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Vehicle To Vehicle Communication

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Abstract
This paper proposes an inter-vehicular communication model using Bluetooth for information transfer. V2vtechnology proposes a variety of solutions for passenger safety. According to research,1.35 million people die each year due to road crashes. Present vehicle system uses radars, cameras to detect collisions and gives potential warnings to the drivers, leaving the decision to the driver. Our main motivation is to avoid crash collisions, reduce fatal accidents, traffic congestion. The proposed idea enhances the current systems by upgrading from alerting the drivers to communication between vehicles, helps the vehicle to take control over the situation and control its state.Project includes accident data logger,parking problem elimination using Iot,left or right turning assistant,brake light warning system,blind spot warning .The idea is demonstrated using two prototype models designed with an Ultrasonic sensor to detect nearby vehicles and objects, Bluetooth module which uses Bluetooth for real-time data transfer of mobility parameters such as speed, distance, etc. providing 360-degree awareness to the vehicle. Bluetooth can be replaced with any highly advanced wireless technologies according to requirements. The average reaction brake time for a driver is 2.3 sec. Replacing the driver with the vehicle taking control over the situation when required helps us in reducing this reaction time which is a major cause of accidents, reduces traffic congestion.

Keywords: *Iot*

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I. INTRODUCTION

V2V has the goal to facilitate efficient and reliable communication without predominantly relying on global system for mobile communication (GSM) network. It is widely recognized that tradition communication systems like Vehicle-to-Vehicle (V2V) relies its core communication using third party infrastructure like bluetooth. Third party infrastructure bandwidth is limited and sometimes not adequate for users' needs and security constraints with regard to their unreliability and not available everywhere. Beside this the existing traffic safety infrastructure and human driver-based interactions are not entirely safe as stated by Federal Highway Administration (FHWA) statistics.

According to World Health Organization (WHO), road traffic caused death estimated about 1.20 million worldwide each year. In USA over 37,000 people die in road crashes each year and additional 2.35 million are injured or disabled. Road crashes cost the U.S. 230.6billionperyear, oranaverageof820 per person. "Dedicated Short Range Communication (DSRC) can reduce or prevent 80unimpaired drivers" according to US DOT research. Based on these reasons V2V solutions was expedited to provide efficient vehicle communication mechanisms enhancing road safety. Past research in the car domain includes work on car IT attack surface topics which give insight to possible attackable surfaces from Tier 1 suppliers to original equipment manufacturers (OEMs), which also involve manufacturing and car IT external links, and the vehicle with its users and passengers. This study also shows how car IT surfaces can be exploited and how to detect and measure attacks. Surface defense mechanism where also highlighted with suggestion to somepossible solutions.

V2V communication uses a wireless protocol, which combined with global positioning system (GPS) technology provide V2V communication that offers 360 view of similarly equipped vehicle within its communication range. Transmitted messages, common to all vehicles, including the current GPS position, speed, acceleration, and heading. It also transmits messages of vehicle control information such as transmission state, break status, steering wheel angle, and vehicle path history and path prediction.

1. Path History: Set of previous position which provides information of vehicle location. It represents 300 m of the vehicle path travel of only the points transmitted to determine its path history. When a vehicle is driving a straight road only a few data points are needed to its path history. When the same vehicle goes through a curve or set of curves more data-points are needed to represent its path history.

2. Path Prediction: Allows a vehicle to provide its future trajectory and its confidence in it. Confidence will tend to be high on straight road ways or cover with constant direction of drive. With path history and path prediction the vehicle is provided with dynamic road way geometry ahead. Essential information is to perform path assessment and predicting potential crashes. The information provided by every vehicle is anonymously transmitted and does not include personally identifying data like name license plate number etc. Sophisticated security system has been put in place to ensure that all communication exchange between vehicles is authentic. If common data, security and communications standards is applied by all vehicle manufacturers V2V interoperability will be achieved. Assuming that a crash is predicted, the vehicle provides a warning to the driver either through seat vibration, tone, display or combination of these indicators. The system is intended to provide only warning but the driver still remains in control of the vehicle and the vehicle will not automatically slow down.

