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Automatic Headlamp Control and Obstacle Detection

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Abstract: ***The number of vehicles nowadays increasing very fastly and so is technology. Safety is a very prime factor and has to be considered. vehicles are fitted with lots of safety features. Automatic Upper Dipper beam control and obstacle detection also need to be installed to improve safety to the next level. These features are mainly used in nighttime driving or foggy weather or rain. Human eyes are very sensitive to light. when the light suddenly comes in contact with the eyes after darkness, the cornea present in the eyes gets contracted. i.e., human eyes will not be able to see for a short time. it is also called light glare. a vehicle coming from the opposite side with headlight in upper mode causes blind to the driver's eyes. In such cases, there are high chances of occurring an accident. So, an automatic mechanism for controlling the light upper or dipper has to be made to decrease the chances of accidents during nighttime driving. Also, sometimes the driver won't be able to see any object in nighttime or foggy or rainy seasons. so, a sensor-based system where obstacle detection is enabled may assist from falling into an event of a crash. these two features assure you a very safe and comfortable drive. The operating principle working and design of PCB is explained in this paper***

Keywords: Ultrasonic Sensor, Ldr Sensor, Atmega328p.

1. INTRODUCTION

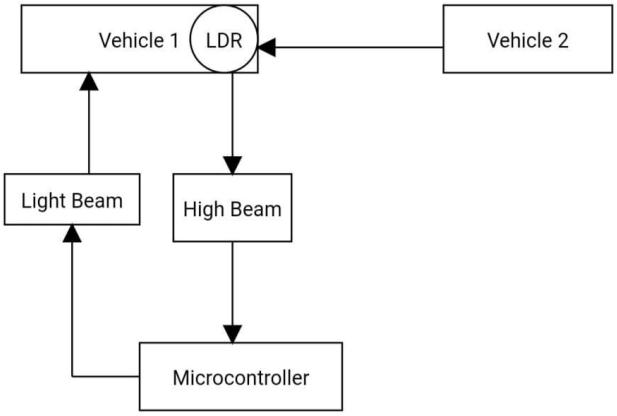
The number of vehicles driving the road is increasing drastically. Safety and comfort are the prior factors from the end of the driver. There should be some smart features in a vehicle that meet desired range of safety and comfort. While driving at night or in the foggy and rainy season, it is hard to drive because of the invisible road. Sometimes driving at night also is a challenge because of the light glare (due the to headlight in upper mode) from the upcoming vehicle. Human eyes are very sensible to light. In the event of light glare on the eyes may lead to cause blurry vision and the chances of an accident increase. A system with automatic Light control is beneficial in many ways.

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At nighttime driving on a two-way road, A vehicle approaching from the opposite side may cause trouble to the driver if its headlight is set in the upper mode and may cause beneficial due to these reasons. problem seeing the road clearly to the driver. Because when a sudde light approaches a human eye the cornea gets contracted. In such cases, there is a high chance of an accident, and to increase the safety feature of vehicles, Automatic light control i.e.

Automatic Upper Dipper Control is introduced which enables smart switching of light when any vehicle is approaching from the other side. this light detection is done using LDR Sensor and switching operations are done using a relay, Where Atmega 328P is taking place, monitoring the whole operation. It is really difficult to switch the light manually because the Driver wants to pay more attention to the steering wheel while driving, rather than switching the light in dipper mode using a toggle. So automatic operation is more



In rainy and foggy weather conditions it is hard to predict the road. The road can't be seen clearly and any object in the way could be a serious trouble while driving in such environmental conditions. So, to increase safety further a detection system must be installed which will save vehicles in the event of crashing any unknown theft. Ultrasonic sensors are sensors that propagate sound waves in the air and after striking an object reflect in the form of echo signals and so the distance of that object can be predicted. So, an Ultrasonic sensor in this way is very helpful to predict if there is any theft in the way. These two features improve safety to the next level at a very minimum cost of installment as only some minor electronic elements and A simple control unit are used.

