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A Multi Featured Automatic Head Light Systems Prototype for Automotive Safety

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Abstract

This paper presents the research work done in the field of automotive safety. As head light are the major important in night drives but up and highs of light as per requirement, intensity of head light as per sun light has to be taken car which is not available in automotive In this work prototype of headlight system is made by using Arduino, sensors, LEDs and other accessories. A prototype of multi featured headlight system consist turning headlight on, off and provides facility of automatic switching of headlight from low beam to high intensity beam in poor weather conditions. Also this model eliminates the requirement of manual switch by the driver as switching takes place automatically. This model brought three different features of headlight system together. These features are automatic starting of headlight in night conditions, automatic light intensity adjustment with respect to opposite light beam and automatic switch ON during the moist weather conditions. This concept is very useful in the automobile field applications, which provides safety of driver during driving.

Keywords: Automotive Safety, Arduino, LED, Light Intensity, Prototype, Automatic Headlight,

Introduction

When driving vehicle, headlights are required to be turned on before sunset and turn off after sunrise, according to light intensity and any other time of poor light conditions, such as fog, snow or rain, which keeps driver from clearly seeing people or vehicles less than 150 meters away. At night even with less traffic on the road, more than half of accidents occur, because headlight glare is a major issue that has grown in terms of public awareness over the past decade. [1] High beam of headlight of an on-coming vehicle as blinding effect and decreases visibility during night driving is dangerously. The drivers of most vehicles use bright beam while driving at night. This causes a discomfort to the person traveling from the opposite direction. It causes sudden glare for a short period of time. This is caused due to the high intense headlight beam from the other vehicle coming towards him from the opposite direction. Glare causes a temporary blindness to a person resulting in road accidents during the night. By considering this fact to dim the headlight to avoid glares, the prototype of headlight system is developed. In another case, during high fog or moisture present in atmosphere, driver can't see the road and vehicle; due to this more an accident are occur, at that time bright light of our vehicle is turning on with high intensity. This point is also considered in the project work.

The requirement of headlight is very common during night travel and different environment condition. 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. The prototype that is has been developed, reduces 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 circuit arrangement by the use sensor with Arduino which senses and switches the headlight according to the conditions required. [1] In this prototype multi-featured headlight system is created. In this work, automatic switch ON and OFF feature is added. Also facility to convert of bright light to dim light according to light intensity of vehicles coming from opposite direction is created. Humidity sensor is used for detection of humidity/moisture in atmosphere; bright light get turning on automatically according to light intensity. The prototype that has been developed, reduces 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.

Motivation

Vehicle and passenger safety has prime importance in automobile manufacturing. An accident occurs during night time and many of them are due to intense focus of headlight beam or due to poor atmospheric conditions. By keeping this point on focus it is needed to develop headlight system which will automatically adjust light intensity in poor or intense light conditions during night. Also headlight system should

automatically start during poor weather conditions like excessive moisture. Current work is focused on vehicle safety by using multi featured automatic headlight system.

The objectives of the work as follows-

i. To develop a prototype of an automatic headlight switch ON and OFF while driving according to light intensity.
ii. Conversion of bright light in to dim light according to light intensity of vehicles coming from opposite direction.
iii. To make headlight turn ON automatically by sensing moisture/humidity level in the atmosphere.
iv. To create prototype of automatic headlight system which have all above features together.

Literature Review

Reputed journals and publications are review to get rid of advancement in automotive safety and contribution in automotive safety with respect to head lights. New technologies are understood and their contribution in safety w. r. t. head light.

Drivers are facing a huge problem due to this high beam light which falls directly onto their eyes from coming vehicle during driving. There are many medical facts which support their problems of night driving. When 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 will create discomfort to driver which results in closing of driver eyes for certain interval of time. This fraction of distraction is the prime cause of many road accidents. In the medical world, Due to the bright light falls onto the eyes of driver, it creates temporary blindness for the driver is known as Troxler effect. [1] It is also known as the 'fading effect'. A study shows that if our eyes are exposed to a very bright light source of around 10,000 lumens, we experience a glare. [3]This glare is produced due to over exposure and cones inside our eye. Even after the source of glare is removed, an after-image remains in our eye that creates a blind spot. This phenomenon is called Troxler effect. There are many accidents caused due to Troxler effect. This is more than enough to cause a disaster on the road. This Troxler effect is across all ages. Any one exposed to sudden bright light experiences this Troxler effect.[3]

The various components used in the circuit are PCB (Plain Circuit Board), ARDUNIO, LDR (Light dependent resistor), Two resistors (1K and 5K), LED (Red and Green), SENSOR (Humidity sensor) etc.

