# Automated Headlight Intensity Control and Obstacle Alerting System

Arpita K , Akhila M Jain, Avi Kumar R
Students, BE, Department of TCE, GSSSIETW, Mysuru, Karnataka, India,

Assistant Professor, Department of TCE, GSSSIETW, Mysuru, Karnataka, India

***Abstract*— Headlight intensity of vehicles poses a great danger during night travel. The drivers of most vehicles use high bright beam while driving at night. This causes inconvenience for the person travelling from the opposite direction. To avoid such incidents. The proposed system can be demonstrated with the help of two vehicles where the high beam of vehicle can be controlled with help of other car coming in opposite direction and vice versa using LDR sensor and zigbee communication which avoid the accidents to greater extent. . We are designing a prototype of automatic headlight intensity control system and expected to dim the headlight to avoid this glare. This beam causes a temporary blindness to a person resulting in road accidents during the night. This automatically switches the high beam into low beam thus reducing the glare effect by sensing the approaching vehicle. This model concept eliminates the requirement of manual switch by the driver which is not done at all time.**

## I. INTRODUCTION

Light is electromagnetic radiation within a certain portion of the electromagnetic spectrum. The word usually refers to visible light, which is visible to the human eye and it is responsible for the sense of sight. Visible light is usually defined as having wavelengths in the range of 400–700 nanometers, or 400×10−9 m to 700×10−9 m, between the infrared and the Ultraviolet. Light can be produced by nature or by humans. Artificial light is typically produced by lighting systems that transform electrical energy into light. The human eye is a very sensitive organ. It works almost an entire day without any rest. The human eyes are adaptable to a particular range of vision. There are two visions namely the scotopic and photopic vision. Human eyes actually behave differently in different conditions. During bright surroundings, our eyes can resist up to 3 cd/m2. This is the photopic vision [2].

## II. RELATED WORK

**Victor Nutt, ShubhalaxmiKher,[1]** proposed by many factors are considered when analyzing automobile transportation in order to increase safety. One of the most prominent factors for night-time travel is temporary blindness due to elevated headlight intensity. While headlight intensity provides better visual acuity, it inversely affects oncoming traffic. This problem is compounded when both drivers are using a higher headlight intensity setting. Also, higher speed due to decreased traffic levels at night increases the severity of accidents. In order to eliminate accidents due to temporary driver blindness, a wireless sensor network (WSN) based controller is devised to quickly transmit sensor data between cars. Low latency allows quicker headlight intensity adjustment to minimize temporary blindness.

**VithalkarAkshayGanesh, KhavareVinayakVithal,[2]** described about an Automatic Headlight Beam Control System for a motor vehicle includes two phototransistors as a normal light sensors, one has a field of view forward of the vehicle, while other has a field of view normal to the road surface and it facilitates not only auto-switching of the headlight but also, beam modulation. This article aims at describing the work accomplished for the development of AHBCS.

**Okrah. S.K williams. E.A kumassah. F,[3]** explained about Headlights of vehicles pose a great danger during night driving. The drivers of most vehicles use high, bright beam while driving at night. This causes a discomfort to the person travelling from the opposite direction and therefore experiences a sudden glare for a short period of time. This is caused due to the high intense headlight beam from the other vehicle coming towards the one from the opposite direction. In this project, an automatic headlight dimmer which uses a Light Dependent Resistor sensor has been designed to dim the headlight of on-coming vehicles to avoid human eye effects. This automatically switched the high beam into low beam, therefore reducing the glare effect by sensing the light intensity value of approaching vehicle and also eliminated the requirement of manual switching by the driver which was not done at all times. Matlab software was employed in designing the project. The Keil software was also employed to program the microcontroller. The system device was able to automatically switch the headlight to low beam when it sensed a vehicle approaching from the opposite side using LDR sensor. It was observed that the maximum spread angle of the headlight was 135º. At the time the spread light from other sources reached the sensor, its intensity would be very much reduced below the triggering threshold level. The sensitivity of a photo detector determined the relationship between the light falling on the device and the resulting output signal. A server module could be included to this system for receiving and storing headlight rays parameters information in a database application.

