International Journal of Future Generation Communication and Networking
Vol. 13, No. 3, (2020), pp. 965–973

Design and implementation of collision avoidance system using IOT

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Abstract

Transport is one of the most important criteria in our day-to-day life. Hence it must be safe and secure. There are many factors that affects transport. The first and foremost cause is accident. The leading causes for accidents are over speeding and usage of mobile phone while driving. The objective of this project is to propose a new way to control these types of accidents. The proposed system consists of transmitter and receiver units. The transmitter will be deployed in the streets and transmits control data for particular range. If the receiver senses the control data, the speed of the vehicle is controlled with the help of solenoid valve which will be placed with the petrol tube. Our project is also incorporated with detecting mobile phone calls by using IOT. An android application is developed so that it detects the incoming and outgoing calls. The app sends the signal to Node MCU and the receiver setup which is insisted in vehicles will stop the vehicle. Our project will reduce the accidents and saves the life of humans.

Keywords: *IOT, Node MCU, Android application*

1. INTRODUCTION

As the days of manned driving are becoming extremely numbered, so are those of traffic jams, bad, dangerous and rough driving and importantly it leads to accidents. Automation of the driving control of vehicles is one among the foremost vital need of the hour. This technology can alright implement what was absent before, controlled lane driving. Considering the hazards of driving and their more pronounced effect on vehicles our COLLISION AVOIDANCE SYSTEM is strictly what's required to our environment.[1] Safety is a necessary a part of man's life. thought to the accident cases reported daily on the main roads altogether parts of the developed and developing countries, more attention is required for research within the designing an efficient vehicle driving aiding system. it's expected that if such a tool is meant and incorporated into our vehicles as a speed guard[1], it'll reduce the incidence of accidents on our roads and various premises, with subsequent reduction in loss of life and property.

ISSN: 2233-7857 IJFGCN

2. HARDWARE AND SOFTWARE

2. 1. HARDWARE SECTION

The components used in our system are

a) IR module (transmitter and receiver)
b) Arduino UNO
c) Arduino NANO
d) IOT module
e) Microcontroller
f) Solenoid valve
g) Node MCU
h) LCD display

The IR module consists of transmitter and receiver, where transmitter is place on poles in prone accident zones and the latter is incorporated with vehicles[1]. The microcontroller ATMEGA328P makes the system more efficient and cost worthy[1].

2. 1. 1 NODE MCU

Node MCU Development Board consist of ESP8266 which is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol[2]. The features of ESP8266 are extracted on Node MCU Development board. Node MCU (LUA based firmware) with Development board/kit that consist of ESP8266 (wi-fi enabled chip) chip combines Node MCU Development board which make it stand-alone device in IoT applications [1]. The Espressif system developed the ESP8266 is Wi-Fi enabled system on chip (SoC) module which is mostly used for development of IoT (Internet of Things) and embedded applications[1].

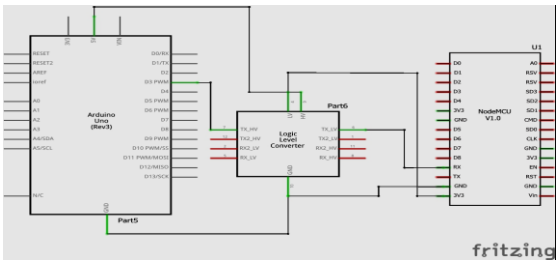

Fig. 2.1 Node MCU with Arduino

2. 1. 2 LIQUID CRYSTAL DISPLAY (LCD)

A liquid Crystal Display commonly abbreviated as LCD is essentially a display unit built using liquid technology. Once we build real life/real world electronics-based projects, we'd like a medium/device to display output values and messages[1]. The foremost basic sort of electronic display available is 7 Segment display – which has its own limitations. [2] LCD modules form a very important part in many arduino based embedded system designs. So, the knowledge on interfacing LCD module to arduino is very essential in designing embedded systems. This section of the article is about interfacing an Arduino to 16×2 LCD. JHD162A is the LCD module used here. JHD162A is a 16×2 LCD module based on the **HD44780 driver from Hitachi**.

