Smart vision safety control system for children using IoT with brightness control

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Abstract— This review paper is all about revised information about various patents, research papers and literatures on vision safety system and automatic brightness, their merits and de- merits and how our project is providing solutions to it. Everything is defined in this paper starting from the introduction to the working principle. This project aim is to provide a low cost solution for the problem of eye strain and dry eyes, especially for kids caused by watching television consistently or laptop screens having high level of brightness with a small distance between user and the screen at low levels of ambient light. At the end of this paper we have proposed a method which will overcome the present literatures. The key-point of the proposed work is inclusion of smart message communication using Node-MCU and usage of Ultrasonic sensor and Light Dependent Resistor for calculating user distance and level of ambient light respectively.

Index Terms—**Vision-safety, User-Distance, Automatic- Brightness, Node-MCU**

I. INTRODUCTION

The present innovation focuses on automatic brightness control based on user distance and ambient levels of light available in surroundings. This project intends to provide vision safety for children who get to watch television nearer to it. Also parents are able to keep an eye on them through automatic warning system using Internet of Things. This system switches off automatically when the user distance is too near beyond a certain limit. It is an intelligent device that senses the physical situation of the user, and the ambient light and based on these two parameters, it decides the level of the screen brightness and adjusts the same accordingly, using Arduino UNO board. So, based on the intensity of light available in the room and the users distance the brightness of the screen is adjusted. Ultrasonic sensor is used to measure the distance between the television and the user. This project has many applications which can be used in offices, homes, IT companies etc. This can certainly be implemented to laptop screens even, so that people who work on computers all day long get their vision safety protection.

II. LITERATURE REVIEW:

In Literature review various patents and research papers are verified that are already available. Some merits and demerits in those patents have been listed and solution to those demerits has been proposed.

"Method and device for monitoring TV set watching distance" the patent which was proposed by x. hé conveys that we can calculate the distance between the human body and the tele- vision and smartly give out a warning for a specific distance and control the connection parameters of the television so as to accomplish the goals of shielding people's eyesight and supervising the watching distance [1]. The present innovation consists the following steps. If the user enters the warning range a buzzer like sound is triggered, else the detection process is continued [1]. The present innovation has the advantages that the present invention improves the accuracy for a television actively identifying a person and the precision for measuring the distance between a person and a television, can effectively protect user's health [1]. "Vision protector "the patent which was proposed by w. g. chéng, relates to vision protector, which is exclusively used for a TV. The utility model is designed in a way that the reflected signal of the human body is received by an infrared receiving circuit, the received tiny signal is enlarged by an amplifying circuit [2]. The tiny signal is sent to an amplifier of the second level to enlarge. After the enlarged signal amplitude is determined using a Schmitt trigger, the signal is input to a comparator circuit [2]. The calculated signal of the human body in the monitoring area or not in the monitoring area is determined using the

comparison and the discrimination. When someone stays in the red zone for three seconds, the vision protector can send out a warning sound [2]. The viewing distance must be immediately adjusted else the antenna signal is destroyed by an ablation circuit of an antenna signal. The innovative model makes the television picture automatically disappear. After the relative distance is adjusted, the normal television picture is automatically recovered.

"Infrared induction brightness control circuit" the patent which was proposed by y. j. ruì, is infrared induction brightness control circuit, and the circuit comprises an infrared detection module which consists one or more infrared induction devices and a start switch, where one end of each infrared induction device is connected with a voltage, the other end of each infrared induction device is connected with the start switch, and the start switch is used for the connection of a detection signal or the power voltage [3].The circuit also consists an integral circuit, and the integral circuit is connected with the start switch, so as to eliminate sharp pulse interference in the infrared signal detected by the infrared detection module. The circuit also comprises a drive circuit, and the drive circuit is connected with the output end of the integral circuit, so as to enable the infrared signal with the sharp pulse interference being eliminated to be driven and then transmitted to a line-field scanning brightness input end of display equipment [3]. The circuit enables the infrared induction devices to be connected to the line-field scanning brightness input end of display equipment through the integral circuit and the drive circuit, thereby enabling the brightness of the display equipment to be lower when the intensity of the infrared signal is higher, and preventing the brightness signal if the display equipment at a short distance from stimulating the eyes of a child [2].