## III. SOLUTION STRATERGY

The proposed system it is expected that the problem of temporary blindness against would be the luminous intensity of the headlight of the vehicle come to the fore, that the analog-to-digital converter ADC can be sent to sense signals

to digital signals. The analog-to-digital converter converts there digital signal to the Arduino controller when the threshold intensity is set. It would compare and sends this signal to the other vehicles via zigbee system as soon as the other system receives the signal via the zigbee the pulse width modulator in the system is connected would reduce the intensity of the headlight to the received intensity. The same function is performed absorbed by the system in the other vehicle..

## IV. DETAILED DESIGN

The chapter includes the block diagram, circuit diagram, design specifications of the project and the components used.

### *4.1 BLOCK DIAGRAM*

The figure 4.1 and 4.2 shows the block diagram of automated headlight intensity control and obstacle alerting system. The hardware and software components required for the project are placed.

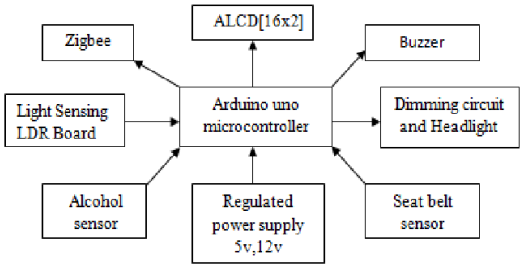


Figure 4.1 Headlight of vehicle 1

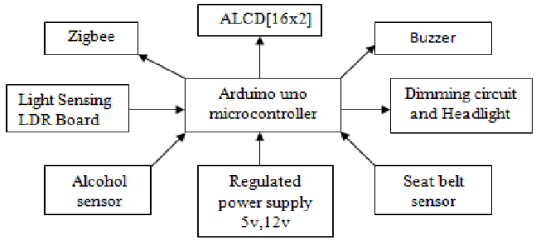


Figure 4.2 Headlight of vehicle 2

The block diagram explains developing system which provides the solution for the temporary blindness, phototransistor is used to sense the headlight intensity of the coming vehicle. Alcohol sensor and slot sensor is used to sense the obstacle which is present in the vehicle. ADC is used to convert analog signal to digital signal. The components used in this vehicle are ALCD[16x2], alcohol sensor and slot (seat belt) sensor, LDR, Zigbee, ADC, dimmer circuit, buzzer.

*HEADLIGHT*

Headlights should project sufficient light far in advance of the vehicle so that steering and braking can be taken in time, while not causing excessive glare to oncoming drivers. While driving, it is necessary to illuminate the rod ahead of the automobile so as to reveal objects ahead from a safe distance but improper lighting arrangements of the vehicles on road cause difficulty in driving at night. Bad driving habits and infrequent use of beam shifting/signals further enhances this problem and often remains the main reason for road accidents at night. With the auto boom, which had brought a large number of vehicles on to Indian rods? The accident rate has also risen alarmingly. “In about three lakh road accidents that occur every year, more than 70,000 persons are killed and 2.5 lakh injured. It is therefore, of paramount importance to drivers and other rod users of fine-tune their road sense” Driving an automobile is primarily a visual task. By one estimate, as much as 90% of the information that drivers gather is received visually and whatever the actual percentage may be, the importance of the visual system to driving can not be doubted. However, in order for the visual system to detect, attend to, and recognize information, there must be adequate lighting. Drivers require enough lighting at night to see a variety of objects on the highway, including traffic control devices.

Figure 4.3 Headlight of car

***ALCOHOL SENSOR***

**Figure 4.4** Alcohol sensor

The alcohol sensor is suitable for detecting alcohol concentration on our breath, just like a common breathalyzer. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple, all it needs is one resistor. A simple interface could be a 0-3.3V ADC.

***LDR***

Light-dependent resistor alternatively called an LDR, photo resistor, photoconductor, or photocell, is a variable resistor whose value decreases with increasing incident light intensity.

