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CAR CRASH PREVENTION AND DETECTION SYSTEM

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Abstract — *Every day around the world, a large percentage of people die from traffic accident injuries. An effective approach for reducing traffic fatalities is: first building automatic traffic accident prevention system, second if still the accident occurs then automatic traffic accident detection system helping to reduce the time between when an accident occurs and when first emergency responders are dispatched to the scene of the accident. This system will use G.P.S. for location, G.S.M. for sending the location where the accident has taken place. To prevent the accidents the sensors mounted on the car will be used to detect the obstacles in front of the car and if the obstacle is still and the car still moves towards it then the motor of the car will automatically stop or the speed of the car will be reduced. The sensors to be used for the project that will help stop the car by detecting will be ultrasonic sensor which will detect obstacle and will stop the car in a very precise distance. The other sensor for detecting the accident will be a vibrator sensor whose x, y, z co-ordinates when see change will trigger the circuit and the message will be sent.*

Keywords- **:** *Accident detection; Accident prevention; Ultrasonic sensor; Arduino; GSM GPS module; Vibration Sensor*

I. INTRODUCTION

With the current fast development in information technology, there has been a tremendous increase in the number of cars. Market research results show that in 2010 the world's car number hits 6.9 billion, the number of cars yet to appear in the next 8 years will be 1.16 times the current one. Cars have become a major tool of transportation in the current society. Car safety system becomes perfect as its number soars nowadays. Ultrasonic systems are widely used in many applications, whose strength lies in its wide range of detection and anti-interference. Moreover, the original material is cheap and production cost is low, making its price more widely acceptable. Its weakness lies in the valid radius of detection that is rather limited and in its accuracy in obstacle detection that is the lowest among the three. A original ultrasonic system is a new system that can assist drivers while car is braking. It is includes ultrasonic emitter and receiver that can producing and receiving the ultrasonic waves to determine the distance between car and obstacle.

