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Smart Road Safety and Automatic Vehicle Accident Prevention System for Mountain Roads

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ABSTRACT- There are many dangerous roads in world where accidents are the major cause of death. Looking at most dangerous roads in the world which are mountain roads and curve roads. In the mountain roads are narrow and very tight which causes severe accidents. The main objective of this project is to reduce the accidents in hairpin bends and U turnings. Vehicle drivers generally not able to see the other side view this cause accidents. Through this project we can able reduce these types of problems. In this project two led's connected with two ultrasonic sensor which will be placed in the above mentioned placed. It is mainly used to avoid the accidents on hill station because the driver not able to see another side of vehicle which is called blind spot. By using signal and sensor based system. The movement of vehicle is tracked by sensor and it indicates vehicle movement to the drivers using signal. The Objective is to decrease the number of accidents in curve roads. This is done by alerting the driver by means of LED light which glows when vehicle comes from the other side of the curve.

I . INTRODUCTION

The dangerous roads in the world are either mountain roads, narrow curve roads or T roads. The most dangerous mountain roads are very narrow and they have many curves. For example: North yungas road in Bolivia, Three level Zigzag road in Himalayas, 99-bend road in China, Tsugaru Iwaki skyline in Japan, Los Caracoles in Chile, Lacets de Montvernier in France. Sometimes there will be the chances of animals on the road in rural areas which is also an major issue in hilly roads. The major issue in curve roads is that the other end of the curve road cannot be seen by the driver Because of the obstacles like trees or rocks present in the middle which causes number of accidents Because of presence of unexpected obstacles. According to Million Death Study (MDS) about 2.3 million people die in India per year. In that 137 thousand is because of road accidents. That is about 377 people per day. In that 3.7% because of failed to look the road. The main reason for the accident in the curve roads is because drivers are not able to see the vehicle or obstacles coming from other end of the curve. Due to very speed it is difficult to control the vehicle and chances of falling to cliff increases.

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Usually horn is preferred to alert other drivers but in the rainy seasons there is least chance of hearing horn sound. So concluding horn as solution isn't right. In order to overcome these problems we are introducing sensor based automatic accident prevention system for mountain roads. Here ultrasonic sensor is installed in one side of the road before the curve and keeping a LED light after the curve. Ultrasonic sensor (obstacle sensor) sends signal in form of pulse. If vehicle is present, signal hits the vehicle and then it is received by the sensor. During this time LED present at the other side of the curve starts glowing. In the absence of the vehicle the above procedure will not occur. The driver can slow down the speed of vehicle when the light glows and if it's necessary he could even stop the vehicle. This system is applicable when the driver cannot see the vehicle coming from other end of the road. All the mountain roads and curve roads can become safer from accidents by this system application and thousands of life can be saved.

II . SYSTEM DESIGN

The design of this sensor based accident prevention system consists of two parts; they are hardware design and software design. Hardware design consists of elements like ultrasonic sensor, a microcontroller and LED. Ultrasonic sensor works on +5V DC supply and has range from 2 cm to 100 cm. Microcontroller Software design is done by using Arduino 1.0.5 IDE tool which is open source software and Programming can be done by using embedded C or C++. The LED light used utilises maximum +5V DC supply.

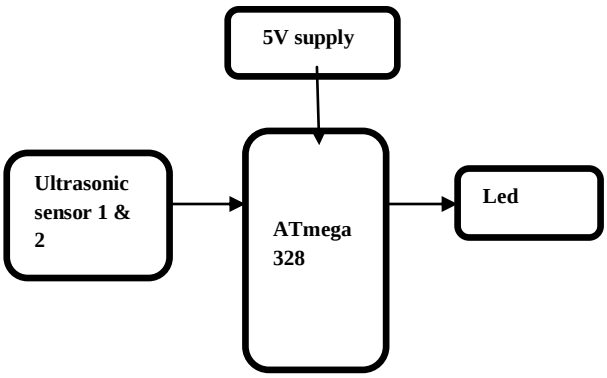

Fig.1 Block diagram of smart road safety

A. HARDWARE IMPLEMENTATION

We have used Microcontroller (Arduino UNO), LED light and ultrasonic sensor. The function of ultrasonic sensor which include sending and receiving of signal is similar as that of bat. Ultrasonic sensor has 4 pins. They are +5V