An LDR is made of a high-resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The

resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

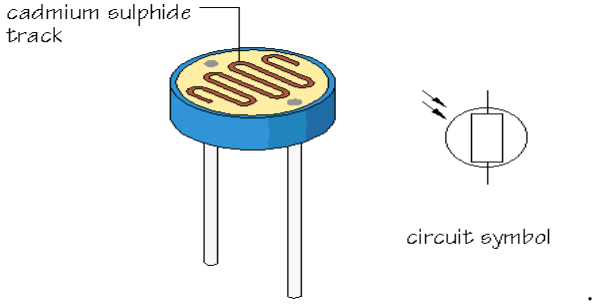


Figure 4.5 Light dependent resistor

A photoelectric device can be either intrinsic or extrinsic. In intrinsic devices, the only available electrons are in the valence band, and hence the photon must have enough energy to excite the electron across the entire band gap. Extrinsic devices have impurities added, which have a ground state energy closer to the conduction band - since the electrons don't have as far to jump, lower energy photons (i.e. longer wavelengths and lower frequencies) are sufficient to trigger the device.

When light shines onto the LDR its resistance falls and current flows into the base of the first transistor and then the second transistor. When the light level is low the resistance of the LDR is high. This prevents current from flowing to the base of the transistors. Consequently the LED does not light.

*ALPHA-NUMERIC LCD DISPLAY*

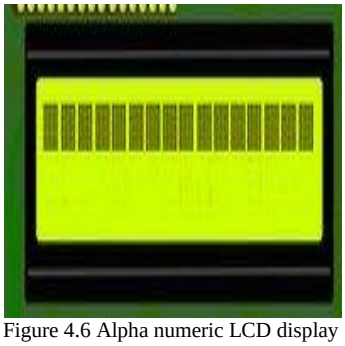

Figure 4.6 Alpha numeric LCD display

A liquid crystal display (LCD) is a flat panel display,

electronic visual display, based on Liquid Crystal Technology. A liquid crystal display consists of an array of tiny segments called as pixels that can be manipulated to present an information. Liquid crystals do not emit light directly instead they use light modulating techniques.

*BUZZER*

A buzzer or beeper is a signaling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound.

Figure 4.7 Buzzer

Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong. Often these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another implementation with some AC-connected devices was to implement a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8-ohm speaker. Nowadays, it is more popular to use a ceramic-based piezoelectric sounder like a Sonalert which makes a high-pitched tone. Usually these were hooked up to "driver" circuits which varied the pitch of the sound or pulsed the sound on and off.

*ZIGBEE*

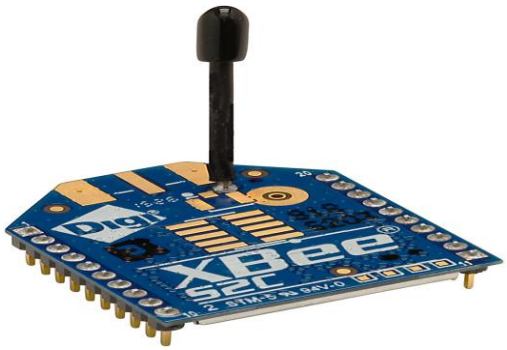

**Figure 4.8** Zigbee communication

Zigbee is ordinarily used in wireless sensor network and control systems which connect and communicate among thousands of tiny sensors, these sensors require very small amount of energy to send data from one sensor to another sensor through radio waves in a relay way, and communication efficiency is very high. Wireless communication is the process of transferring of information in a distance without any conducting physical medium.

Zigbee is a standard that defines a set of communications protocol for low data rate short range wireless networking. Zigbee based wireless devices operate in 868 MHz, 915 MHz, and 2.5 GHz frequency bands. Zigbee is a kind of short distance, low power, low data transfer rate,

low cost, low complexity wireless network technology. Zigbee connect and communicate among thousands of sensors.

**DIMMER CIRCUIT**

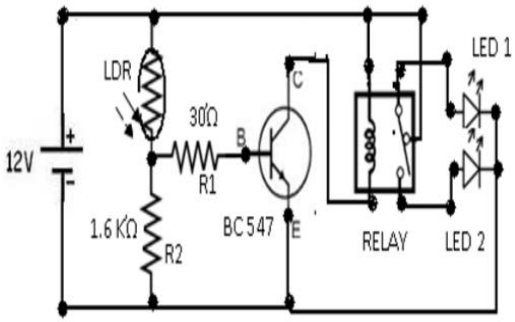


Figure 4.9 Dimmer circuit

The basic idea about the working of the circuit can be understood. The LDR acts as a variable resistor. So the LDR, the two resistors form a potential divider network which will decide the current in the circuit. Thus, this balanced network gives a trigger to the gate/base of the transistor. The design of this particular circuit gets a trigger if there is a voltage imbalance in the circuit due to change in resistance of the LDR due to the light source.