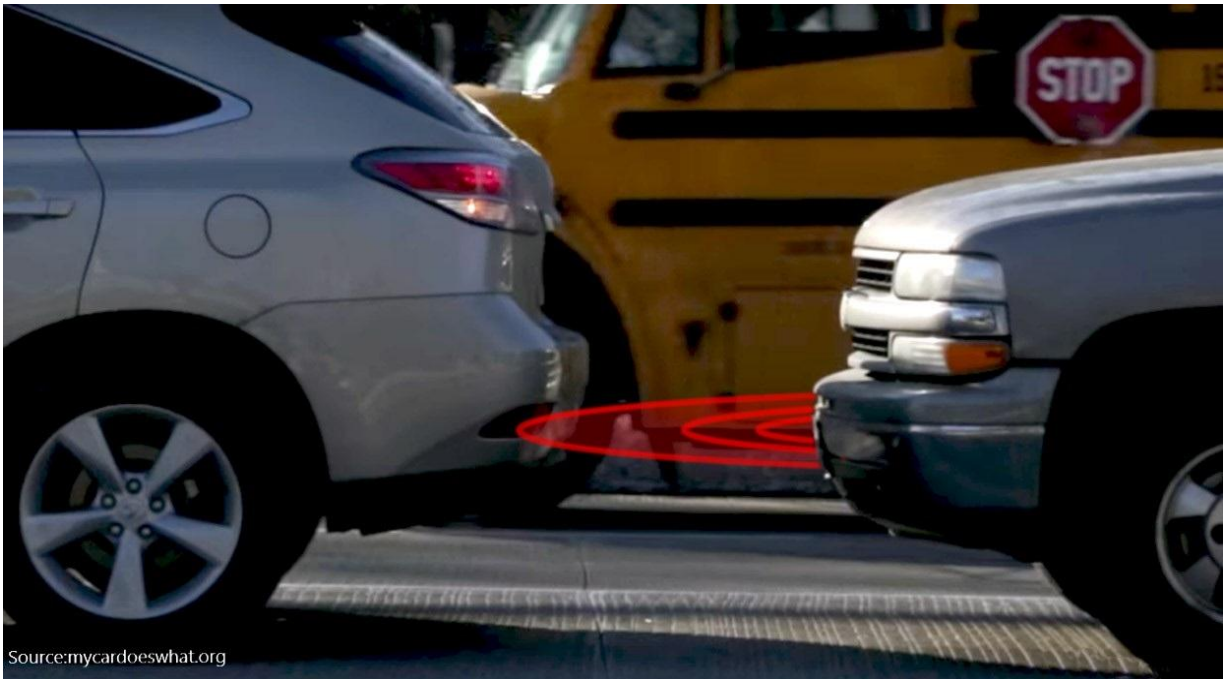


Figure-1. Obstacle Detection

Ultrasonic systems are generally used in middle and low-end cars. The infrared system can have long distance detection and accuracy outshining that of ultrasonic. However, it's also plagued by issues like high manufacturing cost and underperformance in detection before mirror obstacles. Therefore, this one is used with the ultrasonic system in high-end cars. The radar system outperforms the other two. This system outshines the other two in detection radius, range and anti-interference. However, its high manufacturing cost is not preferred by manufacturers of home-use and commercial automobiles. This type of system is generally used in military vehicles. Original ultrasonic reversing warning system is more like a safety distance alarm system, it is used for monitor a distance between the source car and obstacle, if the distance is less than the safety distance, it will active an alarm and give a notice to driver. Our Normal handbrake consists of a rack and pinion arrangement that usually is located near left side of the seat in the car. Whenever the car is running on a highway at a very high speed at that point if time if any obstacle which could be human being, an animal or any such object comes immediately in front of a car the driver gets panicked and thus is unable to gain the control on the car. Even our normal brakes sometimes can fail due to improper lubrication or wear and tear. These are certain problems which arise during normal hand braking in the car. The ultrasonic probe measures the distance between cars by sending and receiving the ultrasonic waves and indicates the distance via beeping (the longer the distance is, the shorter the time between beeps). The pattern of beep interval for safety distance can be measured via the sound signal of different intervals received by a microphone. The circuit design will regard the sound of dangerous distance as the critical value. The circuit will be switched on when the critical value is reached, then activating the brake system. In this way, cars will be stopped before nearing the obstacle at a dangerous distance.

II. SYSTEM REQUIREMENTS

2.1. Car Crash Prevention

The number of vehicles is increasing day by day and proportionately the numbers of accidents are increasing. These accidents square measure principally caused by the delay of the motive force to hit the brake. to forestall the accidents caused by this delay, unhearable braking system is employed in cars. the most target of the unhearable braking system is that, cars ought to mechanically brake once the sensors sense the obstacle. this is often a technology for cars to sense Associate in Nursing close forward collision with Associate in Nursing other vehicle or an obstacle, and to brake the automotive consequently, that is finished by the braking circuit. this method includes two unhearable sensors viz. unhearable wave electrode and unhearable wave receiver. The unhearable wave electrode provided before portion of Associate in Nursing automatic braking automotive, manufacturing and emitting unhearable waves in a very preset distance before of the automotive. unhearable wave receiver is additionally provided before portion of the automotive, receiving the mirrored unhearable wave signal from the obstacle. The mirrored wave (detection pulse) is measured to urge the space between vehicle and also the obstacle. Then PIC microcontroller is employed to regulate the servo motor supported detection pulse data and also the servo motor successively mechanically controls the braking of the automotive. Thus, this new system is intended to unravel the matter wherever drivers might not be able to brake manually precisely at the specified time, however the vehicle will still stop mechanically by sensing the obstacles to avoid Associate in Nursing accident.

2.2. Car Crash Detection

In today's world there's a severe increase within the use of vehicles. Such significant automobile usage has magnified traffic and so leading to an increase in road accidents. This takes a toll on the property likewise as causes human life loss owing to inaccessibility of immediate safety facilities .Complete accident bar is inevitable however a minimum of repercussions is reduced. planned system makes a trial to produce the emergency facilities to the victims within the shortest time attainable. In huge organizations the drivers create criminal use of the vehicles so leading to money, time loss of the organisation. except these functions the system is used for following of taken vehicles or motion baggage, fleet management and transport sales etc. The system incorporates a single-board embedded system that contains GPS and GSM modems connected with a microcontroller. the whole set-up is put in within the vehicle. A vibration device is employed. It measures the vibration at the placement it's placed. The signal is then compared with the quality values that additional confers the accident of the automobile, needless shock or vibration created by machines, tilt of the automobile with reference to the earth's axis is known with the extent of acceleration. world Positioning System (GPS) is employed to spot the placement of the vehicle. GSM is employed to tell the precise transport location to the precoded numbers. Message can provide great circle and latitude values. From these values location of accident is determined. GSM electronic equipment provides a 2 approach communication by employing a sim card. Such a module works a similar as a daily phone. The project aims at intelligent security system providing situational awareness and agile safety.The system incorporates 89S52 microcontroller, Alcohol device, vibration device, Global Positioning System (GPS),Global System for Communication (GSM). The vibration device works on the electricity property of the crystals and produces an electrical signal because it senses vibrations of the unit and provides the signal as input to the microcontroller. The controller analyses the signal with it's output given to relays. A relay is associate electrically operated switch.It is used wherever electrical isolation isto be provided between might 2015, Volume 2, Issue five JETIR (ISSN-2349-5162) JETIR1505018 Journal of rising Technologies and Innovative analysis (JETIR) World Wide Web.jetir.org 1434 controlled and dominant system.In running condition the first relay is in commonly closed state and is connected to the

