Automatic Head Light Dimmer using Arduino

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***Abstract*- 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 Infrared Sensor (IR) 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.**

Arduino UNO was employed in designing the project. The Embedded C was also employed to programming. The system device was able to automatically switch the headlight to low beam when it sensed a vehicle approaching from the opposite side using IR 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.

***Index Terms* - Automatic brightness, Driver safety, Smooth ride, Automatic distance calculation.**

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 (nm), or 400×10−9 m to 700×10−9 m, between the infrared (with longer wavelengths) and the ultraviolet (with shorter wavelengths). 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. During dark and unlit conditions, our eye switches to scotopic vision which has a range of 30-45 μcd/m2. It takes 4 seconds for our eyes to change from photopic vision to scotopic vision. This is also an example of Troxler effect. As the brightness increases, the strain to focus on an object increases. This will increase the response time of that person.

The requirement of headlight is very common during night travel. The same headlight which assists the driver for better vision during night travel is also responsible for many accidents that are being caused. The driver has the control of the headlight which can be switched from high beam (bright) to low beam (dim). The headlight has to be adjusted according to the light requirement by the driver. During pitch black conditions where there are no other sources of light, high beam is used. In all other cases, low beam is preferred. But in a two-way traffic, there are vehicles plying on both sides of the road. So hence the bright light from the headlight of a vehicle coming from the opposite direction falls on a person, it glares him for a certain amount of time. This causes disorientation to that driver. This discomfort will result in involuntary closing of the driver's eyes momentarily. This fraction of distraction is the prime cause of many road accidents.

The prototype that has been designed to reduce this problem by actually dimming down the bright headlight of our vehicle to low beam automatically when it senses a vehicle at close proximity approaching from the other direction. The entire working of the dimmer is a simple electronic circuitry arrangement which senses and switches the headlight according to the conditions required.

II. LITERATUREREVIEW

Overview of Light Dependent Resistor (LDR):

Light Dependent Resistor (LDR) is a type of semiconductor and its conductivity changes with proportional change in the intensity of light. A light dependent resistor (LDR) is a resistor whose resistance decreases with increasing incident light intensity; thus, it exhibits photoconductivity. Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically.

A Light Dependent Resistor 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. The light sensitive part of the LDR is a wavy track of Cadmium Sulphide. Cadmium Sulphide cells rely on the materials ability to vary its resistance according to the amount of light striking the cell. The figure below shows the Construction of LDR.

III PROPOSED SYSTEM:

The following block diagram clearly explains about the proposed system.

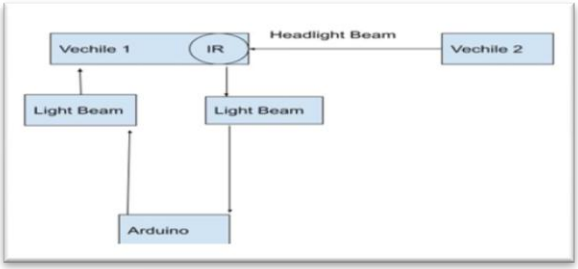

Fig 1.Block diagram of Vehicle headlight

Most of the accidents during night occur due to the high amount of light falling on the vehicle. It causes glaring and troxler fading that leads to accident. To overcome this problem, the intensity of light falling on the other vehicle should be reduced automatically. There is manual adjustment of intensity of light but it is difficult to adjust manually during some situations. To overcome this problem, automatic adjustment of light is needed which is described in this paper. IR is used to measure the amount of intensity of light falling on the vehicle. When the IR detects the large amount of intensity of light falling on it, the microcontroller reduces the amount intensity of light in the vehicle. This gives the clear vision for the drivers. Thus, it prevents the collision and accidents before occurring it.

INFRARED SENSOR (IR):

Infrared Sensor is a sensor that changes its resistance according to the amount of intensity of light falling on it. Increasing the intensity of light decreases the resistance and increases the conductivity of IR. The output of IR is an Analog output.

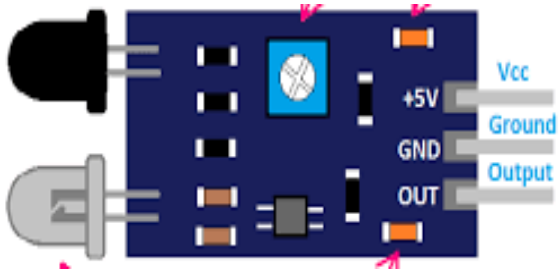

Fig 2. Infrared (IR) Sensor

ARDUINO UNO:

Arduino is a most commonly used physical computing platform and an interactive developing environment. It is a standalone platform that interacts with Arduino software on the computer. The Arduino software consist of an Arduino IDE (Integrated Development Environment) Arduino IDE is used for programming. Ardunio uno is the most frequently used development board though it is not a first board in the market. Arduino uno is a microcontroller based on ATmega328p. It consists of crystal has 14 digital input/output pins, out of which 6 can be used for PWM and 6 analog pins. Here we are writing the code for detecting the light and dimming light.