1.2 THE CIRCUIT DIAGRAM

The overall circuit diagram of the system is shown in fig 1. The major five functions suchas emergency brake light,accident data logger,left or right turning assist,blind spot warning and parking problem elimination are done using the ATmega328 arduino Uno using the CAN protocol. Arduino has 14 input output digital pins and 6 analog pins. A master slave technology is used for data transfer, a bluetooth transmitter-receiver module is engaged for this. All the data from the master is send to the microprocessor and then it sends corresponding signals to the slave receiver.

Two 3.5 volt lithium ion batteries which supply an average of 7volt is used as the power supply. All other components except servo motors on the wheels need 5 volt and hence for better working the battery output of 7 volt is connected to the input of buck converter which supplies a steady 5 volt. Input of buck is also connected to the motor driver.

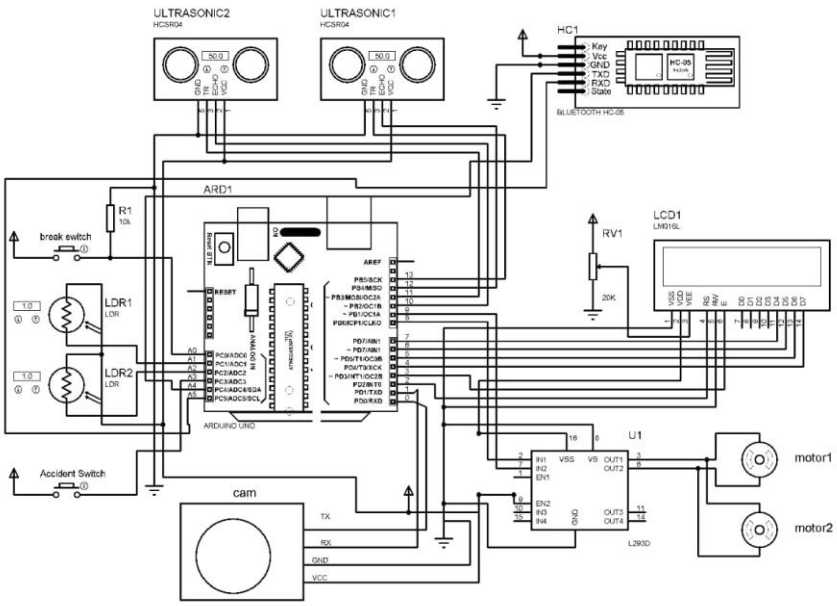

Figure 1:Circuit diagram of vehicle to vehicle communication

When a hard brake is applied on the brake switch,it sends signals to the arduino,and the arduino sends the signal ”brake applied” to the receiver LCD through bluetooth transmitter receiver module. When there is an accident,the piezoelectric sensor senses the pressure and the electric signal corresponding to that pressure is send to the arduino. Later arduino checks the condition that whether the pressure is above the predefined,here the predefined is 1000,that is whether it is a major accident, then arduino sends the data, here it is the vehicle number, to the receiver LCD. Left or right turning assist is done with the help of an LDR, two LDR’s are equipped on both sides of the vehicle, which detects the left or right indicator and sends corresponding signals to arduino then checks for the intensity of the light signal received and sends signal ”leftindicator”,”right indicator” correspondingly to the receiver LCD. For blind spot warning ultrasonic sensor along with anESP32cam is used. Ultrasonic sensor senses any obstacles within the range ,here assumed range is 10 cm,and the signal is send to arduino then arduino passes instruction to the ESP32cam then a shot of the vehicle at blind spot is taken and a warning message ”vehicle at blind spot ” is passed to the receiver LCD through bluetoothmodule. The picture taken by the ESP32cam can be send to the mobile phone through an open source

software called Blynk app.Live streaming of the camera is also possible through wifi connection. Parking Problem elimination is achieved by controlling the vehicle using joystick, it is also done using the Blynk app.Blynk is a new platform that allows you to quickly build interfaces for controlling and monitoring your hardware projects from your iOS and Android device.Along with the warning messages a beep sound is provided using a buzzer for alerting the driver.The buzzer is connected in the receiver section

1.2.2 Components

Table 1 indicates the components.

