AN INGENIOUS CONTROL SYSTEM TO AVERT ACCIDENTS ON ROAD

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Abstract: ***Automobile is becoming one of the most common assert in each and every home on an average. Moreover there are many automotive industries working on various technologies like infotainment, cruise control, auto lane correction, etc., to make the automobile a safer mode of road transport. One of the significant areas in which the industries are researching to provide enhanced road safety is headlamps. Earlier the head lamps of automobiles were made of halogen lamps. In order to improve the efficiency of lighting conditions they were replaced by High Intensity Discharge lamps which are now being replaced by LED's in high end luxury models. But still the High intensity discharge Halogen lamps are more common among automobiles that cause more temporary blindness or glaring when a vehicle with similar lighting approaches from the opposite end. Moreover no proper lighting is provided at the turns by the existing system. Hence to overcome these two problems prototype has been designed, which would automatically dim the headlights when an oncoming vehicle within the distance of 50m is encountered and also the head lights would adapt itself to the path at turnings by constantly measuring the steering angle.***

Keywords: Adaptive headlights, High intensity discharge [HID] halogen lamps, Steering angle, and Temporary blindness.

I.INTRODUCTION

When comparing the last decade the number of automobile users has increased, in specific to this many safety and security systems have been developed. Despite these security systems many accidents takes place. A latest survey shows that the numbers of accidents that occur at nights are higher than that in the day time.

The major cause for night time accidents is poor lighting conditions. Headlamps are the primary requirement for any automobile on road because it provides a proper vision for the driver at night. These headlamps can be switched either to high beam mode or low beam mode. High beam is used when there are no vehicles or any other light sources on the road. Hence in other circumstances low beam is used. Therefore based on the road conditions and the presence of any vehicles the driver has to manually switch the headlamps to high beam or low beam. In case a vehicle with bright light isapproaching from the opposite direction, the driver of the subjected vehicle has to dim his light else the bright light from the opposite vehicle may cause glaring or temporary blindness to the driver. In addition to this problem, Standard headlights are designed to light up the straight path only irrespective of the direction in which the car is moving. Therefore while moving around the curves, only the sides of the road is illuminated, this is not sufficient to cover the entire curvature. Hence a prototype that is has been designed, reduces the problem of manual dimming of the bright headlight of our vehicle when it senses a vehicle at close proximity approaching from the other direction. And a provision is provided for the horizontal movement of the headlamp in accordance to the turning angle of steering of the subjected vehicle thereby illuminating the entire curvature of the curve.

II. TECHNOLOGY DISCUSSION

On an average, in India, the assistance of the headlamp for the driver's visibility is essentially required from 6.00 pm till 5.00 am. In the existing model, the headlamps are switched between the bright and dip modes by the driver using a switch manually. The bright mode is used when there are no other light sources on the road to aid with driving. For example, in long highways, a pitch black street having no lights is the ideal locations where one would use a bright beam. The dip or the low beam is less intense than the bright beam. It is used under normal night driving conditions. The dip beam is aimed low at the road and covers a small range. The high beam has a longer range but very less field coverage. Hence, when tested under a standard distance of 50 feet from the automobile the dip beam is less intense (700 lumens) and high beam has a higher brightness index (1200 lumens). The human eye is capable of bearing the brightness of around 1000 lumens from a distance of 20 feet. Since the high beam has a longer throw and a higher brightness index will ultimately fall on the eyes of the driver coming on the other side of the traffic.
In addition to this, the present static headlamp provides lighting in tangent direction of the headlamp without accounting to the turning angle of the vehicle on road and the distance between incoming vehicle and subject vehicle. Therefore driver is subjected to insufficient lighting and unreliable or incomplete view of the road at corners.

III. METHODOLOGY

The system which detects the rotation of the vehicle steering and the distance between the object or vehicle on road with high sensitivity using sensors and then process the output of the sensors using microcontroller and directing the motors attached to the headlamp based on the controller output is designed.