"Automatic screen brightness control using images and background of user" the paper which was proposed Tien-Yan Ma, Chin-Yang Lina is novel automatic brightness control method which is suitable for low illumination[4]. This paper takes an advantage of the front panel camera on the phone and face detection techniques to capture the image of user's face and background. With low ambient brightness, the proposed scheme calculates the contrast ratio between user's face and background to determine the optimum screen brightness [4]. If the image of user's face is obviously brighter than the background one, the screen brightness should be lower down. On the other side, if the brightness of user's face is too dull, the system software may raise up the screen brightness. This brightness adjustment scheme focusses on eye comfort instead of power saving because, the use of front panel camera raise the energy consumption.

"Auto-brightness control technology depending on user's pupil area" the paper which was proposed by Seung-Ryeol Kim and Seung-Woo Lee is automatic brightness control (ABC) technology depending on pupil area. The experimental results revealed that the pupil area decreases by 33% as the ambient ill-luminance raises tenfold [5]. A relation which is linear was also observed between significant display luminance and logarithmic of ambient in our previous experimentation. As a result, the comfortable and reliable display is proportional to the relative pupil area, which enables us to propose a novel ABC technology depending on the eye pupil area.

In the above patents we have some disadvantages and our project overcomes those.

1) In the first patent the system is only able to give a warning sound but it does not have auto-brightness feature [1].

2) In second patent the screen is completely disabled if user entered warning range. Children cannot find what happened [2].

3) In third patent there is no message communication to parents that the child entered the red zone [3].

4)In automatic brightness control using user's background and images as well as in automatic brightness control using user's pupil area there is no communication with parents[4][5] .

The main objective of this project is to adjust the brightness of screen for vision safety protection based on user distance and ambient light conditions. There are three objectives to be achieved in this project.

LDR should be able to detect the surrounding light and adjust itself automatically. The optimum distance to watch any screen is greater than 2.5

times the diagonal length of screen. So if the user distance is between 1.5 to 2.5 times the length of screen then the message would be sent to parent like a warning. After sometime if the user is still present in that range then the brightness is adjusted. If the user distance is less than 1.5 times the length of LCD screen then a buzzer would make a sound for some time. If the user even after the buzzer sound didn't change the position. Then screen would be automatically switched off. Table-1 shows comparison table of various patents and research papers based on principle and sensors used. Figure-1 shows the proposal given in this paper.

Fig.1 Block diagram of the proposal

Table-1 Comparison table

REF. NO	PRINCIPLE	SENSORS
[1]	User's Distance	Ultrasonic Sensor
[2]	User's Distance	Analog infrared receiving circuit with Amplifying ,Schmitt Trigger and Comparator Circuit
[3]	User's Distance	Infrared Induction Circuit
[4]	Based the contrast ratio between user's face and background	Charged Couple Device
[5]	Depending upon the pupil area.	IR Camera, IR LED, LED Lamp.
Proposed Work	Users Distance, Ambient levels of Light	Ultrasonic Sensor, Light Dependent Resistor

III. CONCLUSION:

This paper reviews the various papers and patents and by analysing and going through the papers we would propose the automatic brightness feature based on the user's distance which has the communication feature using IoT. This paper resolves the disadvantages and limitations present in various papers. Ultrasonic sensor is used to calculate user distance and light dependent resistor is used to calculate ambient levels of light. Arduino is used to function as a micro-controller board which takes decision based on the data available from sensors on brightness and automatically triggers a message to the dear ones.

IV. REFERENCES

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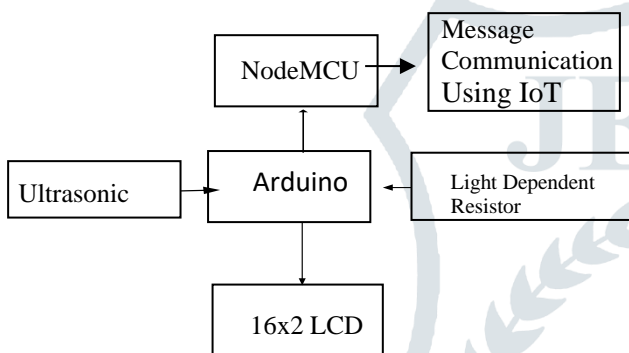[5] S.-R. K. a. S.-W. Leea), "Auto-brightness control technology depending on user's pupil area," Electronics Express, Seoul, 2018.