AUTOMATIC HEADLIGHT BEAM INTENSITY SWITCHER

Ramya Dhawle[1], Rohit Anvekar[2], Shivaji Kulkarni[3], Shrihari Durg[4]

[1]*Electronics and Communication, BVBCET, Hubli, Karnataka, India*
[2]*Electronics and Communication, BVBCET, Hubli, Karnataka, India*
[3]*Electronics and Communication, BVBCET, Hubli, Karnataka, India*
[4]*Electronics and Communication, BVBCET, Hubli, Karnataka, India*

Abstract

The evolution in the technology of automobiles has reached its peak. One of the most innovative features is the invention of driver less car or an autonomous car. An autonomous car controls the motion, sensor activation and action automatically without any human intervention. Such vehicles ensure high degree of safety, comfort and ease of driving. The project aims at designing a system to be used in such autonomous cars. The project is to develop an automatic headlight beam intensity switcher. Such a system will sense the beam status of opposing vehicle and switch the beam intensity of headlight. A sensor based mechanism is utilized to develop the system. The beam intensity switcher plays a very important role while driving. During night time, when two vehicles approach each other in opposite direction the high intensity headlight creates an effect called "Troxler effect". This effect creates a temporary blindness for some seconds thus resulting in unfortunate accidents. Thus, the high beam of both the vehicles must be switched to low so as to have a comfortable driving. The use of such a device in cars can prevent accidents at night time due to driver inattentiveness and provides an ease of driving. We have used the Arduino UNO board as our micro-controller and application specific sensors. In our project we have designed a device which is a combination of software and hardware coding. The sensor used is a light intensity sensor named BH1750 which has a wide range of sensing capacity. The light sensor takes the "lux " reading of the headlight rays from the opposing vehicle and checks for a threshold value assigned in the coding. Based on the threshold value the beam switches from high to low state and vice-versa when both the vehicles pass by each other. The same process takes place in opposite vehicle too. This device can be implanted on the front part of the car at an appropriate position and angle.

Keywords: *automatic, low cost, accurate, headlight beam intensity switcher, Troxler effect, sensor based mechanism and lux readings.*

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1. INTRODUCTION

As per some international surveys around the world, most of accidents occur at night time. These accidents are mainly because of driver inattentiveness while driving. Thus an autonomous car will ensure a safe and easy driving without much human intervention. The effect at night time due to high intensity beam too is responsible for fatal accidents. Thus, an automatic beam switcher helps to switch the high beam to low beam even when driver is inattentive, thereby preventing accidents. The project aims at developing a device or a system to sense the intensity of headlight from opposing vehicle and switching the intensity of headlight automatically based on readings from sensor. The operation of system doesn't depend on human actions.

1.1 Problem Statement

The problem statement for our project is to design a low cost, accurate, easy to use and automatic headlight beam intensity switcher to switch the beam intensity from either high to low or vice-versa based on sensor inputs so as to provide safety to the driver and assist in driving.

1.2 Survey

- Road accidents are more in night than during day due to low visual conditions. [4]
- More than 40 percent of all automobile accidents resulting in death occur at night, despite the fact that there is up to 80 percent less traffic on the road than during the day. (Germany's Federal Statistics Bureau). The major reason is Troxler effect.[3]
- In 2012, road accidents increased by 3.3% when compared to 2011 (Courtesy: NHTSA- Nat. High. Traffic Safety Admin.)
- The National Safety Council says traffic death rates are three times greater at night then during the day.