A. Adaptive Headlamp Control System

An ingenious control system to avert accidents on road is a combination of automatic dimming and angle adjustable headlamp module. The automatic dimming is achieved by constantly measuring the distance between our vehicle and the oncoming vehicle on road using the ultrasonic sensor. The angle of the headlamp will change in accordance with the angle measured by the steering angle sensor which is fitted with the steering of the subjected vehicle. Both the objectives of this project are accomplished by connecting the output of the ultrasonic and steering angle sensor to the micro -controller unit where we have programmed it in such a way to carry out the adjustment of headlamp automatically so as to provide safety to the road users.

It is very essential to make sure that the vehicle's bright (high) beam does not cause glare to the driver coming from the opposite direction. Hence the intensity of the headlamp has to be reduced until the traffic passes away.

The horizontal movement of the headlamp has to be obtained in relation to steering shaft angle; hence a proper illumination in the right direction while turning at corners can be achieved.

B. Ultrasonic Sensor:

An ultrasonic sensor which is also known as transceivers when they both send and receive, but more generally called transducers is also used in this project. It works on a principle similar to radar or sonar which estimates the attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and determine the echo which is received back by the sensor.

C. Steering angle sensor

Steering angle sensor is used to determine the displacement of steering (steering angle) of the vehicle when the vehicle is moving around turns or corners . The steering angle is defined as the angle between the front of the vehicle and the steered wheel direction. The steering system has a maximum (minimum) steeringangle of +0.52359878 (-0.52359878) radians or +30 (-30) degree.

D. Servo motor

A Servo motor is a small device that contains an output shaft which can be positioned to specific angular positions by sending the coded signal. As long as the coded signal exists on the input line, the servo will maintain the angular position of the shaft. As the coded signal changes, the angular position of the shaft changes

. This positional change is used to move the headlamps horizontally in this system.

E. System architecture

The developed system first collects inputs, processes them, and then moves the Servo motors and dims the light beam as output. The Arduino board based on ATmega328P Processor is used in this project. The Features of this includes 16 MHz clock frequency, 32KB Flash and 2 KB SRAM. This Arduino boards operates on 5 V. Moreover it has 14 digital input/output pins among which 6 are analog input pins and 6 are PWM output pins . The choice of controller is determined by easy availability and reliability.

F. Pulse Width Modulation(PWM):

PWM controls the analog circuits, it gives a digital output. It has various applications from communication to measurement and controlling power and converting power.

Fig.: PWM signal for corresponding angle of rotation

WORKING

First and foremost the ultrasonic sensor is used to determine the distance of any oncoming vehicle on road by calculating the time interval between the sent signal and the received echo. Therefore the dimming of the headlamp is achieved in accordance to the distance sensed vehicle or object.

The next objective is to get clear view on road and obstacles on road at night time along curved road, hence it is necessary to turn headlight along the direction of movement of the vehicle. The steering angle sensor is used for this purpose. If the steering shaft of the vehicle rotates at corners, the steering angle sensor attached with the steering also turns accordingly and therefore the voltage varies at the input.

Thus the varying input voltage is converted into digital input via the A/D channel of the microcontroller. This digital signal in turn updates the PWM width. The output is feed to the servo motor through the motor driver IC and the servo motor helps to rotate the headlamp and the ultrasonic sensor together horizontally.

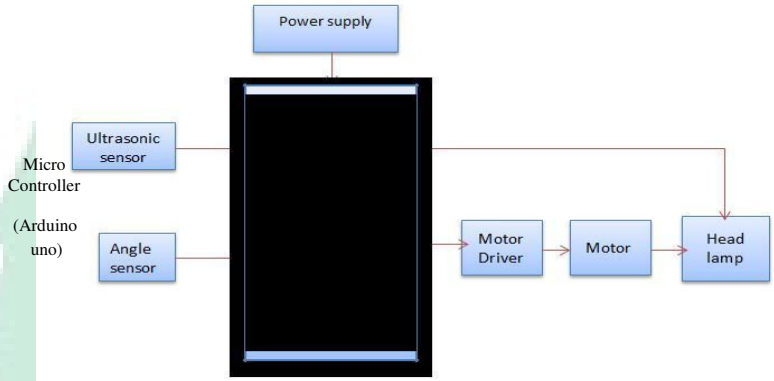

Fig. 1: Block diagram of Adaptive lighting system.

