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Automatic Upper Dipper Headlight for Vehicle

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Abstract: *From the last decade there is several incidents stating the dangerous effects of using high intensity headlights in vehicle. During night this headlights had seen a major reason for accidents. Vehicle driving in night is difficult task compared to the daytime as there is absence of proper light illumination. In night driving the high intensity lights can cause temporal blindness in driver passed by the vehicle. This leads to the driving vehicle unconsciously and can cause life threatening incident. To reduce such risk a prototype for automatically dimming the vehicle headlight is proposed in this paper. Proposed system uses a Light Dependent Resistor to sense the light intensity and according to the intensity of sensed light dimming of Headlight is achieved*

Keywords: Headlight, automatic, dimmer, light control, high beam, low beam, LDR

I. INTRODUCTION

Whenever a high intensity light is focused on human eye a temporal blind effect is reflected in human eye which cause unable to see things clearly for some time this effect is caused due to Human eyes are more sensitive to high intensity light. In science this effect is also called as Troxler's fading effect. According to the report of ministry of transportation and highways, India 2021 most of the accidents are caused in night driving and most of the cases includes the drowsiness, lack of following traffic rules, over speeding etc. Some cases are identified as sudden blindness of drivers on curly road due to the high intensity headlights which flashed on driver's eye [1]. This cases are increasing in India as most of the population in India regularly drive the vehicle at night which increases the possibility that the eyes are exposed to this high intensity lights. Also many times it is noted that drivers not dimming the lights manually whenever needed which causes the accidents. After conducting study on some related research in this domain such as:

An approach for Automatic headlight dimming for vehicles the prototype introduces LDR for photo resistivity against the light intensity for headlight dimming [2]. Another work involves Anti-Glare lights system for vehicles uses electrochromic film which helps to reduce the glare of lights at the same time it also insures that proper light is emitting on the road [3]. Another approach is based on CAN protocol for communicating also uses various sensors to keep track of vehicle momentum and tilting [4]. Using cross way communication between two vehicles for dimming of headlight using visible light communication [5]. A study conducted on vehicle positions conveying to other vehicle by headlight illumination to reduce the risk of vehicle crashing [6]. A handbook published to guide the driver about safety and precautions to be taken while driving a vehicle at night [7]. Another work includes Arm controller and LDR based approach for automatic headlight dimming system [8].

II. TEMPORAL BLINDNESS

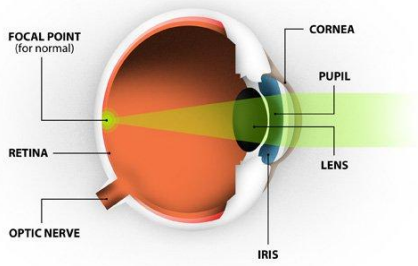

Fig 1: Light Beam Flashed on Eye

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Temporary blindness caused by sudden eye exposure to a bright light which causes oversaturation of retinal pigment. Fig. 1 shows the light beam flashed on eye retina. This effect can last until the pupil is restore to its original size. Study shows that this effect can more affecting in night as the absence of proper light illumination has a greater impact of temporal blindness. Due to the sudden blindness it can be hazardous in situations like driving, or working in place where lack of vision can caused major accidents. This effect is also called as Troxler's effect or fading.

III. METHODOLOGY

Proposed system for Headlight Dimming uses a LDR for sensing the light intensity from coming vehicle this approach is used for Headlight dimming based on the photosensitivity concept.

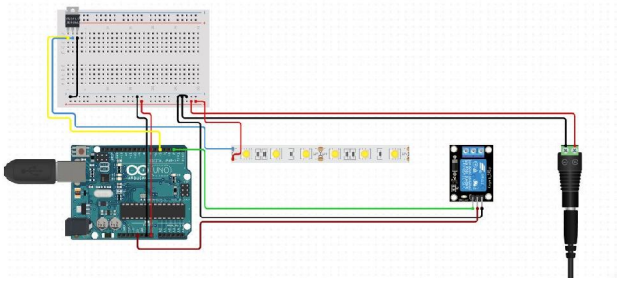

Fig 2: Circuit Diagram of Proposed System

Fig. 2 shows the circuit diagram of proposed system which consist of Arduino Uno board, a relay module, LDR and Battery. Proposed system uses LEDs as headlight and the illumination of this LEDs are adjusted so that the intensity will be high at initial.