Murlikrishnan [3] worked on 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. He 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 him from the opposite direction. He was expected to dim the headlight to avoid this glare. This glare causes a temporary blindness to a person resulting in road accidents during the night. To avoid such incidents, we have fabricated a prototype of automatic headlight dimmer. This automatically switches the high beam into low beam thus reducing the glare effect by sensing the approaching vehicle. It also eliminates the requirement of manual switching by the driver which is not done at all times. The construction, working and the advantages of this prototype model is discussed in detail in this paper.

Robert Tamburo1, Eriko Nurvitadhi2, Abhishek Chugh1, Mei Chen2,Anthony Rowe1, Takeo Kanade1, Srinivasa G. Narasimhan1 researchers observed automotive headlight is to improve Safety in low light and poor weather conditions. But, despite decades of innovation on light sources, more than half of accidents occur at night even with less traffic on the road. Their work introduces an ultra-low latency reactive visual system that can sense, react, and adapt quickly to any environment while moving at Highway speeds. His single hardware design can be programmed to perform a variety of tasks. Anti-glare high beams, improved driver visibility during snowstorms, increased contrast of lanes, markings, and sidewalks, and early visual warning of obstacles are demonstrated in this paper.

Sushil Kumar Choudhary et. al. In their research observed the headlamp glare is an issue that has grown in terms of public awareness over the past decade. High beam of headlight of an on-coming car has blinding effect and decreases visibility during night driving dangerously. The drivers of most vehicles use high, bright beam while driving at night. These researchers expected that the dim headlight avoid this glare. This glare causes a temporary blindness to a person resulting in road accidents during the night. This model concept eliminates the requirement of manual switch by the driver which is not done at all time. This concept is very useful in the automobile field applications.

Methodology And Experimental Investigation

In this experimental investigation the circuit is a simple assembly of commonly used circuit components with Arduino. The layout is shown in fig this layout consist different component as PCB, LDR, RESISTOR, LED, SENSOR.

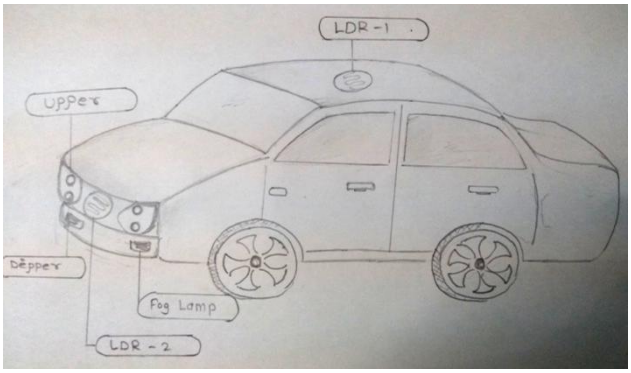


Fig 3.1 General Layout

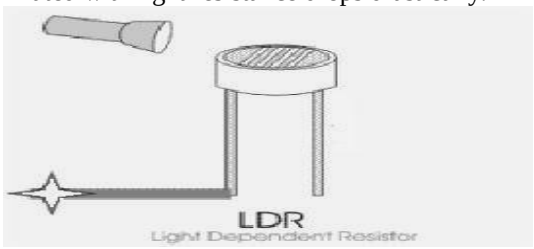
The components have been chosen with care and accuracy so as to keep the design simple and easy to implement. Fig 3.1 gives general idea of positioning of equipment's or pointed circuits.

Automatic night light control system needs no manual operation for switching ON and OFF when there is need of

light. It detects itself whether there is need for light or not. When darkness rises to a certain value then automatically light is switched ON and when there is other source of light i.e. day time, the light gets OFF.

In the project we use light detecting resistor as a light sensor & Arduino for detection of high level or low level of voltage to energize the RELAY coil which is used to interface the control circuit with the external light source

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 drastically.