For example, if the headlight is set at the centre with an initial voltage of 2.5V, if the voltage increases as the angle sensor turns, the microcontroller reads this voltage increment and will send a coded pulse so as to turn the motor as programmed.

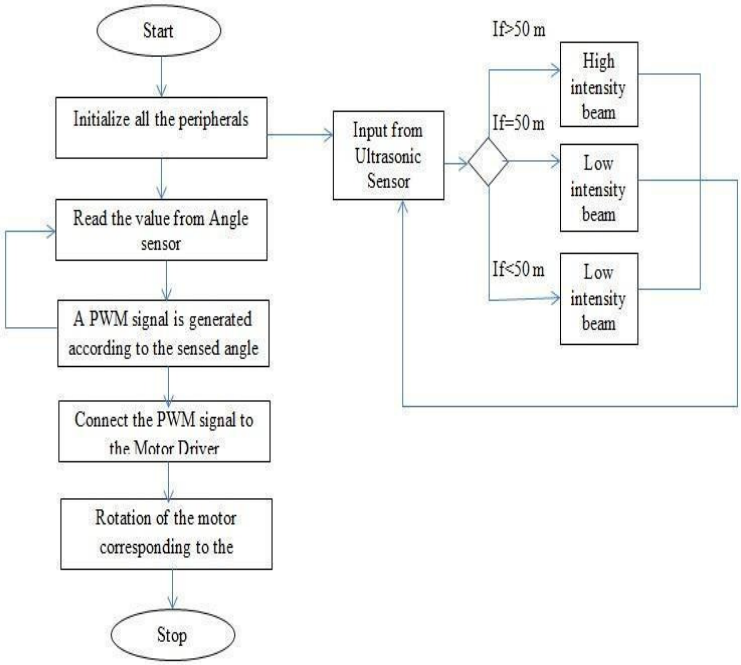

Fig. 2: Flowchart of Adaptive lighting system .

Fig 3: Comparing of the lighting pattern at corner.

IV. RESULTS AND DISUISSION

In this ingenious system, turning the steering according to drive ratio, the angle sensor senses the corresponding angle. The input signals are fed to the controller by the angle sensor after converting it to digital signal using ADC. According to the input angle signal, the controller generates different values pulse width to control the rotation of the motor in desired direction. The auto dimming of head lights are performed when a vehicle in close proximity within 50 m is detected by the ultrasonic sensor.

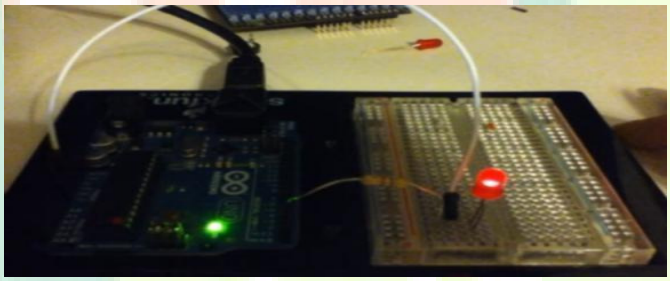

Fig. 4: Result of the Adaptive lighting system.

Therefore the troxler effect or the temporary blindness is eliminated. The future work mainly concentrates on to invent a comprehensive system which can be suitable for complex road conditions like pot holes. In addition to this the idea of controlling head lamp of the automobiles from the remote location by using Wi-Fi module can also be implemented for experiencing better automated headlamps.

V.CONCLUSION

One of the most important factors in mitigating driver fatigue and increasing safety during night driving is providing a well-illuminated field of view. This ingenious control system optimizes the distribution of light from the headlights according to driving circumstances. Depending on distance between the vehicles on road and steering input, the system dims the bright headlights and then turns them in the direction the driver intends to travel. Therefore this system illuminates a greater distance, improving the driver's field of vision and visibility around curves during night driving. Mated with the auto-dimming function, the system helps to prevent drivers of oncoming vehicles from getting blinded.

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