INTELLIGENT HEAD LIGHT CONTROLLER FOR VEHICLES

Achyuth Varma[1], Sravan Kumar[2], R.Sai Varma[3], M. Sukumar[4], P Rajesh[5]
B V Raju Institute of Technology, Narsapur, Telangana State

Abstract

An intelligent head light controller that automatically controls the vehicle is designed and tested. The microcontroller Atmega328P and LEDs are used to prepare a prototype that switches the high beam of those vehicles to low beam whenever it will get another vehicle coming towards with high beam. As a result the road accident will be decreased rapidly. It is possible to implement because the device is cheap in cost, easy to implement and it works automatically.

Index Terms: High beam light, Intelligent controller,

I. INTRODUCTION

We live in India a country where it accommodates about 1.20 billion people. The number of vehicles on our roads is burgeoning day by day. And from the recent statistics, the number of registered vehicles in India in 2016 is given as 159,199,140. That's around 15.9 Crores or 159 million vehicles. This is turn forced almost all this vehicle manufactures to think about the extra safety instruments and electronic controls to attach with these products for giving the users a safety derived in all road conditions through a mass flow traffic. If asked, one should always mention that the right driving is very cumbersome due to the dazzling light problems and the frequent dipping of headlights by manual means that often causes fatigue to the driver particularly at the time of peak traffic. So naturally to get rid of this perennial problem, an automatic mechanism has to come up to dim the headlamp automatically whenever required. So, Automatic High Beam Control is our prototype which can able to dim the headlamps when it detects an external source of light with great intensity. This project is about to control high beam or low beam automatically. Hence, all vehicles are equipped with a headlight system to grant a safe lighting for night time driving or at any other situation. Usually the headlight system contains two reflector lamps the low beam and high beam lights. Typically the driver manually switches between the low and high beams. The high beam lights provide better visibility range over the low beam light. Nevertheless, the high beam lights generate a dazzling effect on the other driver that encounters it. Thus, the drivers must toggle from high beam to low beam lights in order to circumvent dazzling other drivers moving in the opposite way. On the other hand low beam lights create less dazzling effect, but with a reduction of quality and range of visibility. Although using the high beam provides more safety margin, drivers use the high beams much less frequently than they need or can [2]. Even if the use of high beam is justified, drivers only use it about 25% of the total required time [3]. The two major reasons for this behavior are the manual nature of switching between the high and low beam. The second reason is the fear of dazzling other drivers and therefore causes catastrophic accidents. Therefore, an automatic controller to switch off the high beam lights when facing other vehicle is considered necessary. Such feature will make the driving experience more convenient in the night time. Moreover, it makes the road more friendly to the other drivers on the road. Lately high beam light controllers have been discussed in literature. Most of the proposed system are based on complex combination of cameras and image processing techniques in order to detect the vehicles and control the high beam light [4]-[8]. In [4] an image sensor is used to have picture of the road and then a classifier based module is

used to identify the targets. While the authors of [5] used a multiple target classifier in order to classify vehicles and other objects. An input from a forward looking video camera combined with an automated learning algorithm was used to control the high beam light [6]. machine learning engine is discussed in [7]. Moreover, a simulation environment to test the headlight system to find its performance for different conditions is presented by [8]. Furthermore, there are different commercial systems for high beam light controllers, for instance Mobileye [9] and Conti [10], they installed in some vehicles brands. One of the early deployed systems is Gentex [11], which use a tiny imaging array with separate lenses and receptor arrays. The aim of this research is to design a simple and yet intelligent control unit to automatically switching Off/On the high light beam considering the incoming traffic and the available lighting on the road especially inside cities. This control unit can be mounted to all vehicles to insure the high beam switching depending on the light density without the influence of the user (the driver). The novelty of the proposed design resembles in the simple and low cost system with effective results an intelligent headlight control (IHC) using support vector The number of vehicles on our roads is burgeoning day by day. For this reason almost all the vehicle manufactures have to think about the extra safety instruments and electronic controls to attach with these products for giving the users a safety. Modern automotive vehicles include a variety of different lamps to provide illumination under different operating conditions. Headlamps are typically controlled to alternately generate low beams and high beams. Low beams provide less illumination and are used at night to illuminate the forward path when other vehicles are present. High beams provide significantly more light and are used to illuminate the vehicle's forward path when other vehicles are not present. Daylight running lights have also begun to experience widespread acceptance. High beam are used for illuminating a road doesn't have very much traffic on it. By that way the driver can see further ahead for any road obstructions. High beam is also used when a driver is one an unfamiliar road and if there isn't much in the way of lighting such as street lamps. Automatic high beam, as explained is opposite beam detector. Another probable application of automatic high beam is our high beam response due to another high beam and automatically our high beam becoming low. Now a day there are many accidents that cause from the beam light. Our work proposes an effective automatic control of the vehicle.

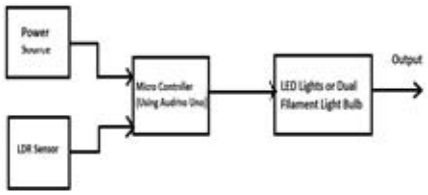
Head lamps based on the detection of head lights and tail lights under night time road conditions. This project is about to control high/low beam automatically. This project will make sure that the consumer will save their time and energy also for those who have the illness of nervous. This project will not disturbing any manual function of the beam.