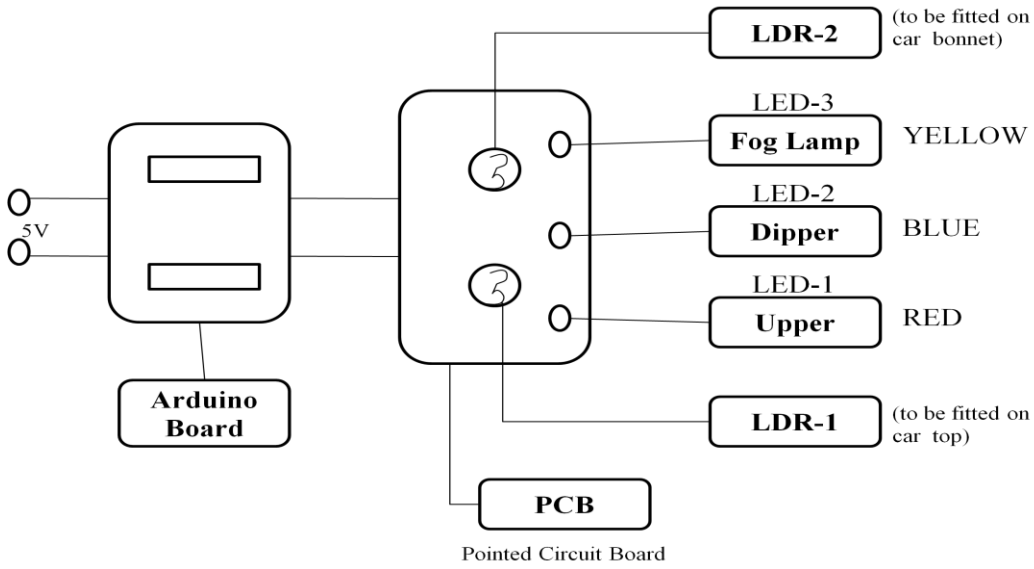


Fig 3.2 Circuit Diagram

Fig 3.2 gives pointed circuit board diagram for the experimental setup all the conditions can be Very well Understood

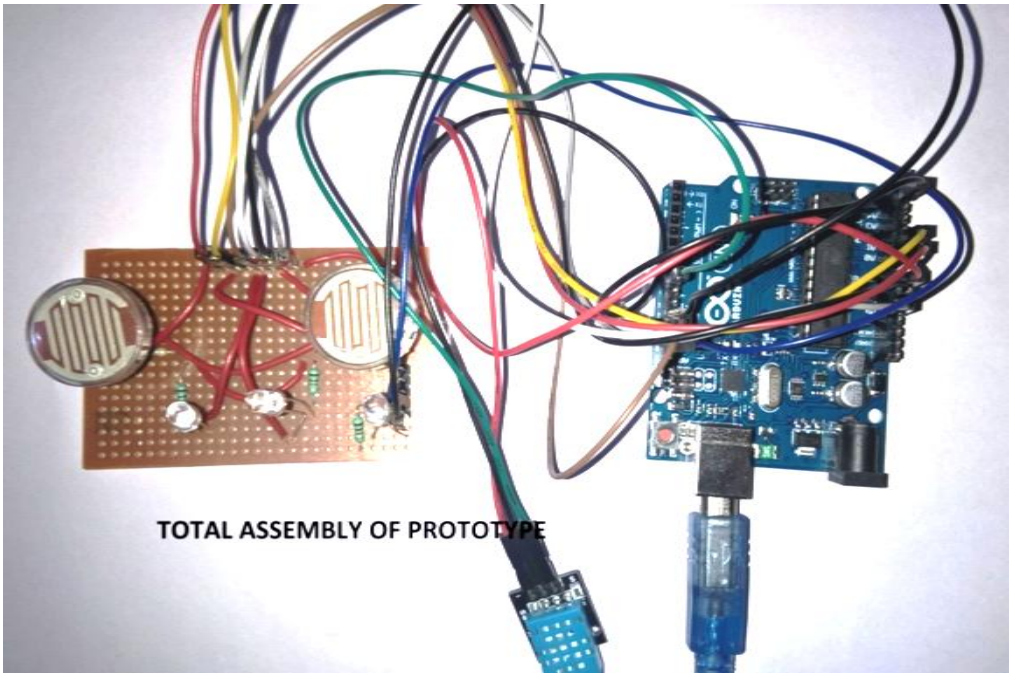


Fig 3.3 Total Assembly of Prototype

The assembly of prototype with connection can be seen in Fig 3.3 it gives connectivity of Arduino PCB LDR etc. such elements as in Fig 3.2 compiled.

Principle ofOperation

This project works on the light intensity of the vehicle coming from opposite direction. Basically adjusting the vehicle intensity as well as lowering the intensity i.e. dimming and brightness of headlight system and its control is done automatically. And adjusting the intensity while vehicle running in fog condition. LDR 1, 2, 3 at respective conditions noted for upper, lower and in fog conditions or in different weather conditions.

Automatic headlamps are a modern convenience in many of today's cars. They eliminate the need for the driver to manually switch on or off the headlamps in most driving situations. The names of the automatic headlamp option differ between car manufacturers, but they perform the same service for the driver. Their secondary features set one automatic headlamp option apart from the others.The automatic headlamps are activated through a photoelectric sensor which is embedded intothe instrument panel. The sensor is located at the base of the windshield under the defogger grill.