VCC, GND, Trig pin and Echo pin. Trigger pin acts as output pin and Echo pin acts as input pin. Ultrasonic sensor sends the signal in the form of pulses from trigger pin and is received by the echo pin and then signal is sent to arduino UNO. Microcontroller arduino UNO processes this data and operates the LED according to programming which is connected to output pin of the microcontroller arduino UNO. LED is operated according to the command i.e. LED will glow if the signal is reflected back. In the absence of the object the signal will not reflect back. Hence the LED will not glow. The simple block diagram is shown in the figure 1. The trig pin of ultrasonic sensor is connected to the digital pin 3, 4 of microcontroller arduino UNO and echo pin is connected to digital pin 2, 5. VCC is connected to +5V and GND is connected to GND of microcontroller arduino UNO. LED is connected to pin number 6, 9, 7, 10 of microcontroller arduino UNO. The sensor senses the vehicle In the presence of vehicle; the light will glow at the other end of the curve. The sensor will not sense in the absence of the vehicle and the light will not glow. This process goes on continuously.

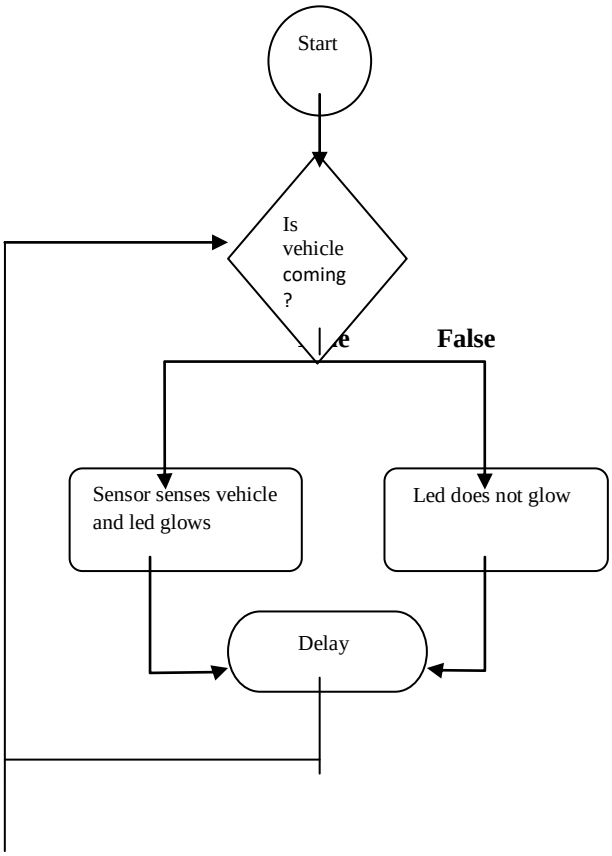

Fig.2 flow chart of sensor working

B. SOFTWARE DESIGN

The software design consists of programming the microcontroller which is programmed by Arduino 1.0.5 IDE tool which is open source software Programming can be done by using either embedded C or C++ depending on programmer choice. First step is to initialize the trigger pin and echo pin as input and output pin and connect LED pin to the output. Then send pulse through trigger pin and then receive it through echo pin. Then received value should be converted into distance. Time delay should be set to 30 if the distance is in range, else no actions should be taken and this process is continued. Next process is to check if time delay is zero if it satisfies the condition then LED will be turned off and if it does not satisfy the condition then turn on LED and decrease the value of time delay by one.