Car accidents data shows that the rate of night time accidents is higher than that for the day time [1]. This fact may be endorsed to number of parameters, among them, is the poor lighting conditions at night that reduce the visual capability of the driver. For that reason it is harder at night to see the road environment parameters such as warnings, cars, pedestrians and traffic signs. At night it is very difficult to determine the nature of objects by human eye from long distance. This due to the fact that night time diminishes the advantages of the colors and contrasts of objects.

Hence, all vehicles are equipped with a headlight system to grant a safe lighting for night time driving or at any other situation. Usually the headlight system contains two reflector lamps the low beam and high beam lights. Typically the driver manually switches between the low and high beams. The high beam lights provide better visibility range over the low beam light. Nevertheless, the high beam lights generate a dazzling effect on the other driver that encounters it. Thus, the drivers must toggle from high beam to low beam lights in order to circumvent dazzling other drivers moving in the opposite way. On the other hand low beam lights create less dazzling effect, but with a reduction of quality and range of visibility. Although using the high beam provides more safety margin, drivers use the high beams much less frequently

than they need or can [2]. Even if the use of high beam is justified, drivers only use it about 25% of the total required time [3]. The two major reasons for this behavior are the manual nature of switching between the high and low beam. The second reason is the fear of dazzling other drivers and therefore causes catastrophic accidents. Therefore, an automatic controller to switch off the high beam lights when facing other vehicle is considered necessary. Such feature will make the driving experience more convenient in the night time. Moreover, it makes the road more friendly to the other drivers on the road. Lately high beam light controllers have been discussed in literature. Most of the proposed system are based on complex combination of cameras and image processing techniques in order to detect the vehicles and control the high beam light [4]-[8]. In [4] an image sensor is used to have picture of the road and then a classifier based module is used to identify the targets. While the authors of [5] used a multiple target classifier in order to classify vehicles and other objects. An input from a forward looking video camera combined with an automated learning algorithm was used to control the high beam light [6]. An intelligent headlight control (IHC) using support vector machine learning engine is discussed in [7]. Moreover, a simulation environment to test the headlight system to find its performance for different conditions is presented by [8]. Furthermore, there are different commercial systems for high beam light controllers, for instance Mobileye [9] and Conti [10], they installed in some vehicles brands. One of the early deployed systems is Gentex [11], which use a tiny imaging array with separate lenses and receptor arrays. The aim of this research is to design a simple and yet intelligent control unit to automatically switching Off/On the high light beam considering the incoming traffic and the available lighting on the road especially inside cities. This control unit can be mounted to all vehicles to insure the high beam switching depending on the light density without the influence of the user (the driver). The novelty of the proposed design resembles in the simple and low cost system with effective results

II. WORKING



Block diagram of high beam controller

Initially, when we turn on the circuit, the two led lights will glow. This indicates that it is in High Beam Stage. When we introduce a strong visible light (Take a white flash light) and put it near the LDR (Light Dependent Resistance), it will sense the light and sends the signal to the Micro Controller. This micro controller will disable one of the LED light. Now it is in low beam stage. Similarly, when we move out the flash light from the LDR, this LDR sensor will give signal to the Microcontroller and Microcontroller enables the LED light which is turned off before. Now it is in High Beam Stage. The following is the detailed process

1. Light Dependent Resistor:

A light-dependent resistor (or photo resistor, LDR, or photo-conductive cell) is a light-controlled variable resistor.

The resistance of a photo resistor decreases with increasing incident light intensity; in other words, it exhibits photoconductivity. A photo resistor can be applied in light-sensitive detector circuits, and light-activated and dark-activated switching circuits.

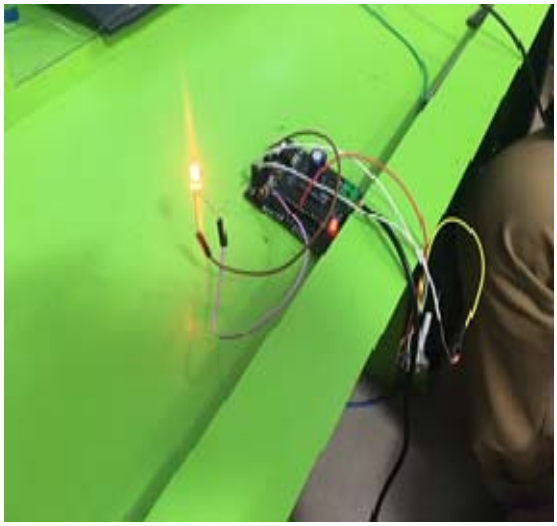
This LDR will sense the light and differs it's resistance depending upon the type of LDR used. It is having very good application in this Prototype. Due to the change in Resistance, the Microcontroller will come to know that there is light source.

