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VEHICLE TO VEHICLE COMMUNICATION FOR ACCIDENT-AVOIDANCE SYSTEM

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Abstract - The main aim of the project is to develop a system where one can avoid accidents while travelling in a vehicle. Now a days the rate of accidents is increasing due to lack of awareness of the driver while driving a vehicle and some maybe because of brake failure. The system includes a specific application of wireless communication or Automotive Wireless Communication which is also called as vehicle-to-vehicle communication. Vehicle to Vehicle communication is the wireless transmission of data between two or more vehicles. The main aim of Vehicle-to- Vehicle communication is to avoid accidents while vehicles are in movement to send the position and speed data to one another. The main aim of this project is to provide safe and comfortable journey to the driver and to the people around the driver. Arduino controller acts as a heart of the system where the entire communication between vehicles is carried out. When a vehicle approaches nearby, an alert will be sent to the driver through buzzer and will be displayed on the LCD display and when a vehicle approaches nearby the speed will be reduced automatically. This action is carried out Automatically regardless the movement of the vehicle. The goal is to avoid collision of vehicles and improve the efficiency and safety to the vehicles, passengers, and people around.

Key Words: **Vehicle-to-Vehicle Communication, Wireless transmission, Automotive wireless communication, Arduino controller, buzzer, LCD Display**

1.INTRODUCTION

In an era of rising in technology when concerned to road safety, is rising rapidly day by day and are making roads safer and smarter. Since today everything in our world is evolving technology in such a way that all the devices around us is connected to the internet. To improve the road safety using the help of technology, a system has been established which is also known as Intelligent Transport System (ITS). The use of sensors is increasing day by day to make things around us smarter. The use of sensors in vehicles have led to communicate each other and leads to an application where accidents or collision of vehicles can be avoided. These vehicles which are connected to each other acts as a building block where the safety and comfort driving can be achieved. Vehicle-to-Vehicle(V2V) communication is a substructure where transmission of data between the vehicles take place. This use of V2V communication has helped in lane departure, parking, Adaptive cruise control and in blind spot detection. The idea is that if communication can happen between vehicles, then collision or accidents can be prevented even before happening by making use of a buzzer. This use of buzzer can help the driver during nighttime where the buzzer turns ON every 25 minutes and the driver turns OFF the buzzer which indicates that the driver is not sleepy. This system can be installed in completely automatic or semi-automatic vehicles.

In India, the main reason why accidents happen is because of drink and driving, drowsiness and because of brake failure because of bad design of braking system. The records of government road transport survey show that, the accident in the year 2018 is 4.61 lakhs with death of 1.47 lakh and many injured. The system which we are designing has high efficiency, cost efficient and a real time solution to all these problems which are mentioned above.

2. SYSTEM IMPLEMENTATION

The system is designed in such a way that the connection is established between two vehicles where the other vehicle is taken as a reference through the connection of Bluetooth. Here in this Project Master is Arduino Mega (which is Referred as Main vehicle) and slave is Arduino UNO (which is considered as reference vehicle). Here the communication between two vehicles take place where they communicate with each other by sending the data through the mode of Bluetooth which is used in Arduino Mega and likewise used in our prototype. The vehicle is detected with the use of IR sensor.IR sensor is basically used to detect any kind of objects in its range by the principle of Reflection of Light. It works by making use of a specific light sensor to recognize a light wavelength using Infra-red (IR) range. When the vehicle is detected, the Buzzer will be activated which indicates that the vehicle is approaching and will alert the driver of a vehicle. Once the vehicle is detected the signals from IR sensor is sent to the Arduino and the Arduino controls the further operation. The below figure shows the block diagram of vehicle-to-vehicle communication using. The Block Diagram is shown in figure 1 ,which consists of Arduino Mega or Mega 2560 which has 54 digital input/output pins (where of which 14 can be used as PWM outputs, 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button), Arduino UNO, Power

supply used to convert AC to DC voltage , Accelerometer (ADXL335), DC motor Driver(L293D), GPS (NEO-6MV2), GSM (SIM800L), LCD display(16*2), IR Sensor. We have made use of Bluetooth Transceiver module (HC05) to communicate between two vehicles.

GSM also known as Global system for mobile communication is a modem which accepts a SIM card and can be operated when the subscriber makes the subscription just like in Mobile phones. The main use of this GSM is the SMS service. The location of the vehicle is collected by the GPS and sent to the GSM server. The SMS will be sent to a particular person or a number which we have programmed. The required program for this project is done using the platform Arduino IDE. Once programmed, the code is integrated with the hardware. One the accident is prevented; the programmed number will receive the message along with the location where the accident is prevented .and in worst case scenario is accident or collision between two or more vehicles takes place the hospitals nearby the location of collisions will be sent an alert through SMS along with the location.

