High Beam Light Controller for Vehicles

Gulab Jain J K¹, Manoj. S², Shaik Saida Hussain³, Govindarasu. S⁴

¹,²,³,⁴student, ⁴th Sem, Electrical and Electronics, GITAM School of Technology, Bengaluru Rural, Karnataka, India

Abstract: The people who drive during night know the difficulty of high beam light from the opposite vehicles. Driver goes completely blank due to this, this may lead to many accidents and eye problems. We have developed a working model to control the switching of a high beam to low beam automatically when one vehicle come opposite to each other and also in city limits too.

Key Words: Ultrasonic sensor, light depending resistor, radar, Arduino UNO microcontroller, high beam light, override switch.

1. INTRODUCTION

Usually, every vehicle has two filaments one is low beam and the other is the high beam. The switching between high beam and low beam is manually controlled by the driver. During night times no driver co-operates to switch from high beam to low beam, during this moment of crossing each other both drivers goes blind on road. Due to this, many accidents happened. To avoid this type of issue we have developed a working model to control the switching of a high beam to low beam and again low to high beam automatically. In the city limits, the headlights of the vehicles remain low beam. We provided the provision of an overriding switch to the driver to switch from low to high beam in case of needy time.

2. COMPONENTS USED

- Arduino UNO
- ULTRASONIC SENSOR MODULE SR-04
- Photo resistor
- 2 LED representing high beam and low beam
- 3 resistors of suitable resistance
- Bread board and jumper wires

3. CIRCUIT DIAGRAM
4. COMPONENTS EXPLANATION

Arduino UNO

Microcontroller ATmega328
Operating Voltage 5V
Input Voltage (recommended) 7-12V
Input Voltage (limits) 6-20V
Digital I/O Pins 14 (of which 6 provide PWM output)
Analog Input Pins 6
DC Current per I/O Pin 40 mA
DC Current for 3.3V Pin 50 mA
Flash Memory 32 KB (ATmega328) of which 0.5 KB used by bootloader
SRAM 2 KB (ATmega328)
EEPROM 1 KB (ATmega328)
Clock Speed 16 MHz

Ultrasonic Sensor Module Sr-04

The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. From 2cm to 400 cm or 1” to 13 feet. Its operation is not affected by sunlight or black material like sharp rangefinders are (although acoustically soft materials like cloth can be difficult to detect). It comes complete with ultrasonic transmitter and receiver module

Photo Resistor

When the light falls on the photoresistor, some of the valence electrons absorbs energy from the light and breaks the bonding with the atoms. The valence electrons, which break the bonding with the atoms, are called free electrons. And these free electrons conducts and thus it acts as a open circuit when there is light and closed circuit when there is no light.
5. MODEL REPRESENTATION

![Image of model representation]

6. WORKING CASES

Case 1:

The ultrasonic sensor constantly sends a signal from the transmitter and if an object is detected in its range, the signal is reflected back to the receiver part of the ultrasonic sensor module. Consider a vehicle coming opposite to the test vehicle where this model is installed. We have preset the distance of the ultrasonic sensor module range (say 3 feet) in the code. If any vehicle is detected by ultrasonic sensor it sends a signal to the microcontroller and the high beam (LED-1) light goes off until that vehicle passes through. Thus, making the easy pass through way for both the vehicles during the night. For practical application radar can be used instead of ultrasonic sensor modules for a larger range of detection.

![Image of working cases]

Fig 1: The vehicle is far away from the range of the ultrasonic sensor, hence both LED-1 and LED-2 remain glowing.

Fig 2: Now the vehicle is in the range of the sensor, hence high beam light (LED-1) goes off and LED-2 remain on.
Case-2:

Here comes the working of LDR (light dependent resistor) or photoresistor. When the vehicles enter into the city limits, photoresistor detects the light from street light during the night and makes high beam light to turn off. It also is able to detect light from other vehicles and can make high beam light to go off. Thus, making smooth clearance in city limits.

![Image of LDR setup with high beam light on](image1)

![Image of LDR setup with high beam light off](image2)

Fig-3:
Both LED-3 and LED-4 remains on because photoresistor is not detecting any light

Fig-4:
Now, the LDR detecting the light from the opposite vehicle and from the street light also. Thus, the high beam light turns off automatically until no light is falling on LDR

7. TESTING AND ANALYSIS

<table>
<thead>
<tr>
<th>Model</th>
<th>Accuracy for detecting distance / light intensity</th>
<th>Power Consumption</th>
<th>Model Size</th>
<th>Energy Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro controller</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Ultrasonic Sensor</td>
<td>96%</td>
<td>Low</td>
<td>Small</td>
<td>High</td>
</tr>
<tr>
<td>LDR(Light Dependent Resister)</td>
<td>98%</td>
<td>Very Low</td>
<td>Small</td>
<td>High</td>
</tr>
<tr>
<td>Head lamps</td>
<td>Low</td>
<td>Low</td>
<td>Medium</td>
<td>Average</td>
</tr>
</tbody>
</table>
8. COST COMPARISON WITH DIFFERENT MODELS

<table>
<thead>
<tr>
<th>S. No</th>
<th>Item Name</th>
<th>Quantity</th>
<th>Approx. Cost(Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Micro Controller</td>
<td>01</td>
<td>3000/-</td>
</tr>
<tr>
<td>2.</td>
<td>High definition cameras</td>
<td>01</td>
<td>2600/-</td>
</tr>
<tr>
<td>3.</td>
<td>GPS System</td>
<td>01</td>
<td>2500/-</td>
</tr>
<tr>
<td>4.</td>
<td>Head lamp</td>
<td>02</td>
<td>600/-</td>
</tr>
<tr>
<td></td>
<td>Total cost</td>
<td>05</td>
<td>8700/-</td>
</tr>
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</table>

Fig-5

<table>
<thead>
<tr>
<th>S. No</th>
<th>Item Name</th>
<th>Quantity</th>
<th>Approx. Cost(Rs.)</th>
</tr>
</thead>
<tbody>
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<td>1.</td>
<td>Micro Controller(Arduino)</td>
<td>01</td>
<td>500/-</td>
</tr>
<tr>
<td>2.</td>
<td>LDR(Light Dependent Resister)</td>
<td>01</td>
<td>50/-</td>
</tr>
<tr>
<td>3.</td>
<td>Ultrasonic Sensor</td>
<td>01</td>
<td>150/-</td>
</tr>
<tr>
<td>4.</td>
<td>Head lamp</td>
<td>02</td>
<td>600/-</td>
</tr>
<tr>
<td></td>
<td>Total cost</td>
<td>05</td>
<td>1300/-</td>
</tr>
</tbody>
</table>

Fig-6

Fig-5 is the estimation of amount using high definition camera and GPS system. Which is high cost compared to our model. Fig-6 is the estimation of our model. Which is very economical and low installation charges.

9. ADVANTAGES

1. Cost of the components is economical.
2. Components used are easily available in the market.
3. The device can be fixed into existing vehicles also.
5. Gives good security while driving the vehicle at night.
10. DISADVANTAGES

1. The dust and dirt particles accumulated on the sensors leads to errors in detection. Therefore, often the vehicle should be washed.

11. CONCLUSION

Implementation of this device in existing vehicles would reduce the accident during the night. Drivers would be easily able to drive during the night. No more eye problems from high beam lights of vehicles.

12. REFERENCES

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