3.1 Flow Chart

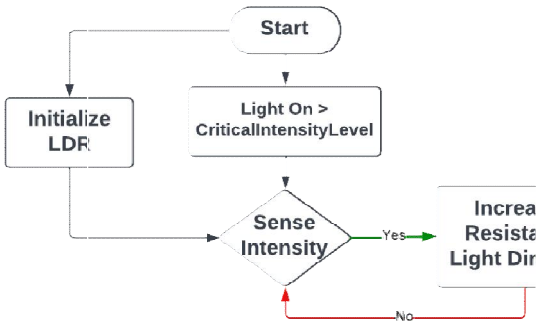

Fig. 3: Flow Chart of Proposed System

Working flow of the proposed system is shown in fig. 3.

Initially the normal functioning of vehicle is expected and the Bright headlight is turned on and the light is at high intensity value greater than the critical intensity level over which a normal human eye can function normally without having fading effect. LDR sensor is initialized and start sensing the light intensity of nearby vehicles if intensity sensed light will dim by increased in resistance if not sensed the working will iterate in infinite loop.

3.2 Working

Normal human eye can work normally at color temperature of 4900 to 6500 k (Kelvin Color Temperature). During night time human eye is highly vulnerable to the light intensity. The working of the prototype is as vehicle is functioning normally at night with high intensity headlight is turned on and whenever the other vehicle with high intensity light is passing by the vehicle LDR comes into picture as name suggest it is a Light Dependent Resistor. The resistance will be varying according to the sensed light intensity.

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If the light intensity is high the resistance will high turning headlight dim. Same functionality can be applied to the other vehicles so that any vehicle is passing by other vehicle both headlights will be dim. This will reduce the risk of Troxler's effect on eye and major incidents can be avoided.

IV. TOOLS AND TECHNOLOGY USED

Major components used for prototype is Arduino Uno which is low cost and user friendly development board. LDR sensor which offers a high light resistivity of 50-100k ohms. A relay module as switching device, for testing the 12v high beam bulb is used which is powered through an automotive 12 v 8h battery.

V. RESULTS AND ANALYSIS

Proposed system is tested using high beam and low beam 12 v lamps which is supplied using the 12v 8h automotive battery. The actual sensing distance is measured from 15 meters in night which is currently suitable for night driving application. In most cases where the traffic is more than the expectations the switching cannot worked properly. Further in future the modifications for high sensitivity using a complex switching circuit can be made. Below table shows the eye and light illumination sensitivity for normal human eye based on various light illuminations such as full moon night, In street lighting illumination etc.

Table 1: Eye and Light Illumination Sensitivity

Light Illumination	**Critical Values**
Full Moon	1 lux
Street Lighting	10 lux
Home Lighting	30 to 300 lux
Office Desk Lighting	100 to 1000 lux
Surgery Lighting	10000 lux
Direct Sunlight	100000 lux

Fig 4 shows the actual implementation of the proposed system with switching to low intensity and fig. 5 shows front view of proposed system with the switching from low to high intensity.

Fig. 4: Automatic Headlight Dipper System

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Fig. 5: Front View

VI. CONCLUSION

Major cause of accidents are fading effect in driver's eye due to high intensity light flashed on eye during night time this effect is also known as Troxler's effect as the evolved modernization and the facilities of vehicles increased in the number of vehicle users and also the road accidents are increased day by day so there is need to improvement in vehicles and innovations should be considered for human safety based on the need the proposed system will play a major role in avoiding such incidents with a low cost and reliable solution for automatic headlight switching from high beam to low beam which can avoid the fader effect in drivers eye. Proposed system will sustain in future for its user-friendliness and for its reduced power consumption factor which are essential factor in any automobiles development.

VII. FUTURE SCOPE

Currently the proposed system is focused on controlling the intensity of light but in future some considerations can be made like adjusting the beam of headlight for particular area of road or also the range of the system can be increased with proper alerting of high light beam so that if any sudden error comes in to picture the driver can be able to manually switch the headlight so that the probability of accident can be further reduced. Also modifications can be done with the system to adjust the development cost according to specific applications.

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