Table 1: Components used

Components	Specifications
Ultrasonic sensor	HCSR04
Arduino UNO	ATmega328P
Piezoelectric sensor	0.0046
Motor driver	L298D
LCD	16*2
LDR	

II. RESULT AND DISCUSSION

The results obtained are as discussed below

2.1Vehicle Prototype

Two vehicle prototype is made. One for transmitter section and other for receiver section.

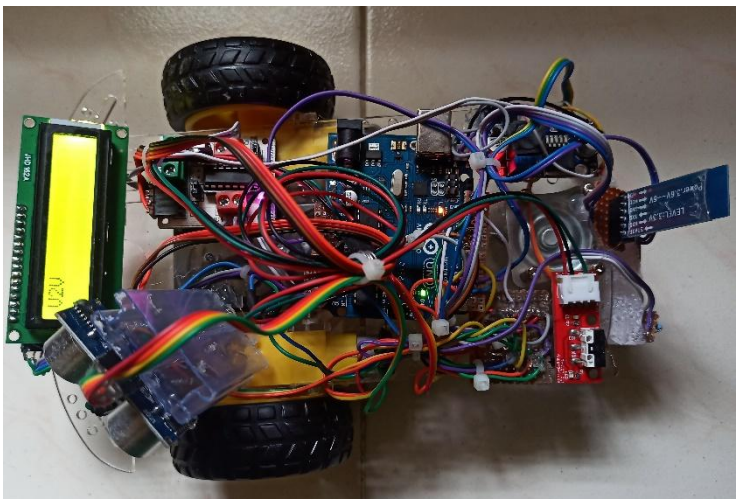

Figure 2: Transmitter vehicle

Transmitter vehicle transmits corresponding signals through bluetooth transmitter module to the receiver module.

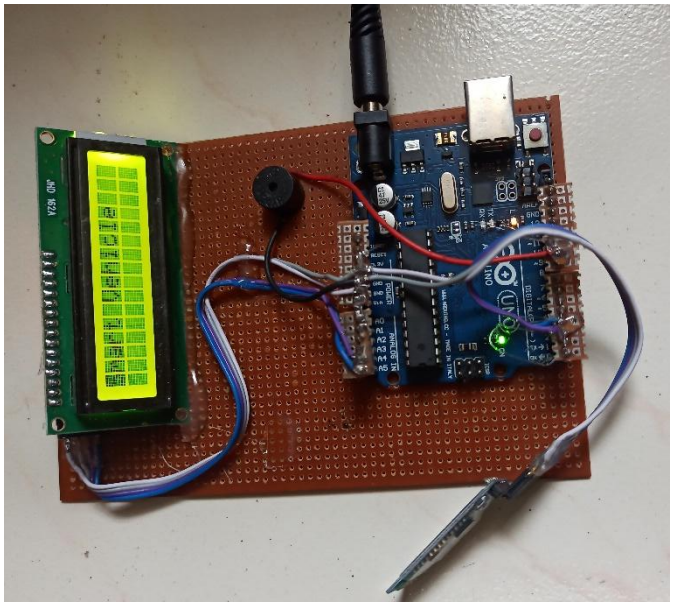

Figure 3: Receiver vehicle

Receiver vehicle receives the ultrasonic waves transmitted from the transmitter vehicle through Bluetooth receiver.

2.2 Turning Assist

The indicator warning message is displayed on both the receiver and the transmitter module for both left and right turning.