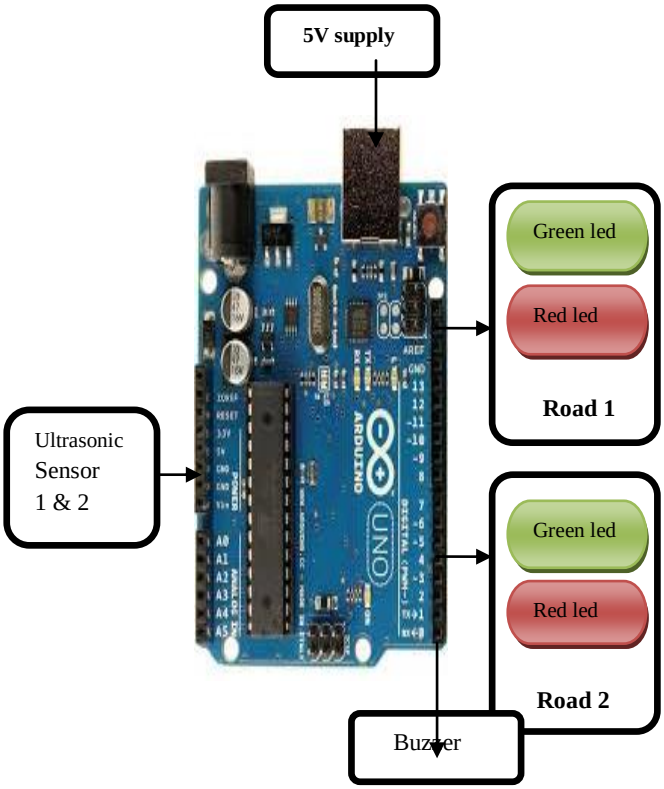

Fig.3 Circuit Diagram

III . EXPERIMENTATION AND RESULTS

First step is Coding of micro controller arduino UNO which consists of set of commands to process the data from sensor and to operate the LED.

Second step is Circuit connection of sensor, Led and microcontroller arduino UNO where the sensor senses the vehicle or obstacle and the microcontroller arduino UNO operates LED according to commands.

Analysing, debugging and running the program becomes the third step of building this system. Once this process is done the program is uploaded to microcontroller arduino UNO. Sensor performs its function by sending the signal as sensor senses the object, it gives the signal information to microcontroller arduino UNO which possesses and shows the output in the serial monitor. Here the output is in distance.

Fourth step is fixing the circuit to the hardware model which includes fixing of microcontroller arduino UNO, ultrasonic sensor and LED light to the model of curve road.

Detection of obstacle by the sensor when vehicle passes through the road is fifth step. The signal sent by the sensor hits the vehicle and reflected back to the sensor. It is the experimental demonstration.

In last step Output is obtained i.e. glowing of LED when the signal is received by the sensor after reflecting back from the vehicle. By all this steps experimental demonstration is performed successfully and result of glowing Led is obtained and sensor based system is ready to perform its particular task and fulfils the main objective of our paper.

IV . ADVANTAGES

1. Avoid accidents in curve roads mountains roads and hill roads.
2. Saves thousands of lives
3. Easily implementable to the existing roads.
4. Fully automated (No person is required to operate).
5. Installation cost is very less.
6. Vehicle monitoring systems can be implemented easily.

V . FUTURE WORK

1. Arrangements to protect the sensor from being damaged in critical places.
2. Decrease the size of unit so that it occupies small place and easily kept in narrow roads.
3. Implementing the system to detect number of vehicles and velocity of vehicle.

VI . CONCLUSION

The purpose of this paper is to save thousands of precious lives and decrease the number of accidents in curve roads. This is possible by alerting the driver by means of LED light which glows when vehicle comes from the other side of the curve. The vehicle is detected by the help of Ultrasonic sensor which is interfaced to the microcontroller arduino UNO. By this we can save thousands of lives in the curve roads.

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