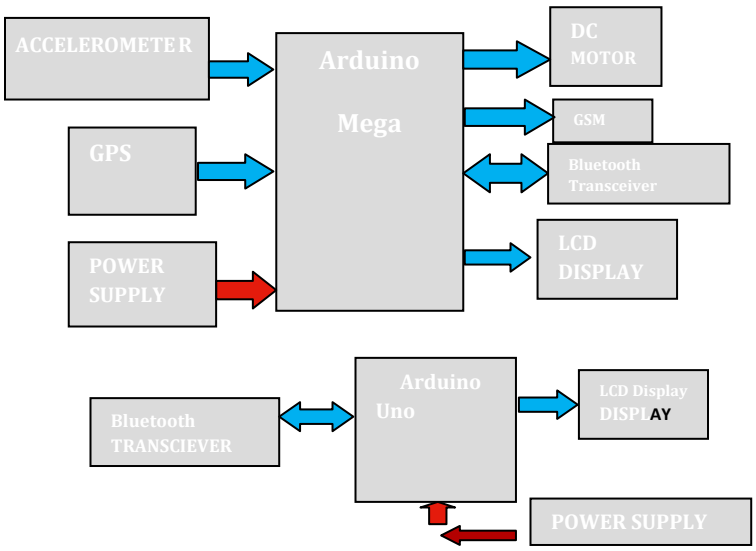

Fig -1: Block Diagram

The figure 2 shows the prototype which contains LCD display, Arduino mega, Accelerometer, GPS, GSM, DC motor Driver and IR sensor. all the operations such as vehicle approaching and communicated messages will be displayed on the LCD Display. Power supply of 9v with output current of 1.2 amps is used to drive this system. The collision is detected based on the accelerometer which contains X, Y and Z axis, where x axis is the ground and Y axis is the height between the Ground and vehicle and Z axis is toppling of a vehicle.

Fig-2: Prototype

3. COMPONENTS USED AND ITS SPECIFICATION

3.1 Arduino Mega

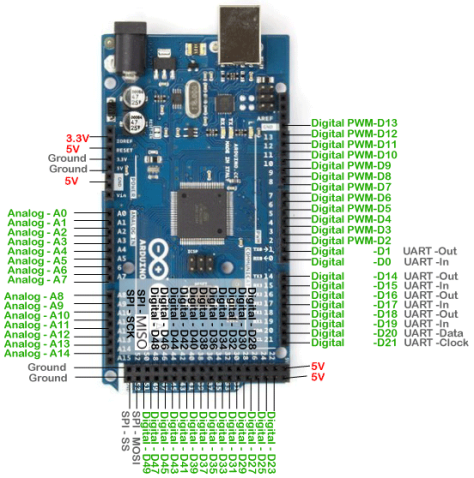

Fig-3: Arduino Mega

The Pictorial representation of Arduino Mega 2560 is as shown in figure 3. Arduino mega is a microcontroller which can perform arithmetic and logical operations and is based on ATMEGA 2560. It contains a total of fifty-four digital input-output pins. In these fifty-four pins, fourteen pins can be used as PWM Pins ,16 pins are analog inputs (A0 toA14),10 are UARTs which are also the Hardware Ports(serial) (D1 to D21), Reset Butten. It contains 16Mhz crystal oscillator which acts as clock for the Microcontroller. By making use of 16 MHz crystal oscillator, it provides greater accuracy Arduino can also run using 8Mhz crystal oscillator but does not provide that accuracy that 16 MHz oscillator will provide. . It contains a USB port to connect the hardware and the computer to upload the code/Program into the hardware. It also contains a port were if there is insufficient of power supply to turn on the board and external hardware can be connected to the board which is also known as adapter. It has 5vcc Pins where 4 are of 5v and another port is of 3.3v. It contains four ground pins. The advantage of using this board is because it contains a greater number of ports, and many sensors can be connected.