1.3 Statistics

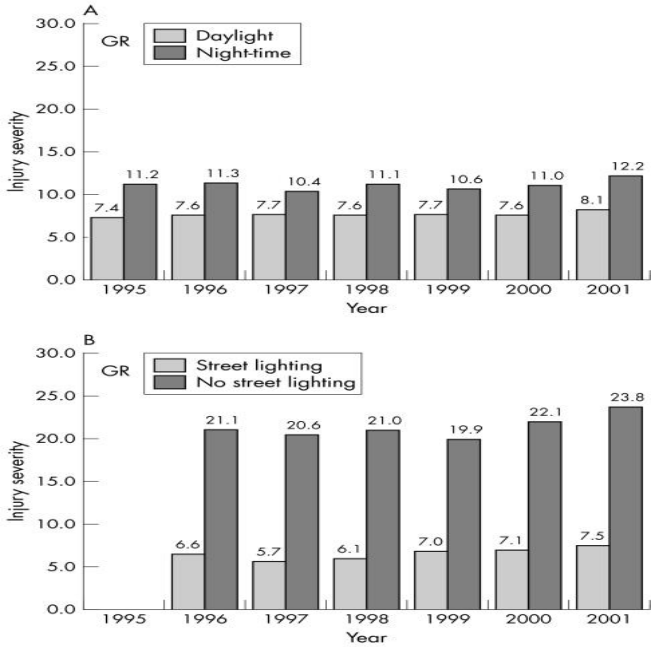


Fig.1 Graph indicating number of accidents at night time as compared to day time.

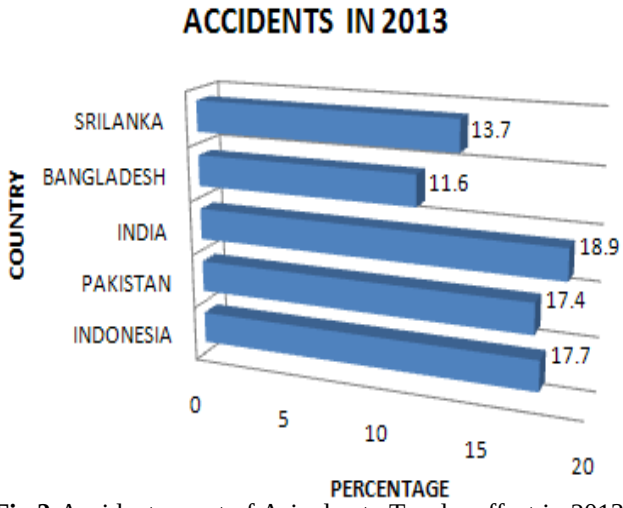


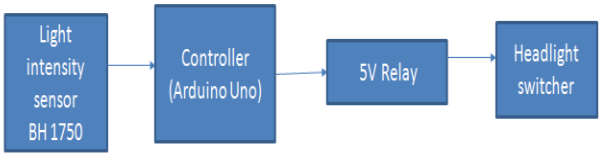
Fig.2-Accident report of Asia due to Troxler effect in 2013

2. DESIGN PROCESS

2.1 Hardware Requirements

Component	Specification	Quantity
Power Supply	12V, 2.2A and 5V	1 each
Arduino	Uno	1
Digital Light sensor	BH1750	2
Relay	5V	2
Headlights (Dual Filament Bulb)	12V, 35W	4

2.2 Block Diagram



2.3 Specification of Digital Light Sensor BH1750

- I2C bus interface.
- Illuminance to digital convertor.
- Wide range and high resolution (1-65535 lux).
- Low current by power down function.
- 50Hz/60Hz light noise reject function.
- Operating Voltage: 3.3 – 5V.
- Dimensions – 21*16*3.3 mm.
- Influence of IR is very small.

2.4 Circuit Diagram

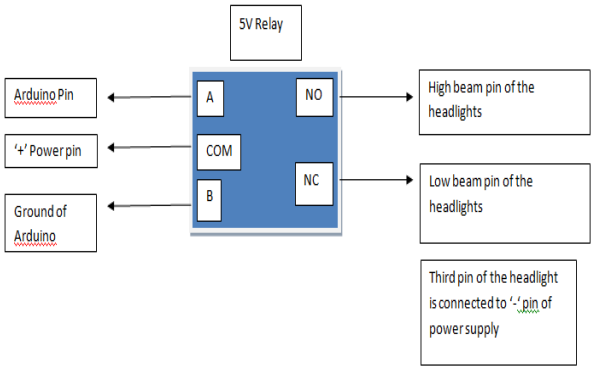


Fig -3: Circuit Diagram of the headlight.