The basic operation is like that of a comparator. The transistor's output is connected to the relay coil. The bulbs are already connected to the relay contacts as mentioned earlier. Bulb 1 represents the high beam which is in normally closed (NC) condition with the relay. Bulb 2 represents the low beam bulb of the vehicle which is at the normally open terminal (NO) of the relay. Whenever a high-intense light falls on the LDR, it's resistance drops thus creating an unbalance in the potential divider formed between the LDR, and two resistors R1 and R2. This will create a trigger current which turns on the transistor BC 547. The transistor gets into conduction mode and switches the relay. Hence the NC terminal will get disconnected and NO terminal will be switched. So, the vehicle's headlight which is in bright mode(bulb1) gets turned off and the low beam mode bulb 2 gets turned on by the relay. This happens when the vehicle from the opposite side crosses the vehicle. Thus as the other vehicle comes nearer, the intensity of that beam will increase and will hence switch high beam light to low beam. As it moves away, the LDR will be turned away from the moving vehicle. So the LDR resistance increases and the bridge balances. There will hence be no trigger current and the relay switches back to its normal position. This will again turn on the bright beam mode bulb in our vehicle.

*SLOT SENSOR*

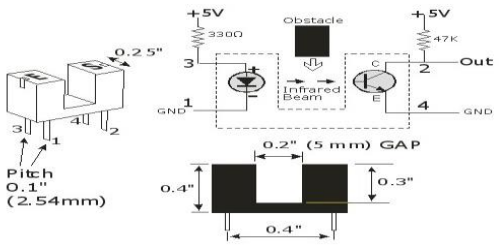


**Figure 4.10** slot sensor

MOC7811 is a slotted Opto isolator module, with an IR transmitter & a photodiode mounted on it. Performs Non-Contact Object Sensing. This is normally used as positional sensor switch, limit switch or as Position Encoder sensors used to find position of the wheel. It consists of IR LED and Photodiode mounted facing each other enclosed in plastic body.

*RELAY SWITCH*

Figure 4.11 Relay switch

A relay is an electromagnetic switch operated by a relatively small electric current that can turn on or off a much larger electric current. The heart of a relay is an electromagnet. Relay is a kind of electric lever: switch it on with a tiny current and it switches on another appliance using a much bigger current. Many sensors are incredibly sensitive pieces of electronic equipment and produce only small electric currents. But often we need them to drive bigger pieces of apparatus that use bigger currents. Relays bridge the gap, making it possible for small currents to activate larger ones. That means relays can work either as switches turning things on and off or as amplifiers converting small currents into larger ones.

*LM358 IC*

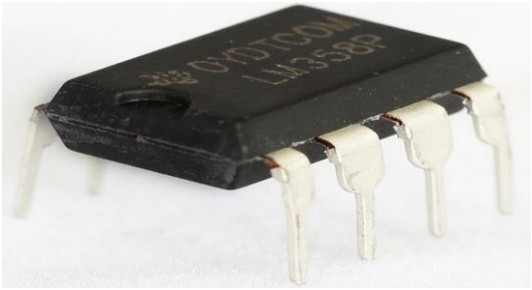


Figure 4.12 LM358 IC

The LM358 IC is a great, low power and easy to use dual channel op-amp IC. It is designed and introduced by national semiconductor. It consists of two internally frequency compensated, high gain, independent op-amps. This IC is designed for specially to operate from a single power supply over a wide range of voltages. The LM358 IC is available in a chip sized package.

## CIRCUIT DIAGRAM

The design of this device was done on a vero board of dimensions 310.5 mm x 160 mm x 2 mm. Vero board is called strip board. It is a widely-used type of electronics prototyping board characterized by a 0.1 inch 2.54 mm regular rectangular grid of holes, with wide parallel strips of copper cladding running in one direction all the way across one side of the board. In using the board, breaks are made in the tracks, usually around holes, to divide the strips into multiple electrical nodes. With care, it is possible to break between holes to allow for components that have two pin rows only one position apart such as twin row headers for ICs. Components were placed on the plain side of the board, with their leads protruding through the holes.

