Vehicle To Vehicle Communication and Accident Prevention

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Abstract: V2V collisions are one of the most destructive events. Although there are many other causes of V2V accidents, driver neglects and excessive speed are the main culprits. Additionally, it appears that a lack of awareness makes it difficult to arrive at the scene of the collision in time. By reducing the frequency of accidents, the development of Internet of Things(IoT) technology Can aid in the solution of this issue. In this study, a smart system that warns users, control vehicle speed, and properly warns people in the event of accidents. This device continuously monitors the distance between oncoming cars and any obstruction by using distance sensor. It will alert the driver to restrict speed and will automatically slow down the when crucial distance is approaching. It is a system that can send a warning to the police stations and be capable of identifying accidents. RSU will be used to monitor and compare a vehicle's speed. IOT-based vehicle safety Alert and Tracking System Research and Implementation When an accident occurs under unclear conditions, a notice alert with V2V information is delivered to the person responsible.

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1. Introduction

Our project aims to create a hardware tracking device based on GSM/RSU technology that alerts at the time of an accident with enough details, such as the precise location and time of the accident. This project will create a connection between the vehicle-mounted unit and the control station. Cellular networks and tracking devices with RSU/GSM capabilities will be used to monitor vehicles in real time.. In the event of an accident, the device will utilize the GSM network to send a warning message to the control station along with RSU module position information database. The software inside the microcontroller will manage all of the device's operations by analyzing the waveform from the vibration sensor. The gadget will use the GSM network to send a warning message and location data from the RSU module to the control station in the case of an accident. It is a comprehensive and useful cure for the insufficient emergency reaction. The accident reporting system is capable of automatically locating a traffic accident, locating the scene, and then relaying the essential information to the rescue organisation, such as the position, the time, and the specifics of the accident. In order to query the database in real time for accident data from prototypes, a control function at the server end will collect essential data and save it. Our solution combines cutting-edge hardware design and sophisticated control technologies in a compact, dependable container. Design and Development of Automatic vehicle accident detection." The concept is tracking of vehicles using Google Earth application develop in android application for mobile V2V communication system using **Bluetooth technology.** Accident Prevention and Reporting V2V communication system Using **GSM (SIM 900D)** and **GPS (NMEA 0183)** [1]. It enables intelligent detection of an accident at any place and reports about the accident on predefined numbers. Vehicle Speed Control V2V communication System Using **GSM/GPRS** [2]. GPS-technologies having greater range of frequencies, the user can get the information as quicker as possible. speed control at specific traffic roads[3]. Vehicle Pre-Deployment Using **GIS** Identification of High-Accident Density Locations [4-6]. The general characteristics of the car fatal accidents and makes an attempt to establish the most common types of fatal accidents and the causal factors [7,8]. Development of Risk Models for the Road Assessment Programme . This paper outlines the principles underpinning the development of both risk models from the viewpoint of the TRL researcher who directed the development process.

2. Existing System

Our system is totally autonomous. The V2v's onboard satellite navigation is not utilised. It has a separate antenna and RSU module[12]. The gadget is designed to be plug-and-play, low power-consuming, and compatible with a wide range of automobiles regardless of make or model while also being relatively cost-effective so that it may be widely used. One of the trigger events is physical damage to the V2v. A vehicle will likely operate as a trigger if it has destroyed important V2V regions. Just a push button needs to be pressed. It is positioned between the V2V's chassis and frame with some protection. A accident is unquestionably acceptable if the force of the impact is great enough to bend the panels and body up to the chassis. Additionally, this will prevent triggering in the case of minor, non-life-threatening crashes, which occur more frequently. Since it simply requires a push button trigger, it may be installed in a variety of locations throughout the car to protect against side hits, roof collapses, and angular impacts, as illustrated in and which also illustrates potential

impact switch placements inside the V2V frame (green). Two Maxim DS18B20 Digital Temperature sensors are included in the device. When the cabin temperature reaches 80°C or more and the engine temperature reaches 120°C, a trigger is set off. We can modify the programming because we are aware that this varies depending on the vehicle and the region.

3. Proposed System

This research suggests a new approach that, whenever possible, helps prevent automobile collisions. As a result, when an accident occurs, the system notifies a responsible party. It keeps an eye on the car to gather data on the separation between two cars. The distance is measured using ultrasonic sensors. Every second, this measurement is updated. Additionally, the driver sees it via an interface. Depending on a number of conditions, including safe, slow down, brake, etc., the system sends the driver a warning. The alarm in the V2V will sound if two vehicles get too close to one another. To signal warning, a yellow led alert will be presented. When a dangerous situation arises between two vehicles, a red led alert will be displayed along with a buzzer sound.