3.2 Arduino uno

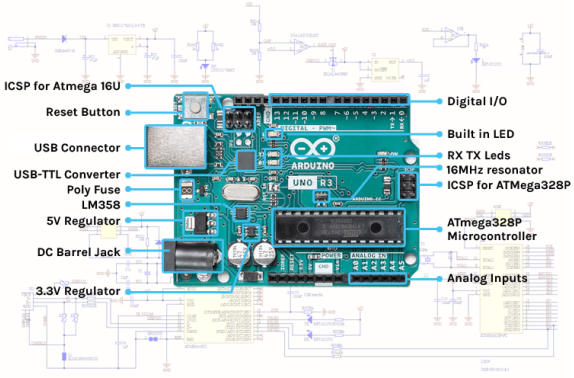

Fig-4:Arduino Uno

The Pictorial representation of Arduino UNO is as shown in figure 4. Arduino is a platform where it is easy to use and understand in both ways that is Hardware and Software. It is a microcontroller which can perform arithmetic and logical operations with the use of chip also known as single silicon wafer chip which is mounted on the hardware. With the help of this Arduino, you can turn on many sensors by connecting to the board with making use of the ports available on the board. We can drive the motors by providing efficient power supply to the board. It is a component made of ATMEGA 328p which consists of analog and digital pins, communication pins, reset button and USB port to dump the code into the hardware by connecting it to the personal computer.

3.3 Accelerometer (ADXL335)

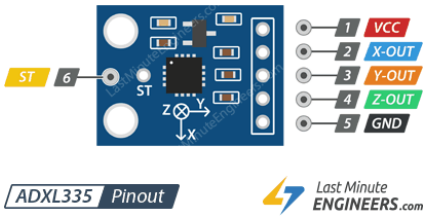

Fig-5: ADXL335

Accelerometer is a device which contains three axis that are X, Y and Z axis whose output depends on the input applied to the Accelerometer. The pictorial Representation of Accelerometer ADXL335 is shown in figure 5. It is of low cost, Power efficient, and is easy to use. It has a sensing range from -3g to +3g along the X, Y and Z axis. The output of these axis is in analog and are directly proportional to acceleration. To determine the acceleration various techniques are used which are called Phase Sensitive Demodulation techniques. It contains a capacitor when variation in acceleration takes place, it unbalances the differential capacitor and affects the output voltage where the output voltage is directly proportional to the acceleration. It has an operating voltage from the range 1.8v to 3.6v and has operating current of 350 micro amperes. It has a temperature range of -40 to 85 degrees Celsius. It also has a shock resistant up to 10,000g.

3.4 Infra-Red (IR) Sensor

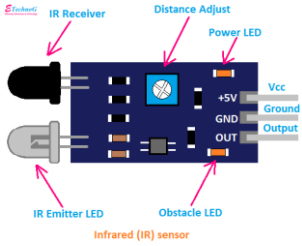

Fig-6: IR Sensor

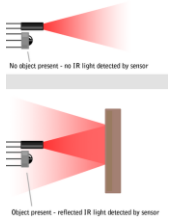

Fig-7: Reflection

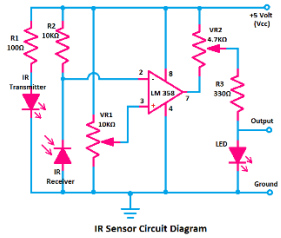

Fig-8: LM358 IC Circuit

IR sensor uses LM358 IC which performs necessary operations. The circuit diagram of IR sensor circuit is as shown above in figure 8. It consists of 2 LEDs (Light Emitting Diodes) which will play the key role in sensing any objects which are in front of it by the Principle of Reflection of light as shown in the figure 7. In two LEDs one LED function as transmitter and another as receiver. The resisters used in the circuit diagram of IR sensors are in the range of Kilo ohms. The IR sensor consists of three pins (VCC, GND and Output). When the IR sensor is powered, then the Power LED Turns ON. When there is any object in front of the sensor, then the obstacle LED will turn ON. This sensing operation will happen with the help of transmitting and receiving LEDs. The Pictorial Representation of Infra-Red Sensor is shown in Figure 6.

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3.5 Gps (NEO-6MV2)

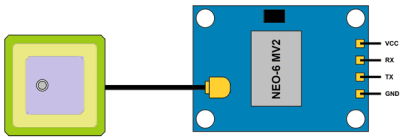

Fig-9: NEO-6MV2

The GPS (NEO-6 MV2) is as shown in figure 9. It is based on high-quality NEO-6 MV2. This GPS module works with voltage in range of 3.3v to 5v. Hence all the Arduino bords which has voltage rating of 5v can make use of this GPS module. For better reception of signal, an antenna is used as shown in the figure.it contains four pins which are VCC, GND, TX(Transmitter) and RX(Receiver). It Receives the signals from satellite and provides us the location of the vehicle where the system in which is installed.

