eye humidifier is tested and is able to increase the humidity level in eyes. The prototype model is developed to show the concept and ideas of the wearable eye humidifier which is a new invention to provide a better solution to the dry eye disease. Further power management to reduce power consumption (e.g. reduce the frequency of sensing if measurements are the constant) can also be exploited in next generation of prototype.

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