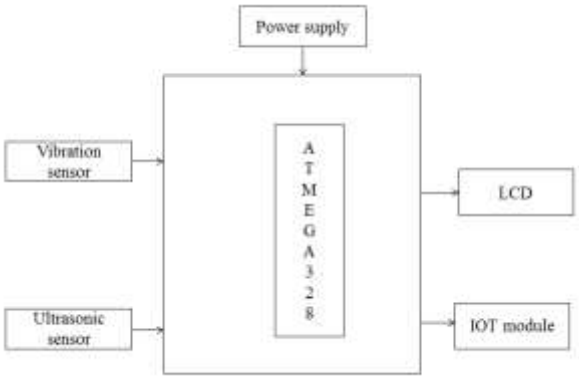

Fig1.Tx/Rx block diagram for V2V communication

The UI of the system will continuously display the separation between two vehicles. Alarms are used to warn the driver, and calculating the distance can help determine the likelihood of a collision. The technology will brake the V2V or change its gear to slow down using a servo motor when the gap between two cars gets crucial and the driver doesn't react. An IoT-based smart system is the approach we suggest using. While driving or entering an accident, this technology doesn't require any user interaction. It gives the driver a real-time vehicle alarm and automatically regulates the V2V's speed. Both accident detection and reporting are done by it. This could be used to avert any kind of auto accident.

4. Hardware Specifications

The following components are used to design the V2V communication System for Accident prevention.

4.1 Arduino

The gap between two vehicles will be continuously displayed on the system's user interface (UI). Alarms are meant to alert the driver, and measuring the distance can assist in figuring out how likely a collision is. When the distance between two automobiles narrows to a critical point and the driver doesn't react, the technology will brake the V2V or change its gear to slow down using a servo motor. The method we propose is an IOT-based smart system. This system doesn't require any human interaction while driving or during an accident. It provides a real-time vehicle alarm to the driver and automatically controls the V2V's speed. It does both accident detection and reporting. Any type of auto accident could be avoided using this. Instead, the Atmega16U2 (or Atmega8U2 up to version R2)-based USB-to-serial converter is emphasised. A resistor that pulls the 8U2 HWB line to ground to make entering DFU mode simpler.

The following improvements are now included with the board (A000066):
- A more reliable RESET circuit.
- The 8U2 is replaced by an Atmega 16U2.

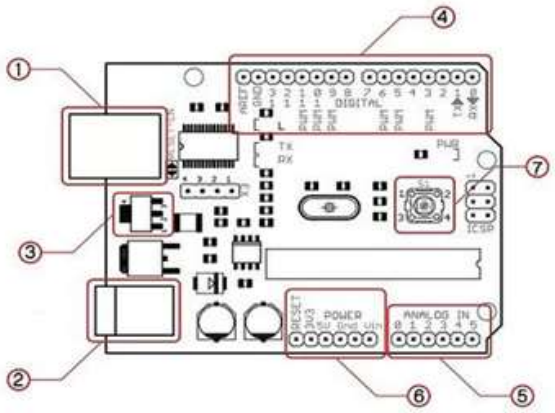

Fig2.Pin configuration of Arduino Uno SMD R3

The following numbered parts are:
1:USB connector, 2:power connector, 3:Automatic

power switch, 4:Digital pins, 5:Analog pins, 6:power pins, 7:Reset switch

4.2 I2C Module

I2C **SDA(4)** and **SCL(5).** Use the Wire library.If you require i2c (TWI) communication capability, use sda4 and scl5. The board also features an AREF pin, which is frequently used to describe the screen that blocks the reset button on the board. This particular pin serves as both an analogue reference for analogue input and a voltage reference refresh.