car's engine. It ensures that the vehicle runs below the conventional operating condition. As presently as associate accident is detected ,that is if the device signal values deviate from the precise limits then microcontroller offers a lively high signal.

The relay's affiliation gets opened and therefore the engine can shut down,thus stopping the automobile. Another relay is connected to the air-bag.and it's in commonly open state.The air mechanical device is activated and airbag blows as presently because the controller signal goes high.at each instant the present location of the vehicle is shipped by the GPS's receiver to microcontroller. GSM sends a message to antecedently coded numbers. GSM is connected to microcontroller with the accident location details . MAX232 IC converts signals from anRS-232 port to signals appropriate to be used in TTL compatible digital logic circuits.it synchronizes baud rate rates of microcontroller and GSM electronic equipment.

III. DESIGN

3.1. Block Diagram Of Obstacle Avoidance

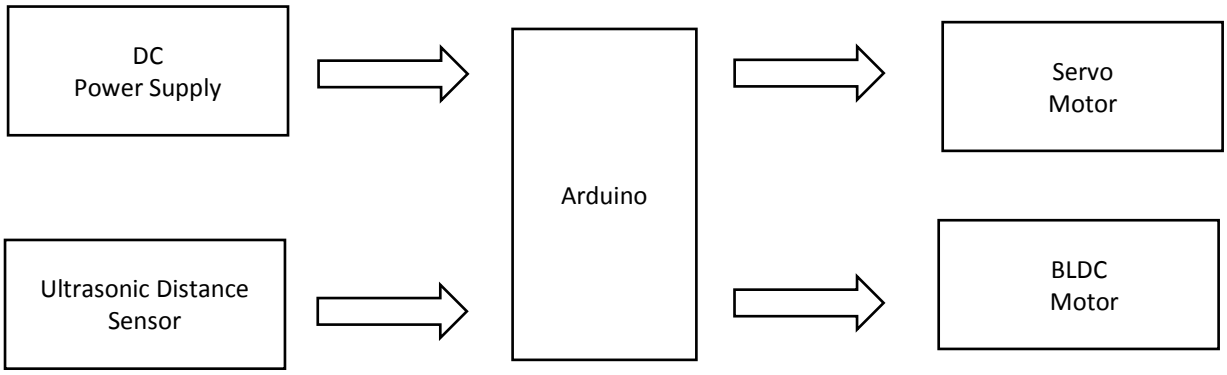


Figure-2. Block Diagram for Smart Obstacle Avoiding Robot using Arduino

First device for our design is to determine the distance between car and obstacle. The ultrasonic system is the best within infrared system and radar system. Ultrasonic detection is a technology developed based on bionics, whose design stems from bats' locating obstacles via ultrasonic waves. The ultrasonic probe consists of ultrasonic transmitter, ultrasonic receiver and main circuit. Ultrasonic waves, sent by the transmitter, travel at the speed of sound (340 m/s) in the medium (air). The speed of sound wave traveling in air depends on temperature. In real life, the temperature of environment people are generally exposed to ranges from -30 ℃ to 50 ℃.This means that sound velocity ranges from 313 m/s to 361 m/s. Generally speaking, very few places may exhibit such a huge temperature difference. So temperature's impact on sound velocity won't be huge. Temperature's impact on the calculation of distance from obstacles to be discussed later is controllable and adjustable. Sound wave will bounce back to the ultrasonic receiver after its encounter with the obstacle. The microcontroller in the main circuit will calculate the time interval T between sending and receiving sound wave, and the distance S between the probe and obstacle by the formula(T=S/V). V is the velocity of ultrasonic wave. Nowadays, ultrasonic probes have two types: 1. Those that generate ultrasonic waves electrically. 2. Those that generate ultrasonic waves mechanically.