Literature Review

This literature survey gives brief information about the recent trends which are being used in the automobile sector, concerning smart features to increase the driver's safety and comfort driving. It includes automatic light control and obstacle detection. Muralikrishnnan. R (Feb 2014) Presented an analysis where travelers face huge problems during night travel. The high beam directly falls on the driver's eyes. the driver's eyes discomfort and this discomfort will result in the involuntary closing of the eyes. this fraction of distraction caused many of the

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accidents to happen at night. It is avoided using the automatically operated upper and dipper light using the sensor. Manjula s.c, Sushmita M R, (2017) Proposed this project. The upper and dipper light and their intensity pose harm during night driving. the high bright beam cause discomfort to the person traveling from the opposite direction. The sensors sense the intensity and reduce the glare effect to overcome such incidents they have a fabricated prototype of an automatic headlight. Videep Virat, Rahul Kumar Roy, Doneti Sai Kumar, Ganesh Kanike, and Swastik Pradhan (2021) presented how to overcome road accidents, it's a big challenge. In the present era, accidents happening during night traveling are caused by headlights and streetlights. this paper represents a review of work done for automatic upper and dipper light and its control. The research gap they presented includes a newly based design. Arpita K. Akhila M. Jain, Avi Kumar. R (2018) describes the automatic upper and dipper lights pose a great danger during night traveling. Its control is the most important term, the proposed system can be demonstrated with the help of two vehicles where the high beam of the vehicle can be controlled with the help of other vehicles coming from opposite directions and vice versa. the sensor used in it avoids accidents. Samira Badrloo, Masood Varshosaz, Saied Pirasteh, and Jonathan Li (2022) Describe some techniques using which one can overcome the problem of crashing any robot or vehicle into an unknown object. This smart feature simply uses sensor and program-based technology which enables comfort and safety. Recently this feature can be seen in almost every smart system. This innovation in robotics is more likely to be seen everywhere in the upcoming years. Roni Stiawan, Adhi Kusumadjati, Nina Siti Aminah, Mitra Djamal, and Sparisoma Varidi (2019) Proposed a system where obstacle detection is made even more superior. By using a camera along with an ultrasonic sensor and a program that can detect the number of vehicles on the road at a particular distance over a specific period. A vehicle monitoring system is improved further and the detection is made simpler by integrating the sensor and camera. Abhishek Vaishnav and Ritesh Kumar Nishad (2015) Describe an Automatic headlight dipping system. Where, a common problem of light glare while driving at night is eliminated. And a very safe and sound architecture is implemented which involves less cost. The sensor-based Automatic dipping is far superior to other alternatives.

Headlamp System

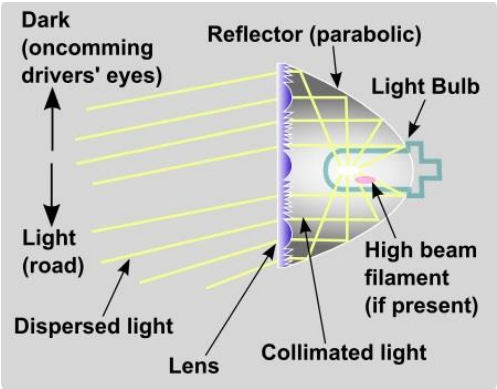


Fig.1 High Beam and Low Beam Mechanism of Vehicle Headlight

The headlamp system is made Automatic i.e. The High beam and Low beam modes, Using LDR sensors. This Enhances the driver's safety, comfort, and ease of driving. It makes the

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driver to more concentrate on the road rather than focusing on the auxiliary systems. This automatic operation takes place for almost all the vehicles driving on the road at that instant. the approaching vehicle from the opposite side and the vehicle from behind both react to this operation. However, Vehicles from behind do not receive high-intensity light as tail lamps are low-intensity lights. Also, external lights like street lights, signal lights, and any other external lights don't seriously cause trouble as these sensors are only going to react at some intensity. Atmega 328p Controller