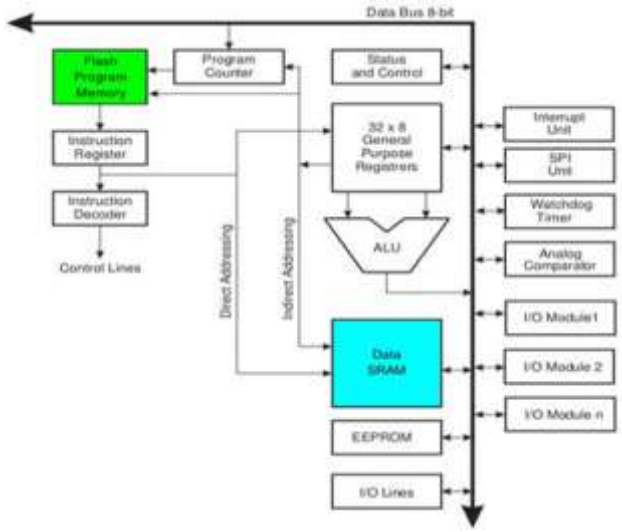

Fig3.Architecture of I2C Module

4.3 LCD

LCDs and other digital displays are widely employed in a variety of industries. A 16x2 LCD is used in our article. This is a very fundamental module that is utilized in many circuits. Only two lines and a maximum of sixteen characters per unit can be displayed on a 16x2 LCD. incredibly easy to use and programme. The LCD pin-out is provided. Under

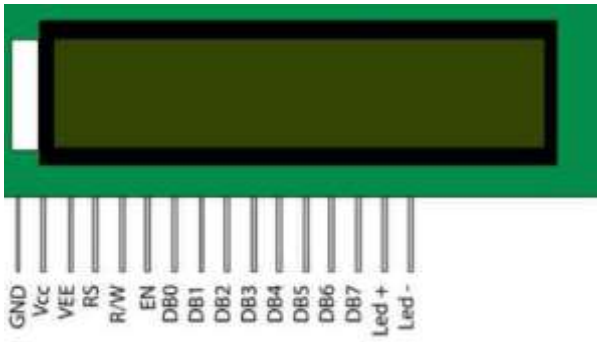

Fig4.Pin diagram of LCD

4.4 Power Supply

After being filtered by a straight forward capacitor sludge to produce a dc voltage, a diode therapy creates a full- surge remedied voltage by employing a motor to drop the interspersing current voltage, generally 220v rms. Anyhow of variations in the input dc voltage or the cargo coupled to the affair dc voltage, there's generally some ripple or ac voltage shift in the performing dc voltage. A controller circuit eliminates one of the well- known voltage controller ic chips that generally offers this voltage regulation by reducing ripples and maintaining the same dc value.

Fig5.Block diagram

5. WORKING PRINCIPLE

5.1 Transformer

The implicit motor reduces the voltage position of the power source from 0 to 230 volts to 0 to 6 volts. The perfection therapy, which is produced with the help of an op- amp, will next be connected to the implicit motor's secondary. Precision cures have the advantage of producing peak voltage as direct current(DC), whereas the rest of the circuits only produce RMS voltage.

5.1.1 Bridge Rectifier

This circuit is called ground protection when the four diodes are connected as shown. The angled edge of the network serves as the input of the circuit, and the other two edges serve as the business of the network. Assume the engine is in good operating condition and points a and b have positive and negative characteristics respectively. A positive result at point A causes D3 to move forward and D4 to move backward. if point B develops negatively, D1 and D2 move in opposite directions. D3 and D1 are presently forward biased, allowing current to flux through them D4 and D2 are reversed biased ,preventing current flux. The secondary of the motor serves as the conduct for current flux, which travels from point B through D1, over through RL ,through D3 and back to point B. The solid arrows point in this direction. across D1 and D3 waveforms 1 and 2 can be seen. A partial cycle subsequently, the opposition across the motor’s secondary reverses, driving D2 and D4 in

one direction while driving D1 and D3 in the contrary direction. The direction of current flux will now be through point A D4,RL, D2 ,the secondary of T1 and back to point A. A broken arrow indicates the direction of this path. Oscillograms (3) and (4) can be seen at D2 and D4. The direction of current flow through RL is constant. when this current passes through RL, it produces a voltage corresponding to the wave described (5). This earth protector s a complete protector because current flows through the load (RL) for half a cycle of the applied voltage.The fact that the ground protector produces an operating voltage that is almost twice as high as a conventional full swell circuit using this motor is one advantage over the former. This can be demonstrated by assigning values to the set of corridors in views A and B. Let's assume that both diagrams have the same engine .The peak voltage that occurs between points X and Y in both circuits is 1000 volts. In a typical full expansion circuit shown in figure A, the peak voltage from the central stopcock to either X or Y is 500 volts. The topmost voltage that can be remedied at any time is 500 volts because only one diode can conduct at a time. Due to the minimal voltage drop over the diode the maximum voltage that can be seen across the weight resistor is nearly 500 volts, but it no way goes above that position. The full secondary voltage or 1000 volts is the topmost value that can be remedied in the ground remedy depicted in view B. As a result, there is nearly 1000 volts of peak affair voltage across the weight resistor .The ground remedy circuit generates a advanced affair voltage than the traditional full- swell remedy circuit when the same motor is used in both circuits.