The more common is the piezoelectric ultrasonic transmitter, which internally includes two electric chips and one sounding board. When two electric poles have pulse signals added to them, the generator's frequency equals the piezoelectric chips' inherent concussion frequency. Then, the electric chips will resonate and set the sounding board in motion. At last, the mechanical energy is transformed into electric signals and generates ultrasonic waves. Varieties of sensors are available which can be used for the detection of obstacles. Some of the very popular sensors are: Infrared sensors (IR),Ultrasonic sensors, Cameras, which can be used as a part of Computer Vision, Sonar. . It can measure the distance in its field of view of about thousands to hundreds points. In the design of robot, we are using ultrasonic sensors for obstacle detection and avoidance.

The ultrasonic sensors continuously emits the frequency signals, when obstacle is detected this signals are reflected back which then considered as input to the sensor. The ultrasonic sensor consists of a multi vibrator, which fixed at its base. The multi vibrator is combination of a resonator and vibrator. The ultrasonic waves generated by the vibration are delivers to the resonator. Ultrasonic sensor actually consists of two parts: the emitter which produces a 40 kHz sound wave and detector which detects 40 kHz sound wave and sends electrical signal back to the microcontroller.

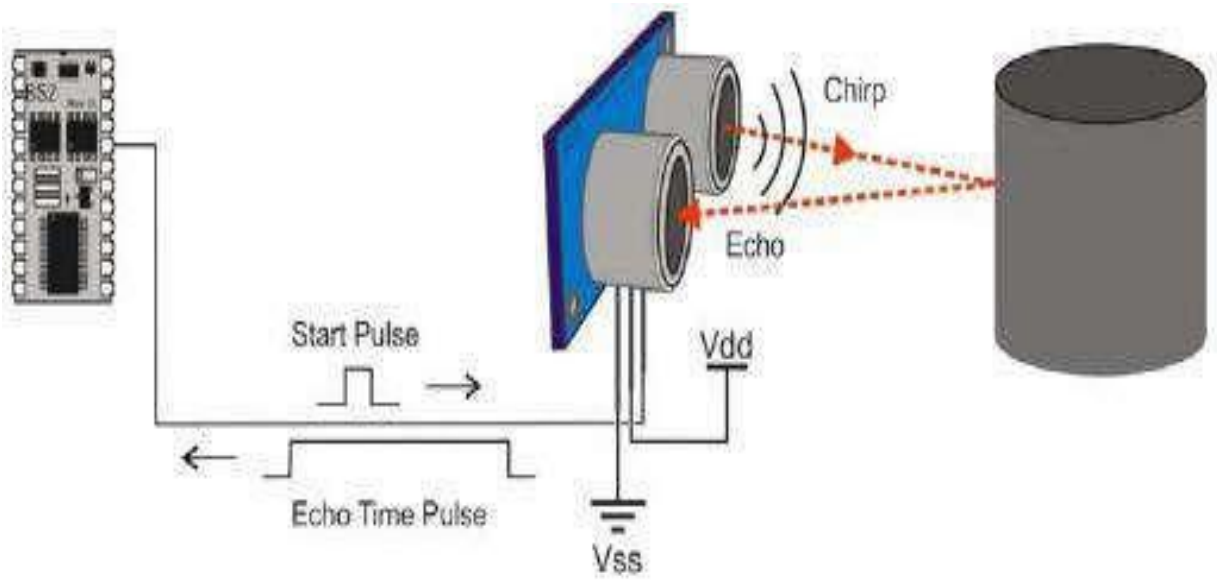


Figure-3. Schematic Diagram

Figure-4. Ultrasonic Sesnor

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digitalinput/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, aUSB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DCadapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDIUSB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version1.0 will be the reference versions of Arduino, moving forward.
Specifications-: Microcontroller ATmega328 , 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 of which 0.5 KB used by bootloader , SRAM 2 KB , EEPROM 1 KB , Clock Speed 16 MHz.