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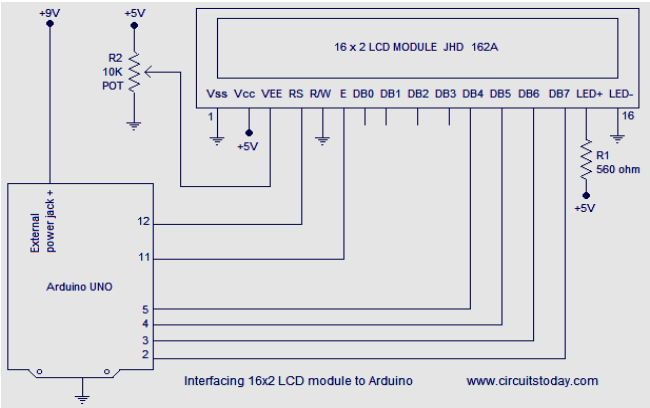

Fig.2.2 LCD display with arduino

2. 2. 3 SOLENOID VALVE

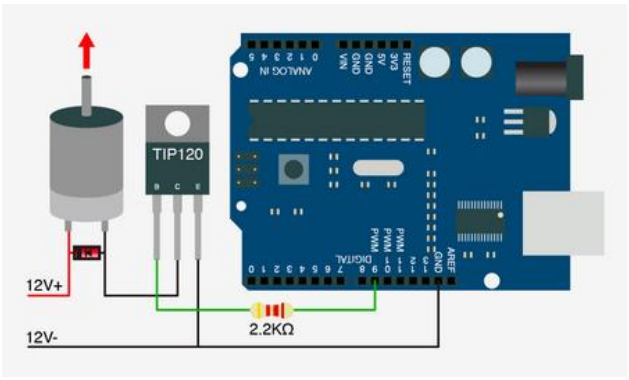

Fig.2.3 Solenoid valve with arduino

Solenoid valve is used to control the speed of the motor. The fig 2.3 shows the solenoid valve connected with arduino board[2].

2. 2 SOFTWARE SECTION

The software section contains Arduino UNO and NANO coding. An android application is to be installed in mobile phone. With the help of the application the IR receiver can sense the electromagnetic signals from mobiles during call received.

2. 2. 1. ANDROID APPLICATION

An android application is being created using “App Inventor” and that application will send the signal to Node MCU if the user attend or performs a call. This application should be made as a default one.

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3. WORKING OF SYSTEM

The working/construction of the system is divided into three categories:

a) Transmitting section
b) Receiving section
c) Controller and motor driver section.

The proposed system restrains accidents over two major factors, they are, Accidents due to

a) Over speeding in prone areas
b) Mobile phone usage

3. 1. ACCIDENTS DUE TO OVER SPEEDING

According to our proposed system the transmitter consists of an IR transmitter, Arduino Nano and a power source. But in real time the IR module is replaced by a Radio Frequency module[1]. The main reason for the RF module is that the range is high. It can transmit the radio waves starting from 100 meters. There is no need of Arduino Nano in case of RF module in the transmitter end[1]. The receiver consists of a microcontroller (Arduino UNO), IR receiver, motor driver and two motors. The threshold value will be set up in the microcontroller in the receiver. The transmitter will keep on transmitting the infrared waves[2].

When the vehicle enters the speed restricted zones like schools, colleges, hospitals, etc., and if the receiver in the vehicle receives the signal it checks the microcontroller whether the speed of the vehicle is lesser than the threshold speed. If the speed is greater than the threshold value it sends signal to the motor driver and in turn the motor driver controls the speed of the motors[2]. And once the vehicle crossed the speed restricted zones, the receiver is turned OFF so that the vehicle can be moved in the normal speed as of the driver. But in real time we can't reduce the speed of the vehicle using the motor driver. To reduce the speed of the vehicle a solenoid valve will be placed in the fuel pipe.[3] Once the receiver receives the signal the microcontroller will send the signal to the solenoid valve. The solenoid valve is a water controller valve in which it works on the pressure[3]. The solenoid valve will close accordingly so that the speed of the vehicle is controlled. This system will reduce the accidents which is caused due to over speed[3].

3. 2 ACCIDENTS DUE TO MOBILE PHONE USAGE

The other part of the project is to reduce accidents due to usage of mobile phones while driving. In the existing system to reduce this type of accident they used jammers to cut OFF the signals and in case of any emergency calls it becomes a question mark[4]. To overcome this IOT is used to reduce the accidents. An application is created, and that application should be made mandatory in every mobile phone. When there is any incoming or outgoing call the app sends signal to Node MCU[4]. It acts as a Wi-Fi module and in turn it sends the signal to the microcontroller. Then the microcontroller sends the signal to the motor driver and in turn it stops the motor[4]. By doing this the accident rate is reduced since most of the accidents are due to mobile phone usage while driving[4].

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Transmitting section:

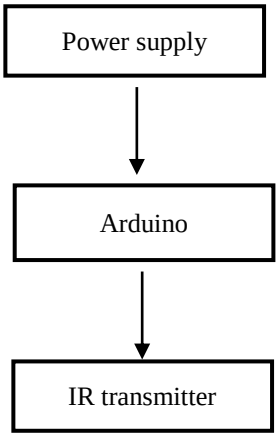

Fig.3.1 Block Diagram of transmitter

The fig 3.1 shows the block diagram of transmitter circuit. Power is supplied to the microcontroller using 12V dc power supply[4]. The electromagnetic signal which can be sensed by the receiver is fed to the environment is by using infrared transmitting sensor.