5.1.2 IC Voltage Regulator

Generally used IC classes include voltage controllers. The reference source, comparator amplifier, control and load protection circuitry are combined into one IC in the controller IC block. Fixed positive voltage, fixed negative voltage or malleable preset voltage can be acclimated by IC device. Controllers can operate with currents from hundreds of milliamps to knock-outs of amps, corresponding to power conditions from (milliwatts)MW to knockouts of watts. An unsupervised DC input voltage Vi is applied to one input outstation of a fixed 3- pole voltage controller regulates DC affair voltage Vo is handed by the alternate terminal and ground is connected to the third outstation. Voltages from 5 to 24 volts are tightly regulated by the 78 series controllers, and the 79 series controllers work in a analogous way to give negative regulation voltages in the 5 to 24 volt range.

- For IC, Microcontroller, TV 5 Volt
- For alarm circuit, functional amplifier, 12 volt relay circuit

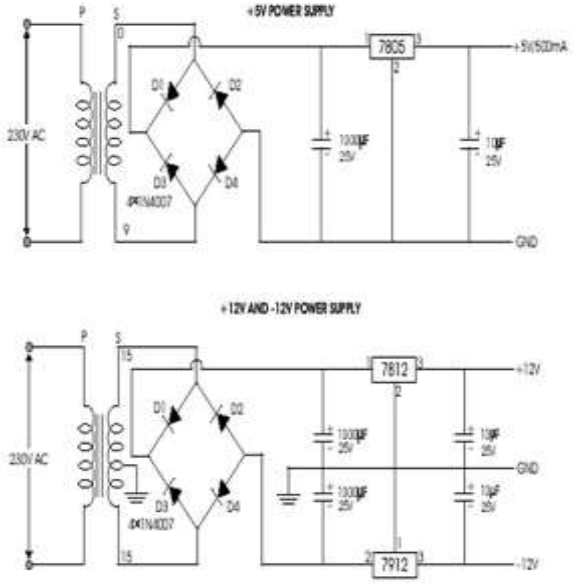

Fig6.Circuit diagram of IC voltage regulator

5.2 Nodemcu

A low- cost system- on- chip(SoC) called the ESP8266 serves as the backbone of the open- source NodeMCU(knot microcontroller). Express if Systems developed and released the ESP8266. The ESP8266 contains all the major factors of a computer, including the processor, RAM, network(Wi- Fi), and the rearmost operating system and SDK. This makes it a fantastic option for all types of Internet of effects(IoT) systems. still, the ESP8266 is delicate to pierce and use as a chip. For the simplest of tasks, like turning on power or transferring keystrokes to the chip's" computer", you will need to solder a line with the analog voltage demanded for the conclusion. also, you need to programme it in low- position machine instructions that the chip tackle can understand. Using the ESP8266 as an bedded regulator chip in mass-produced bias isn't problematic at this degree of integration. For amateurs, hackers, or scholars who want to test it out in their own IoT systems, it's a significantburden.What about Arduino, however? For their adaptable IoT regulator, the Arduino design developed an open- source software development tackle(SDK) and tackle armature. The Arduino tackle is a microcontroller board with standard data anchorages, LED lights, and a USB connector, analogous to NodeMCU. Standard interfaces for interacting with detectors or other boards are also defined. Unlike a NodeMCU, an

Arduino board can contain multiple memory chips, a CPU chip(generally an ARM or Intel x86 processor), and a programming terrain. An Arduino reference design is also available for the ESP8266 chip. still, the rigidity of Arduino also results in significant differences between manufacturers. For illustration, utmost Arduino boards don't have Wi- Fi capability, and some have periodical data heads rather than USB anchorages.