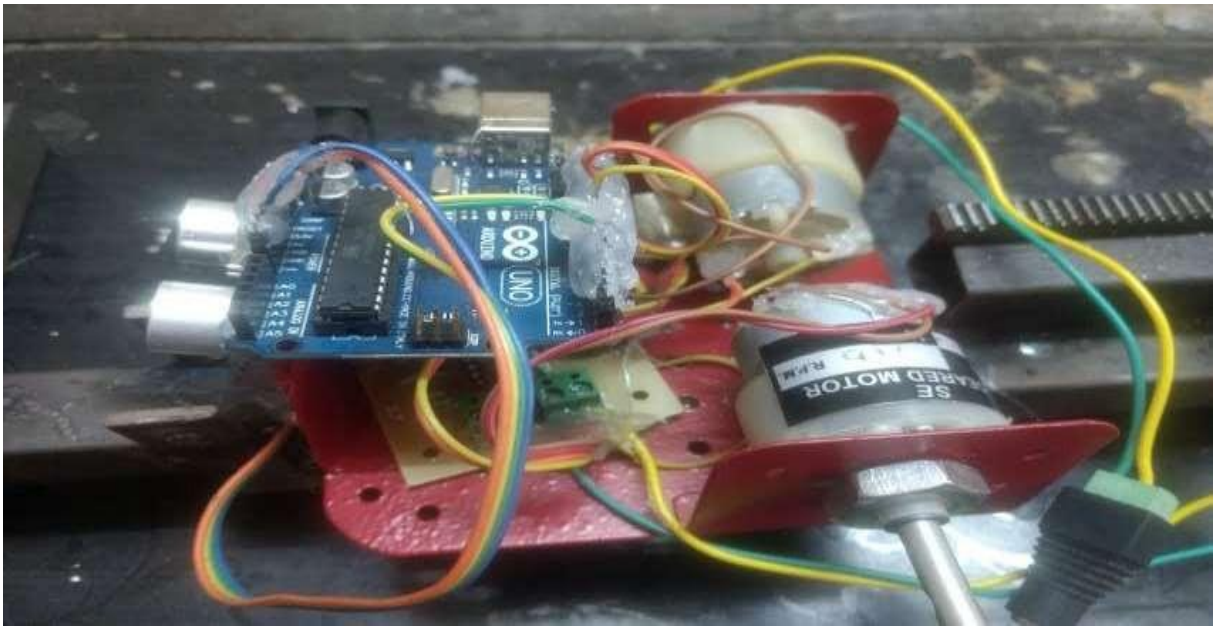


Figure-5. Arduino Circuit

3.1. Block Diagram Of Accident Detection

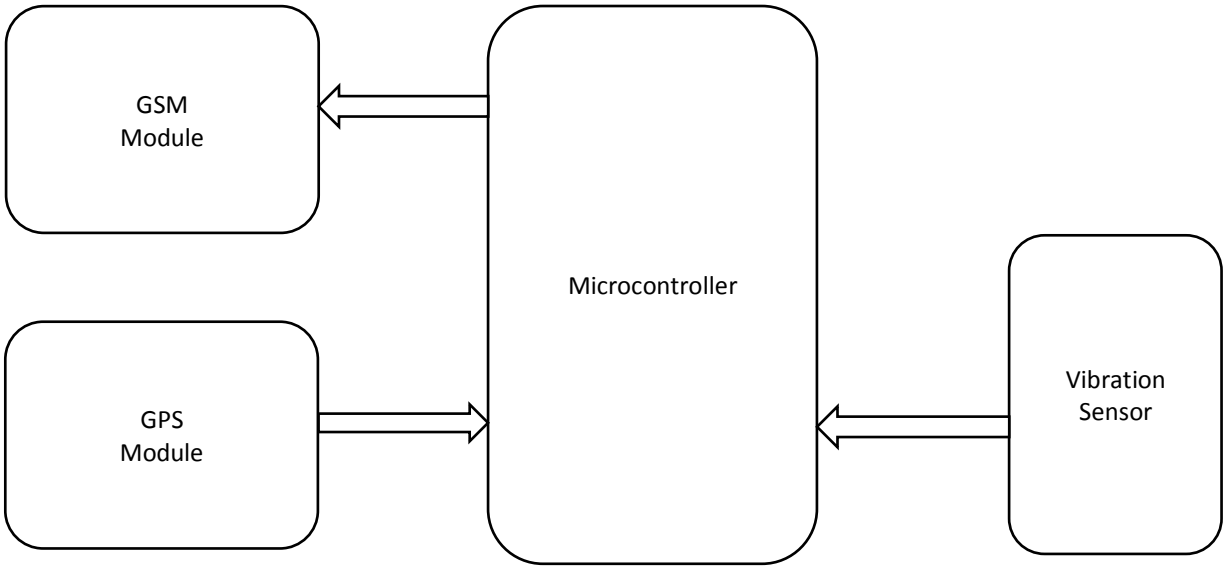


Figure-6. Block Diagram for Crash Detection

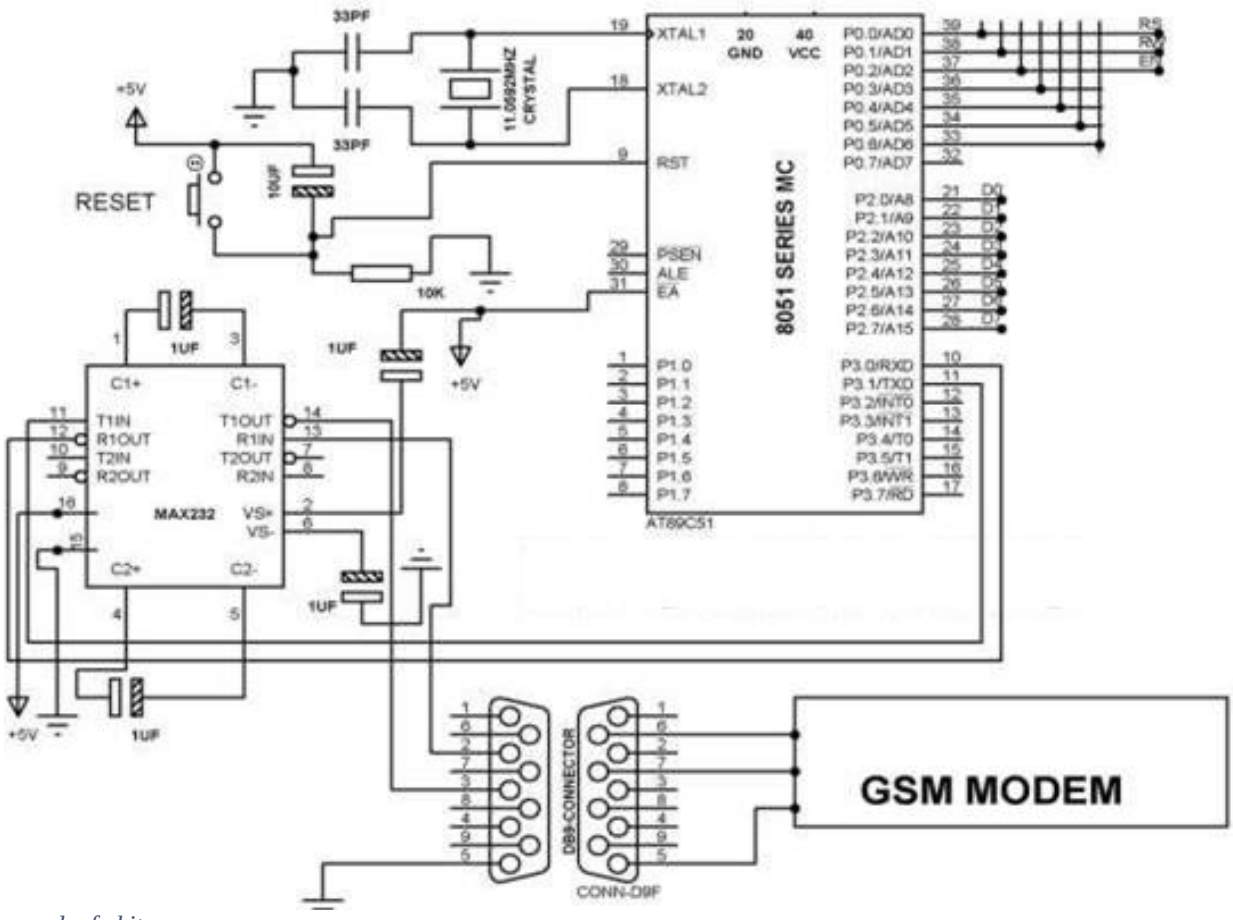
GSM is a mobile communication modem; it is stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands. A GSM modem is a device which can be either a mobile phone or a modem device which can be used to make a computer or any other processor communicate over a network. A GSM modem requires a SIM card to be operated and operates over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection.

From the below circuit, a GSM modem duly interfaced to the MC through the level shifter IC Max232. The SIM card mounted GSM modem upon receiving digit command by SMS from any cell phone send that data to the MC through

serial communication. While the program is executed, the GSM modem receives command 'STOP' to develop an output at the MC, the contact point of which are used to disable the ignition switch.