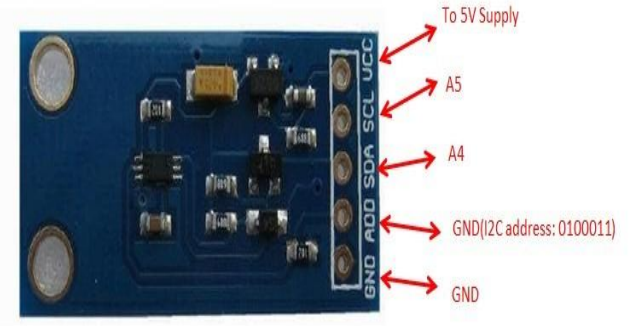


Fig -4: BH1750 connections

2.5 Working

Initially the intensity values from the opposing vehicle are read by the BH1750 digital light sensor. These readings are sent to the Arduino board. If the value exceeds the limit of around 100lux, indicating that the vehicle is nearing us, the device switches the beam of the headlight from high to low using a 5V relay. Simultaneously, the similar process takes place in the opposing vehicle as well. Once the vehicles have passed by each other the intensity again goes from low to high. Thus the system automates the headlights and assists the driver.

2.6 Arduino Code

```
/*
 Sample code for the BH1750 Light sensor
 Website :www.elecrow.com
 Connection:
 VCC-5v
 GND-GND
 SCL-SCL(analog pin 5)
 SDA-SDA(analog pin 4)
 ADD-NC or GND
 */
#include <Wire.h> //BH1750 IIC Mode
#include <math.h>
int BH1750address = 0x23; //setting i2c address
byte buff[2];
int led = 11,led1=12;
void setup()
{
  Wire.begin();
  Serial.begin(57600);//init Serail band rate
  pinMode(led, OUTPUT);
  pinMode(led1, OUTPUT);
}

void loop()
{
  int i;
  uint16_t val=0;
  BH1750_Init(BH1750address);
  delay(200);

  if(2==BH1750_Read(BH1750address))
  {
    val=((buff[0]<<8)|buff[1])/1.2;
    Serial.print(val,DEC);
    Serial.println("[lx]");
  }
  delay(150);
  if(val <= 250)
  {
     analogWrite(led, 255);
     analogWrite(led1, 255);
  }
  else
  {
     analogWrite(led, 10);
     analogWrite(led1, 10);
  }
}
int BH1750_Read(int address) //
{
  int i=0;
  Wire.beginTransmission(address);
  Wire.requestFrom(address, 2);
  while(Wire.available()) //
  {
    buff[i] = Wire.read();  // receive one byte
    i++;
  }
  Wire.endTransmission();
  return i;
}
void BH1750_Init(int address)
{
  Wire.beginTransmission(address);
  Wire.write(0x10);//1lx reolution 120ms
  Wire.endTransmission();
}
```

3. OUTPUT RESULTS

Fig-5: Output/Results of the product

3.1 Budget Approximation

Components		Price (in Rs.)
1.	Battery	3000/-
2.	BH1750	530/-
3.	Relay	25/-
4.	Arduino UNO	1500/-
5.	Headlights	160/-
Total		5215/-

4. CONCLUSION

The working product thus achieves the aim of switching the beam from high to low or vice-versa. This system not only assists the driver but also protects him from the temporary blindness due to the opposing headlight glare. Thus, the product provides safety to the driver especially during the night time. The product is low cost, accurate and small in size.

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BIOGRAPHIES

Name – Shivaji Kulkarni, CGPA – 8.98, currently pursuing 7th semester, B.E in electronics and communication.

Name- Rohit Anvekar, CGPA - 7.87, currently pursuing 7th semester, B.E in electronics and communication.

Name- Ramya Dhawle, CGPA- 9.12, currently pursuing 7th semester, B.E in electronics and communication.

Name – Shrihari Durg, CGPA - ,currently pursuing 7th semester, B.E. in electronics and Communication.