3.6 GSM (SIM800L)

Fig-10:SIM800L

The GSM(SIM800L) is as shown above. It contains a port where SIM card can be inserted and by programming it messages in form of SMS can be sent to the programmed number. SIM800L is designed in such a way that it consumes less power, and the current consumption is as low as 1.2 milli amps. SIM800L makes use of TCP-IP protocol and is very useful in case of data transfer.

3.7 Liquid Crystal Display (LCD)

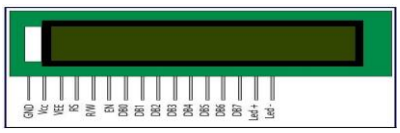

Fig-11:LCD Display

An LCD display is a Liquid crystal display which is of 16x2 is shown in figure 11.An 16x2 means that sixteen characters are displayed into two such rows. Each character is displayed with pixel size of 5x7. It contains two Registers which are namely Command Register and Data Register.

3.8 Bluetooth Transceiver (HC05)

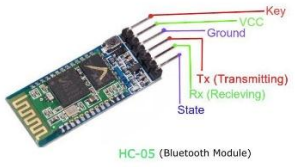

Fig-12:HC05

The use of Bluetooth transceiver it to establish the connection between two vehicles. The Pictorial Representation of Bluetooth Hc05 is shown in figure 12. It consists of Transmitter and receiver to transmit and receive the signals' and GND which are used to make the circuit complete. It makes use of Enable which is used to set the data. The state Pin is used to make sure that the Bluetooth is functioning Properly or not.

4. RESULTS AND DISCUSSION

With this project, the live location of a vehicle can be monitored with the help of GPS and GSM through a text message as shown in figure 13,where the intended user will receive the GPS location with the help of GSM.

IR sensor senses the vehicle when a vehicle approaches within the range of sensor and collision which has been prevented will be sent to the subscriber or the programmed number through SMS along with the location by making use of GPS and GSM.

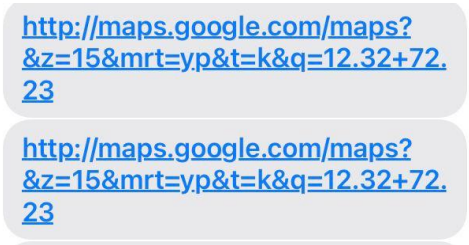

Fig-13: Short Message Service

The above figure 13 shows the location sent to the intended user where the collision has been prevented when a vehicle is approaching near within the range of IR sensor. This action will be carried out even without the driver braking the vehicle manually. Both the Entry point vehicle and the Reference vehicle's speed will reduce and after certain distance after the vehicle passes, the acceleration can be increased again.

5. CONCLUSION AND FUTURE SCOPE

This system represents automatic braking system for accident avoidance using Vehicle-to-Vehicle(V2V) communication. Infra-Red (IR) sensor is used to detect an object or the vehicle and to notify the system to prevent collision of vehicles. The Arduino microcontroller is used to control the DC motor gear through Dc motor driver and based on the vehicle, which is approaching near the reference vehicle, specific operation is carried out. If the accelerometer is affected, then an SMS will be sent to the intended user or the programmed number along with the location where the collision is prevented with the help of GPS and GSM. The interaction between the vehicles will allow to follow Lane discipline and act accordingly in case of emergency situations. The driver can toggle between any parameters like speed, distance, temperature, humidity. This system can be used to automatically reduce the speed of the vehicle when another vehicle is approaching through front end. The use of buzzers can be used during night times where within specified time intervals, the buzzer turns ON and the driver must manually turn it off by making use of a switch which indicates that the driver is not drowsy or sleepy. When this system is installed in an ambulance and the vehicles around it, the ambulance is given the priority and it acts as a central hub, where it sends the message to all the vehicles around it, and this helps in clearing the traffic congestion and helps the ambulance to move forward. Since the acceleration in a vehicle is dependent on the amount of fuel injection, a switch can be made between the system, breaks and the fuel pipe. when a vehicle approaches a, the switch will be used to turn on our system and the speed will be reduced. Once the speed is reduced (for e.g., 25km/h) and the vehicle in still in front of us, even though we manually press the accelerator the speed will remain the same (which is the reduced speed) this is because the vehicle is still in front of us. Once the vehicle passes then the switch will be connected back to manual. This mechanism of switching between Automatic (our system) and manual is immensely helpful in semi-automatic vehicles. In addition to this other feature can be implemented such as Iris detection where the system can identify whether the driver drowsy or not.

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