The command so sent by the user is based on an intimation received by him through the GSM modem 'ALERT' a programmed message only if the input is driven low. The complete operation is displayed over 16×2 LCD display.

Figure-7. GSM GPS Module Circuit



source:edgefx kits

Figure-8. GSM Modem Circuit

The next module is GPS module. GPS receivers use a constellation of satellites and ground stations to compute position and time almost anywhere on earth. At any given time, there are at least 24 active satellites orbiting over 12,000 miles above earth. The positions of the satellites are constructed in a way that the sky above your location will always contain at most 12 satellites. The primary purpose of the 12 visible satellites is to transmit information back to earth over radio frequency (ranging from 1.1 to 1.5 GHz). With this information and some math, a ground based receiver or GPS module can calculate its position and time. The data sent down to earth from each satellite contains a few different pieces of information that allows your GPS receiver to accurately calculate its position and time.

GPS Accuracy depends on a number of variables, most notably signal to noise ratio (noisy reception), satellite position, weather and obstructions such as buildings and mountains. These factors can create errors in your perceived location. Signal noise usually creates an error from around one to ten meters. Mountains, buildings and other things that might obstruct the path between the receiver and the satellite can cause three times as much error as signal noise.

GPS data is displayed in different message formats over a serial interface. There are standard and non-standard (proprietary) message formats. Nearly all GPS receivers output NMEA data. The NMEA standard is formatted in lines of data called sentences. Each sentence contains various bits of data organized in comma delimited format (i.e. data separated by commas).

Most GPS modules have a serial port, which makes them perfect to connect to a microcontroller or computer. Once a GPS module is powered, NMEA data (or another message format) is sent out of a serial transmit pin (TX) at a specific baud rate and update rate, even if there is no lock. To have your microcontroller read the NMEA data, all that is needed is to connect the TX pin of the GPS to the RX (receive) pin on the microcontroller. To configure the GPS module, you will need to also connect the RX pin of the GPS to the TX pin of the microcontroller. It is common for the microcontroller to parse the NMEA data. Parsing is simply removing the chunks of data from the NMEA sentence so the microcontroller can do something useful with the data. Once the microcontroller can grab the data needed, the information can be manipulated to create other interactions on the microcontroller. The Arduino platform can parse NMEA data easily with the help of the Tiny GPS library. Check out the GPS Shield Getting Started Guide for a walk-through example on how to connect an Arduino to a GPS module and parse NMEA sentences. A simple way to see the NMEA data directly is to connect the GPS module to a computer. For the connections, all that is needed is to power the GPS with the FTDI basic (in this case 5V and GND), then connect the TX pin of the GPS to the RX pin on the FTDI Basic. Next, open a serial terminal program at the same baud rate of your GPS module. Even if the GPS does not have a lock, you should see NMEA sentences steaming by.

To configure a GPS receiver, knowing the type of chipset your GPS is using is very important. The GPS chipset contains a powerful processor that is responsible for the user interface, all of the calculations, as well as analog circuitry for the antenna. The chipset also allows for data to be sent to the GPS receiver to configure parameters like, update rate, baud rate, sentence selection, etc.

In order to send commands over a serial interface to a GPS receiver, you will need a command set or reference manual. Before diving too far into the command set for a given module, be sure to check with the vendor. Many chipset vendors provide software that allows you to easily communicate and configure the GPS module over a serial port.

Figure-9. Vibration Sensor Circuit

Vibration sensors are sensors for measuring, displaying, and analyzing linear velocity, displacement and proximity, or acceleration. Vibration — however subtle and unnoticed by human senses — is a telltale sign of machine condition. Abnormal vibration indicative of problems with an industrial machine can be detected early and repaired before the event of machine failure; because such a failure is potentially costly in terms of time, cost, and productivity, vibration measurement allows industrial plants to increase efficiency and save money. Therefore, vibration analysis is used as a tool to determine equipment condition as well as the specific location and type of problems. This page classifies various devices — including sensors (or transducers), transmitters, and switches for vibration measurement — under the blanket term "vibration sensor." Many devices which are not nominally considered vibration sensors can be used for vibration measurement; for example, Accelerometers Specification Guide are frequently used to measure vibration as well as acceleration.

IV. FLOWCHART

Figure-10 shows the flowchart of the system. Initially the car starts moving, if there is any obstacle in front of the car then it will check the distance between car and obstacle .If the distance is more then no action will be taken but if the distance is less then the car will reduce its speed slowly and will stop finally. Even then the accident occurs crash impact will be measured. If it's less then no action will be taken but if its more then a S.M.S to the S.O.S number and the nearest hospital and police station is sended.