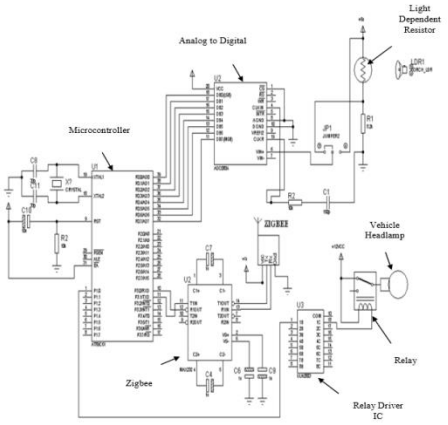


Figure 4.13 operational circuit

The leads are then soldered to the copper tracks on the other side of the board to make the desired connections, and any excess wire is cut off. The continuous tracks were easily and neatly cut as desired to form breaks between conductors using a 5mm twist drill, a hand cutter made for the purpose, or a knife. Tracks were linked up on either side of the board using wire. The soldering process was carried out using a lead and soldering iron. This was done by joining the supposed terminals together before soldering. And after soldering each unit, test was carried out using a meter to ensure good contact.

The LDR acts as a variable resistor. Therefore, the LDR and the two resistors form a potential divider network which will decide the current in the circuit. Thus, this balanced network gives a trigger to the gate/base of the transistor. The design of this particular circuit gets a trigger if there is a voltage imbalance in the circuit due to change in resistance of the LDR from the light source.

The source required for the operation is 12 V DC supply and the DC source is then taken from battery. However, in real-time application, this can be substituted from the car's own battery pack. The headlights, LDR and transistor are all connected to the same DC supply

## V. RESULTS

An automatic headlamp dimmer of on-coming vehicles had been designed using LDR sensing technique. Thus, the system device automatically switches the headlight to low beam when it senses a vehicle approaching from the opposite side using Light Dependent Resistor (LDR) sensor. Automatic headlight intensity beam is controlled by using photo transistor and XBee. The work gives the solution for night temporary blindness which is caused by high beam headlight intensity could be cured .so the accidents can be reduced during night time so people can safely travel in night time.

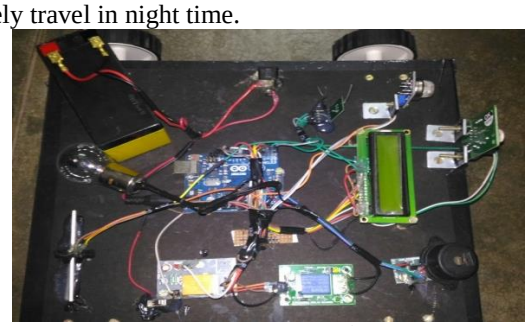

Figure 5.1 Interior circuit of vehicle

## CONCLUSION

Glare during driving is a serious problem for drivers. This is caused due to the sudden exposure of our eyes to a very bright light; the bright headlights of vehicles in this case. This causes a temporary blindness called the Troxler effect. Eventually this becomes the major reason for night accidents. The driver should actually turn down the bright lights immediately to avoid glare to the other person which is not happening. Hence, is the idea for the design and development of a prototype circuit called the automatic headlight dimmer. It gives the driver to use high beam light when required. But it automatically switches the headlight to low beam when it senses a vehicle approaching from the opposite side. Thus the implementation of this device in every vehicle in future will not only avoid accidents but also provide a safe and a comfortable driving.

## FUTURE SCOPE

The use to headlights on automobiles has involved a compromise between providing enough light for drivers to see the road ahead and avoiding the excessive light that produces glare. This system eliminates human error from the scenario, which in turn allows the driver to focus on safely navigating the road instead of manually adjusting headlight settings. Technology has brought changes to headlight, interior surfaces, and the highway environment that directly reduce glare or indirectly reduce the effect of glare on the driver. In future the concept of this project will be used in auto vehicles and no doubt it will be of great and universally adopted.

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