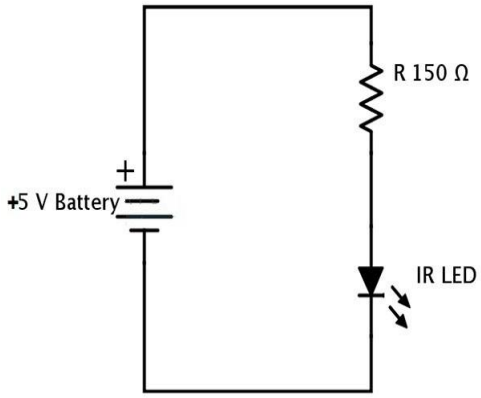

Fig.3.2 Circuit Diagram of IR transmitter

Fig 3.2 shows the circuit diagram of the IR transmitter. The IR transmitter LED is powered up with +5v power supply. The positives of IR LED and power supply is connected with 150ohm resistor in order to prevent the damage of heavy fluctuation during the movement of the vehicle[5].

Receiving section:

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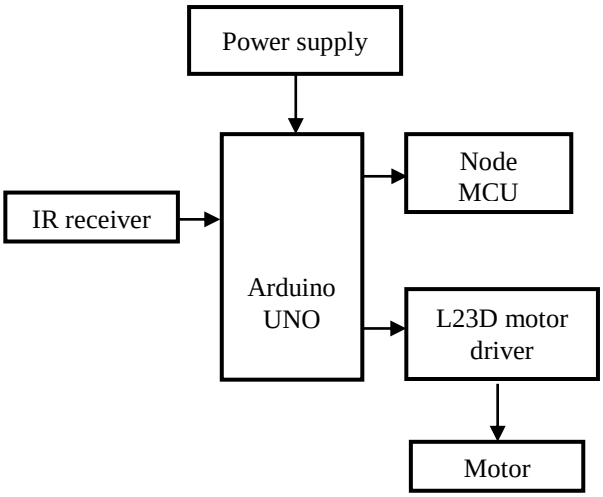

Fig 3.3 Block diagram of receiver and controller section

The fig 3.3 shows the block diagram of receiver circuit. The signal from the transmitter is received in infrared at the receiver end of the module. Then the signal is transferred to microcontroller[5]. Based on the sensed signal the microcontroller sends the information to motor driver and in turn to control the speed of the motor. The alert message is displayed in LCD[6]. The IR receiver is connected by the following circuit diagram 3.4[7]. The IR receiver LED is powered by power supply and potentiometer is used to vary the power to the receiving LED[7].

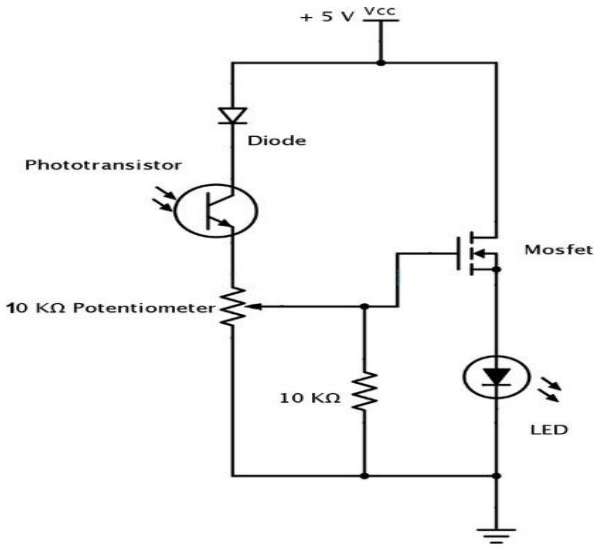

Fig.3.4 Circuit Diagram of IR receiver

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4. ADVANTAGES

The proposed system will control the speed of the vehicle and it alerts the driver to decrease speed.The system won't block the call, in turn it reduces the speed of the vehicle and allows the driver to attend the call.The cost of our project is comparatively lower than existing systems

5. CONCLUSION

The proposed system checks the speed of the vehicle using IR sensors and microcontroller and sends warning signals to driver to lower down the speed if speed is on higher side on prone accident areas. Incase driver didn't reduce the speed then within seconds our system will take over the control of the vehicle and will reduce the speed of vehicle automatically. Hence, this project is a great lifesaving system in heavy traffic areas.

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ISSN: 2233-7857 IJFGCN

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