PROGRAM IMPLEMENTATION:

```
void loop() {
  // Clears the trigPin
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  // Sets the trigPin on HIGH state for 10 micro
seconds
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  // Reads the echoPin, returns the sound wave travel
time in microseconds
  duration = pulseIn(echoPin, HIGH);
  // Calculating the distance
  distance = duration * 0.034 / 2;
  // Prints the distance on the Serial Monitor
  Serial.print("Distance: ");
  Serial.println(distance);
  // put your main code here, to run repeatedly:
  if(digitalRead(3)==LOW)
  {
    for(int value=255;value>=70;value--)
    {
      analogWrite(6,value);
      delay(10);
     Serial.println("DIMM LIGHT IS ON");
  }
  if(digitalRead(3)==HIGH)
  {
    digitalWrite(6,HIGH);
    Serial.println("DIMM LIGHT IS OFF");
    }
  }
}
```

IV. RESULT AND ANALYSIS

The result of the system is shown in the fig 3 given below. The amount of intensity of light falling on the IR is displayed in the serial monitor. Whenever the amount of light falling on the IR is greater than the desired intensity value, the headlight beam starts fading out

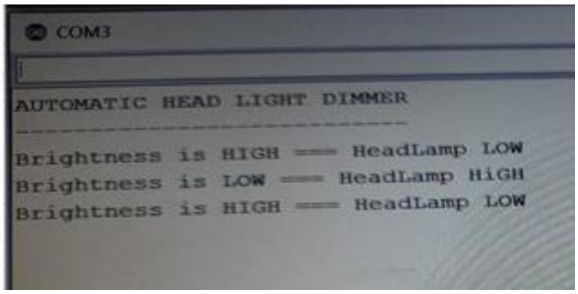

Fig.3: Intensity of light falling on the IR

The hardware setup and the results are shown in the Fig.4 below. As headlight needs 12v power supply, it is connected to 12v battery. Using a 5v relay, headlight is connected to the Arduino uno.

Fig.4: Prototype of Automatic Head Light Dimmer using Arduino UNO.

VI. CONCLUSION

This paper presents the automatic headlight dimmer that uses IR. Here, high beam is automatically switched to lo beam when a high beam of light from another vehicle falls on the IR. Glaring of light from the opposite vehicle during the night travel is one of the major problems. Though there is a manual method to reduce the headlight beam, it will be difficult during some situations.

REFERENCES

[1] AslamMusthafa R, Bala Krishnan T, Seetha Raman N, Shankar M, Swathi R, "Automatic Headlight Beam Controller" Special Issue Published in International Journal of Trend in Research and Development (IJTRD) 15th March 2017.

[2] Abdul Kader Riyaz, S.ArunJeyakumar, M.AbdulHameedSharik, A.Tamilarasi ,"Graphene Coated LED based Automatic Street Lighting System using Arduino Microcontroller" IEEE International Conference on Power, Control, Signals and Instrumentation Engineering (ICPCSI-2017).

[3] Okrah. S.K, williams. E.A, Kumassah.F, "Design and Implementation of Automatic Headlight Dimmer for Vehicles using Light Dependent Resistor (LDR) Sensor" International Journal of Emerging Technology and Innovative Engineering Volume 2, Issue 4, April 2016.

[4] G.M. Pushpanjali, P.S. Mali, and R.R. Naman, "Automatic Headlight Dipper with Respect to Upcoming Vehicles" Response International Journal on Emerging Technologies (Special Issue on ICRIET-2016).
[5] SanalMalhotra, Shiv Taneja, "Automatic Brightness Control Using LDR Sensors" Advanced Research in Electrical and Electronic Engineering Volume 1, Number 2 (2014).
[6] SaksheeSrivastava, "Automatic Street Lights" Advance in Electronic and Electric Engineering. Volume 3, Number 5 (2013).
[7] B. K. Subramanyam, K. Bhaskar Reddy, P. Ajay Kumar Reddy, "Design and Development of Intelligent Wireless Street Light Control and Monitoring System Along with GUI" International Journal of Engineering Research and Applications (IJERA) Vol. 3, Issue 4, Jul-Aug 2013.
[8] Chitradeep Sarma, Ankita Gupta, Abhinav Singh, Indrani Bhattacharjee, Abhilash Mohanta, "Limitations of Probable Vehicle Headlight Technologies – A Critical Review" 3rd International Conference on Materials and Manufacturing Engineering 2018 IOP Publishing.
[9] Ghassan Maan Salim, Hashimah Ismail, Niranjan Debnath, A.Nadya "Optimal Light Power Consumption Using LDR Sensor", 2015 IEEE International Symposium on Robotics and Intelligent Sensors (IEEE IRIS20I5).
[10] Rodrigo Cassio de Barros, Joao Marcus Soares Callegari, Dayane do Carmo Mendonc¸, "Low-Cost Solar Irradiance Meter using LDR Sensors" 13th IEEE International Conference on Industry Applications-2018.
[11] Kavita A. Bajaj, Tushar S, "Mote Review on Intelligent Street Lightening System" International Journal of Science and Research (IJSR) Volume 4 Issue 2, February 2015.