Fig 3.4 LED & LDR mounted on PCB

From the layout given in fig 3.4 the basic idea about the working of the circuit understood. The LDR acts as a light sensor and variable resistor. Two LDR's are used, LDR 1 is connected to the resistor (5k) and another LDR 2 is connected to the resistor (5k). So the LDR, two resistors form a potential divider network which will decide the current in the circuit. The balanced network connected to the Arduino. The LED's are connected to the Arduino board. The LED 1 represent upper. The LED 2 represent deeper. The LED 3 represent as fog lamp. When high intense beam falls on LDR 1, then total circuit get closed and that time LED 1 is turned off. Other case when there is dark, then total circuit gets open and that time LED 1(UPPER) is turned on. At the same instant when light from opposite vehicle falls on LDR 2, then LED 1 get turn off and LED 2(DEEPER) will get turn on. During rainy season or when high fog condition will that time LED 3 get turn on automatically.

Working of Circuit

Basic automatic headlights work through sensors which detect how much light is there outside. These sensors are located on the dash of the vehicle mostly. The headlights turn on when the sensors detect a certain level of darkness (darkness means the level of light).When light fall on the LDR depending on the intensity of its current flows through it. If the intensity is low, there is more resistance to the flow of current and when it is high resistance is low hence more current passes through it. Depending upon the values given by the sensor i.e. LDR we have developed the program for Arduino, if the condition in the program is satisfied by the program then output is given in the form of LED. Consider a situation when there is dark and vehicle is moving along round and crosses the vehicle from opposite side. As we have used two different LDR. LDR 1for natural light sensor tin i.e. when there is natural light (Day) all system will turn off automatically another LDR second work on principle but gives analogy signal when light from opposite vehicle solved incident on it.LED to switching of the lights. Upper light will be deeper. So main purpose of to avoid glaring at night which causes due to not using deeper will be by this automatic head light system. Which is helpful to avoid accident? In this prototype we created multifeatured headlight system in this following cases are added,

Case 1- We introduce automatic switch on and off while driving.

Case 2- Conversion of bright light to dim light according to light intensity of vehicles coming from opposite direction.

Case 3- we use humidity sensor for detection of fog or moisture in atmosphere, bright light get turning on automatically according to light intensity.

The prototype that is has been designed, reduces 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.

Another feature of the system is automatic fog lamp. When there is fog condition visibility on the road is very less. We face many difficulties during driving vehicle. Due to this system when there is change in atmosphere i.e. fog, heavy rain, fog lamp will be automatic turn on. In this we have used the humidity sensor which senses the relative humidity and temperature of surrounding. If the value of humidity increases from certain amount it switch on fog lamp.

Observations and Conclusion

Output of Prototype

From environmental condition we obtain following cases. On those cases this setup gives an output for different environmental conditions.

FOR LDR 1

When light intensity greater than 200 falls on LDR1, it will get off and when light intensity less than 200 falls on

LDR1, it will get turn on i.e. upper is turn on. In this prototype we use LDR 1 as natural light sensor.

FOR LDR 2

When light intensity from opposite vehicle is greater than 500, which falls on LDR 2 that time deeper will get turn on and LDR 1 get turn off. Also when light intensity from same vehicle less than 500 at that instant LDR 2 will get turn off and LDR 1 get turn on. Here we use LDR 2 for sensing light which falls on it from opposite direction of vehicle.

FOR FOG LAMP

When there is moisture or humidity present in environment is greater than 195 that instant fog lamp get turn on. And in another case when there is less moisture or humidity present in environment i.e. less than 195 it will get turn off.. All above values are taken from Arduino software.

The exposure of high light intensity to a human eye is a major problem and largely contributes to accidents. This problem has led to the research and design of an automatic headlight dimmer which aims at reducing the chances of the exposure. The dimmer is to be installed in every vehicle. It has been built with three key parts with the technique of an LDR. Light falls on the LDR which reduces its resistance instantly sending a signal to the microcontroller which acts as an analog digital converter and then outputs the digital signal to an LED. The installation of this product has a safety significance, it provides safety to a motorist on the accident aspect as well as their health i.e. glare causes partial blindness.

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Appendix

```
#include <SoftwareSerial.h>       //for serial monitor
intledup=13,leddpr=12,foglamp=11,constant=8;
float ldr1,ldr2,humidity;
//float light=sensorvalue_of_light_ldr1(); //A0
//float light=sensorvalue_of_light_ldr2(); //A1
void setup()
{
Serial.begin(9600);           // for serial monitor.
pinMode(ledup,OUTPUT);
pinMode(leddpr,OUTPUT);
pinMode(foglamp,OUTPUT);
digitalWrite(constant,HIGH);
}
void loop()
{
ldr1=sensorvalue_of_light_ldr1(); //A0;
ldr2=sensorvalue_of_light_ldr2(); //A1;
humidity=sensorvalue_of_humidity();//A5;
Serial.println("average voltage of Light of ldr 1");
Serial.println(ldr1);
delay(5);
Serial.println("average voltage of Light of ldr 2");
```