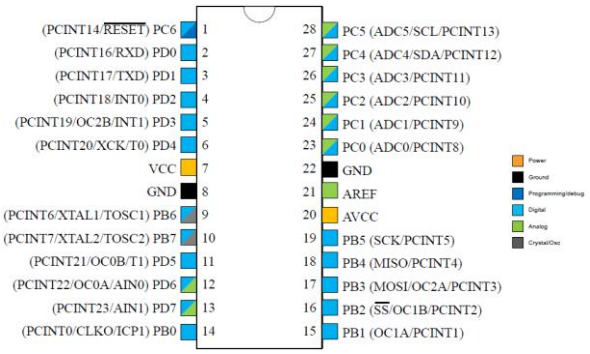


Fig.2. Pin Diagram of Atmega 328p

Features- 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 is used by the bootloader
SRAM 2 KB (ATmega328) EEPROM 1 KB (ATmega328)
Clock Speed 16 MHz The Arduino Uno can be powered with an external supply using USB. Supply can be fed using an AC-DC adapter by plugging a 2.1mm center-positive plug into the board. Supply is given to the Gnd and Vin pins. The recommended supply range is 7-12 V. Violating these limits may cause the operation unstable.
Vin- This pin is used to feed the voltage (7-12V). If supplying through a power jack this pin is used.
5V- This pin gives 5V output from the regulator on the board
3.3V- onboard regulator generates 3.3V and the max current drawn is 50 mA.
GND- Ground pin.
Atmega 328p has a memory of 32 KB. It has SRAM of 2 KB and EEPROM of 1 KB

Power Supply
Components Required-
Step down transformer (0-15V) AC – 1
Bridge Rectifier module – 1
Bridge Rectifier module – 1
Regulator IC L7805 – 1
Capacitors 1000µF, 0.1µF, 100µF, 0.1µF – each 1

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Resistors 2KΩ, 1KΩ – each 1
Resistors 2KΩ, 1KΩ – each 1
First, the 110V/220V AC supply is stepped down to 15V AC by a 1 Amp step-down transformer and then converted to DC by using a Bridge Rectifier module. Capacitor C1 removes AC ripples from the DC supply and then IC L7812 regulates and gives 12V at output. High-frequency ripple filtering is done by Capacitor C2. LED indicates that 12V Supply is available. 12V DC is again filtered by Capacitor C3 and gain regulated by IC L7805 regulator. We get 5Vregulated at the output of the IC L7805 regulator. Capacitor C4 performs high-frequency ripple filtering and LED2 indicates the presence of a 5V DC supply. This is then constructed on PCB. 1N4007- Bridge Rectifier module is constructed using the 1N4007 diode. Resistors, Capacitors, and LEDs are used on the board for respective use.

Sensors and Relay

1. LDR- LDR stands for Light Dependent Resistor. LDR is a resistor that changes its resistance when light intensity falls upon it. it works in a way such that, whenever light intensity falls upon it, its resistance drops.
   LDR has the following approximate values-
   Daylight = 5000 Ω
   Dark = 20000000Ω
2. Relay- A relay is nothing but a switch that operates electromechanically or electronically. they simply control one circuit by opening and closing contacts in another circuit.
3. Ultrasonic sensor- at regular intervals ultrasonic sensors emit short, high-frequency sound pulses. Initially, when these sound pulses are emitted, they strike an object and reflect in the form of echo signals. And so, this computes the distance between the object and the vehicle.

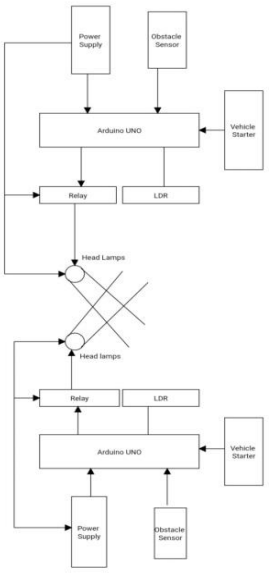
Working

Its working is completely sensor and program based. Both the light control and obstacle detection works on sensors. Mostly, sensors are located on the dash of the vehicle. As LDR senses the light intensity and changes the value of resistance i.e., it restricts the amount of current flow through it. In the dark, LDR has high resistance hence more current can pass through it. A program is made for Arduino. If the condition matches the program the output is given by LED. Two LDRs are used in this model. Where one is used for natural light. In natural light it will turn off the whole system i.e., lights will be turned off automatically. Second LDR is used for High beam and Low beam operation when any vehicle is approaching from the opposite direction. made regulated and ripple-free. This process is repeated two times and at the output 12V pure DC supply is available which is then can be fed to the Microcontroller for respective operation.

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Fig.3. Working Block Diagram



The ultrasonic sensor is used to sense the obstacle by emitting sound pulses, which travel at the speed of sound. Then reflects after striking an object in the form of echo signals.

2. CONCLUSION

Safety and comfort are the utmost prior considerations when driving any vehicle. So smart features enable a vehicle to automatically control the high beam and low beam switching and to smartly detect any object in a way without crashing it. Vehicle manufacturers can easily implement these features as it involves very low cost and these are completely electronic based so involves no maintenance. A separate power supply module is used where 110/220V is stepped down to 15V, and using a bridge rectifier module it is converted to DC, and using capacitor filters it is then

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