2. Microcontroller (ATmega328P):

A microcontroller (or MCU for microcontroller unit) is a small computer on a

single integrated circuit. In modern terminology, it is similar to, but less sophisticated than, a system on a chip or SoC; an SoC may include a microcontroller as one of its components. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of Ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips. By using Arduino IDE Software, we can able to code the Microcontroller

This LDR is fixed to PC0 pin of the Microcontroller and the LED lights are connected to PB0 and PB1 of the microcontroller. It waits for the signal from LDR and gives the corresponding output to the LED Lights depending upon how we compiled it using Arduino IDE Software.



Automatic high beam using 1 LED

3. LED Lights:

LEDs are like tiny light bulbs. However, LEDs require a lot less power to light up by comparison. They're also more energy efficient, so they don't tend to get hot like conventional lightbulbs do (unless you're really pumping power into them). This makes them ideal for mobile devices and other low-power applications. Don't count them out of the high-power game, though. High-intensity LEDs have found their way into accent lighting, spotlights and even automotive headlights.

We've used two LED lights. If two LED lights are glowing, then it is in High Beam Configuration. When If only one of the LED lights is glowing, it is in Low Beam Configuration.

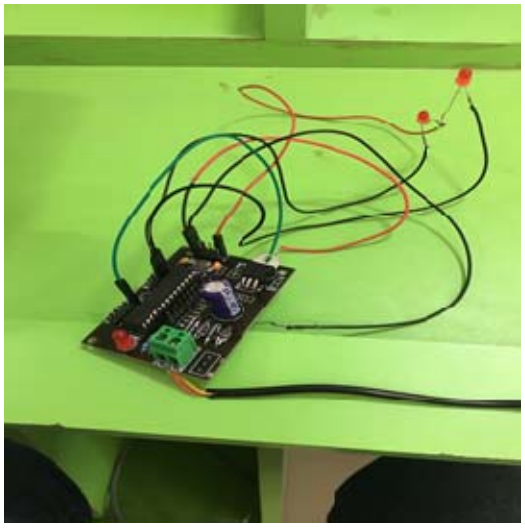


Fig: Automatic High beam using 2 LEDs

Advantages:

1. Low price - Cost of the components and making cost of the device is low.
2. Efficiency – The device performs in the best possible manner with the least waste of time and effort.
3. Availability - The parts or components of the device are available in the market.
4. High beamed light detection - It can detect high beamed light which have high light intensity through a LDR.

III. CONCLUSION

Road accident is being increased deadly day by day. Especially in our country most of the drivers don't follow the driving rules and regulations. Even they don't know that high headlights beam might be the cause of dangerous Road Accident. Thousands of people lost their lives in every year by Road Accident. Matter is that our government is also not concerned about this problem. So if we can implement this prototype in all vehicles of our country, the device will switch the high beam of those

vehicles to low beam whenever it will get another vehicle coming towards with high beam. As a result the road accident will be decreased rapidly. It is possible to implement because the device is cheap in cost, easy to implement and it works automatically.

References

1. White Paper. (2000). Traffic safety facts, U.S. National Highway Traffic Safety Administration.
2. J. Sullivan, G. Adachi, M. Mefford, and M. Flannagan. (2003). High-Beam Headlamp
3. Usage on Unlighted Rural Roadways, UMTRI report 2003-2. White Paper. (2006). Use of high-beam headlamps, Transportation Research Institute, Michigan University.
4. A. Lopez, J. Hilgenstock, A .Busse, R. Baldrich, F Lumbreras and J. Serrat. (2008). Nighttime vehicle detection for intelligent headlight control, in: Proc. of 10th Int. Conf. on Advanced Concepts for Intelligent Vision Systems (ACIVS'08), Springer-Verlag, pp. 113–124.
5. J. C. Rubio, J. Serrat, A. M. Lopez and D. Ponsa. (2010). Multiple target tracking for intelligent
6. headlights control, 13th International IEEE Conference on Intelligent Transportation Systems (ITSC), pp. 903-910.
7. J. H. Connell, B. W. Herta, H. Hess and S. Pliefke. (2011).A Fast and Robust Intelligent
8. Headlight Controller for Vehicles, 2011 IEEE Intelligent Vehicles Symposium (IV), pp. 703-708.
9. Y. Li and S. Pankanti. (2011). A Performance Study of An Intelligent Headlight Control System, IEEE Workshop on Applications of Computer Vision (WACV), pp. 440-447.
10. M. Tideman and S. J. Janssen. (2010). A Simulation Environment for Developing Intelligent Headlight Systems, 2010 IEEE Intelligent Vehicles Symposium (IV), pp. 225-231.
11. G. Stein, O. Hadassi, N. Haim and U. Wolfovitz. (2009). "Headlight, taillight, and streetlight detection", US Patent 7, 566, 851.
12. Continental, "Intelligent Headlamp Control", http://www.contionline.com/
13. J. Stam, J. Bechtel, S. Reese, J. Roberts, W. Tonar and B. Poe. (2005). "Vehicle Lamp Control", US patent 6, 947, 577.
14. B. P. Singh and R. Singh. (2006). Electronic Devices and Integrated Circuits, Pearson Education India.
15. D. A. Neamen. (2009). Microelectronics: Circuit Analysis and Design (4th edition), McGraw-Hill