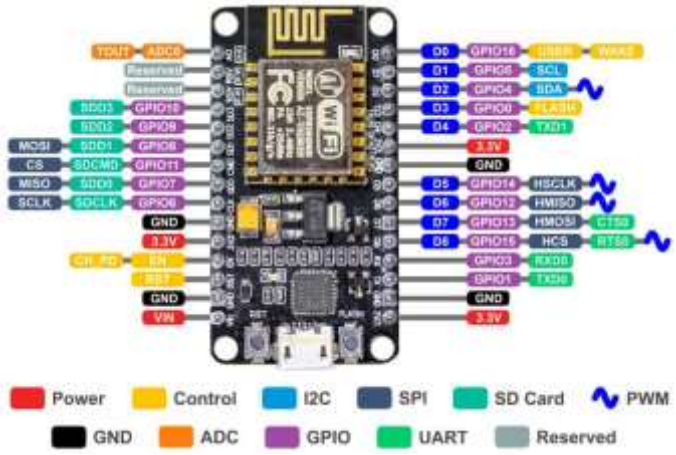

Fig7. Pin Description of NodeMCU

5.3 Ultrasonic Sensor

An ultrasonic detector is a contrivance that measures an thing's spacing using ultrasonic swells. Ultrasonic detectors determine the propinquity of an object by transferring and entering ultrasonic beats from a transducer. The hem reflects high- frequency sound swells, creating a characteristic echo pattern. For ultrasonic detectors to work, sound swells must be above the range of mortal hail. Transducers act as microphones to admit and transmit ultrasound swells. Like numerous other products, our ultrasonic transducers use the same transducer for palpitation transmission and echo event. The detector can calculate the distance to a target by tracking the ceased time between delivery and event of ultrasonic beats. The principle of operation of this module is simple. It emits ultrasonic beats at a frequency of 40 kHz, which propagate through the air and reflect to the detector if there are obstacles or objects. You can calculate distance by calculating trip time and speed of sound. Transparent object identification is an excellent operation for ultrasonic detectors. For illustration, operations using infrared detectors struggle with this particular use case in liquid position dimension due to the translucency of the target. Except for veritably soft accoutrements that absorb sound, similar as hair, ultrasonic detectors can descry objects anyhow of their color, face, or composition. Ultrasonic detectors are a feasible option for detecting translucent objects and other objects for which optic styles may not work.

Fig8.Pin diagram of Ultrasonic sensor

6. Software Description

An embedded system is a piece of software that has at least one programmable computer inside of it, generally in the form of a digital signal processor chip, microcontroller, or microprocessor. Users of an embedded system are typically not aware that the system is computer-based. Embedded programming is different from other computer programming. Compared to personal computers, embedded systems differ primarily in the following ways: Embedded systems have limited resources (low CPU performance, limited ROM, RAM and stack space). PC components are different from those used in embedded systems. Embedded systems frequently employ smaller, less power-hungry components. Embedded systems rely more on hardware. The size and speed of the code are two significant aspects of embedded programming. The quantity of accessible programme memory and the programming syntax employed dictate code size, whereas processing speed and time constraints determine code speed. The purpose of embedded system programming is to achieve maximal functionality in the least amount of time and space. To construct embedded systems, various programming languages are employed.

- machine code
- assembler Low-level language
- High-level programming languages such as C, C, Java,and others.
- Application-level languages including Visual Basic, Scripting, and Access.

7. Hardware Connection

The making of hardware prototype model is described in the following:
Firstly the program for distance measurement is coded using Arduino IDE software and successfully complied. This program is feeded in the Arduino

Board. For the final output LCD display is used. The distance measured is displayed in centimetres(CM). The connection is shown in the below figure.

Fig9.Hardware connection of the vehicle Model

nodeMCU and sensors are connected. NodeMCU is also known as wifi module which is used for the purpose of communication. The ultrasonic sensor is connected to the board for the purpose distance Measurement. These connections are made with the help of jumper cables.

8. Conclusion

These kinds of technology and devices could ultimately change how safe roads are. Because life is so valuable, we should take all reasonable steps to make roads safer. By 2020, the WHO already anticipates 1.9 million casualties. As the nation undergoes reform by constructing more bridges, roads, and improved transportation networks, and as new areas begin to emerge and grow, Bangladesh is particularly at risk. We can gradually lessen the impact of the constantly worrying problem of road accidents with help from both car owners and the government supporting in the deployment of such devices in vehicles. Additionally, it will support the nation's emergency services by building an infrastructure solution employing Emergency Crash Reporting Software, assisting in better data collection, and saving lives.

Fig.10 Final output of the Communication System

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