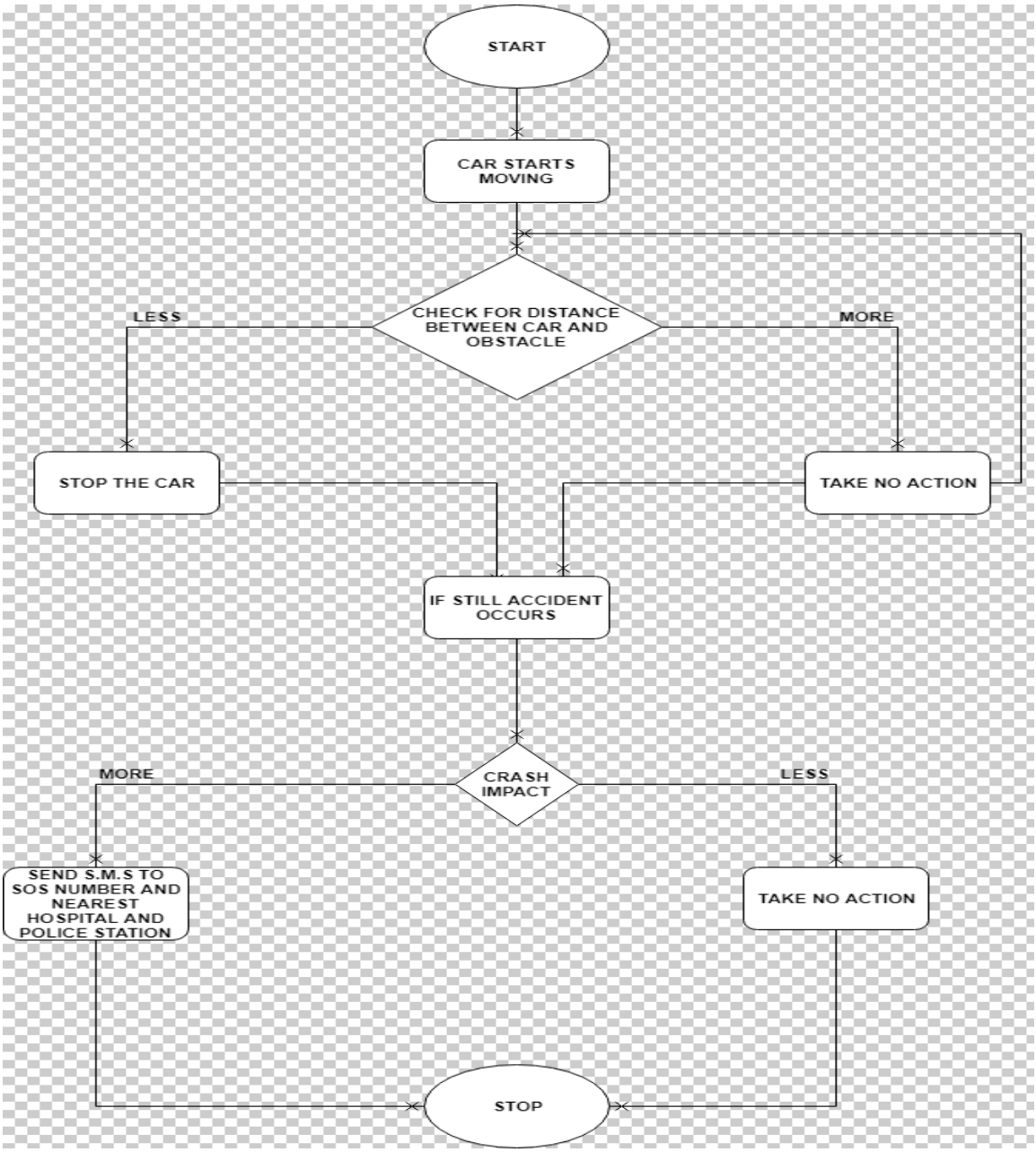


Figure-10. Flowchart

V. CONCLUSION

In this way Car Crash Prevention and Detection system is developed, The improvement in the current scenario of the collision system depends upon the modern ways of collision management and control.The innovation in collision system brings out with powerful functions and hardware interface.This would lead to a hazel free modern system with less human efforts eventually giving more outputs and more saving of human lives.

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