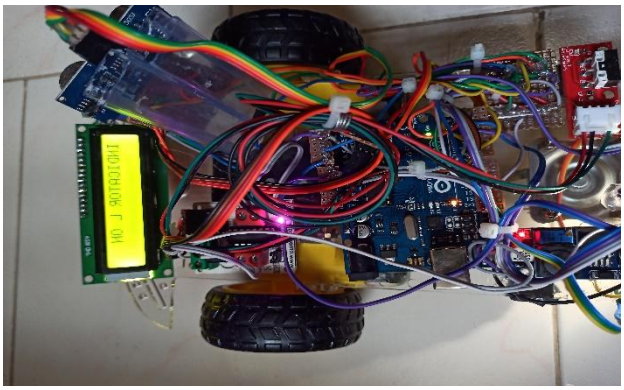

Figure 4: Turning Assist on transmitter vehicle

Figure 5: Turning Assist on receiver vehicle

2.3 Emergency Brake Light Warning

When the transmitter vehicle applies the break a warning message is displayed on the receiver LCD.

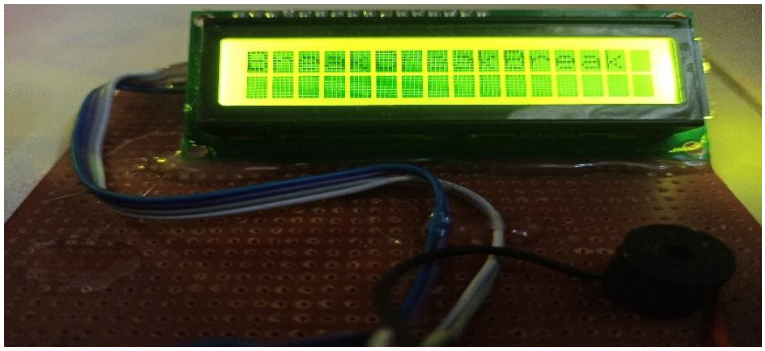

Figure 5: Break light warning

2.4 Blind Spot Warning

Blind spot alert message is displayed on the LCD and on the mobile screen ,the picture taken will be displayed on the mobile phone. These results are shown in figure 6 and figure 7.

Figure 5: Blind spot warning on LCD

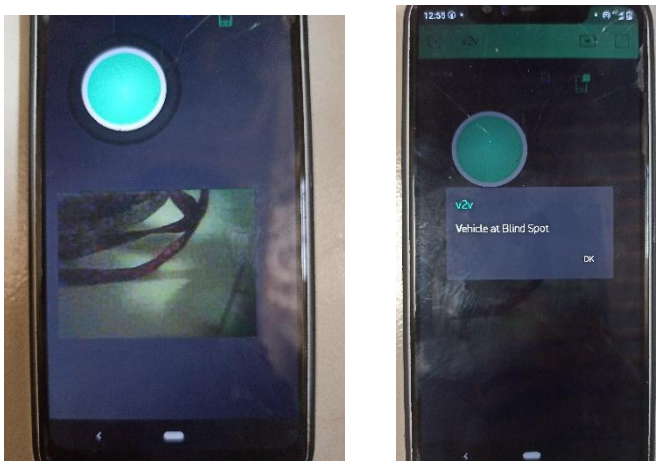

Figure 5: Blind spot warning on mobile screen.

2.5 Accident Data Logger

When an accident occurs the data of the vehicle that hits will be send to the receiver vehicle through bluetooth transmitter of the transmitter vehicle and the data is received through receiver module of the receiver vehicle.

Figure 5: Accident display message

2.6 Parking Problem Elimination

If any vehicle makes hindrance to ours, User can move his vehicle through commands over the mobile phone connected to IoT. A joystick is used for moving the vehicle in desired direction.

III. CONCLUSION

V2V test performance, requirements, procedures, driver-vehicle interface far good enough for the purpose of the model according to US DOT but still research and development activities would still be needed to level up performance . It's evident that technology has great capabilities to help future generation transportation systems. V2V communication has unique characteristics to enable future generation intelligent transportation systems. The technology works both in V2I and V2V environments providing many mobile safety applications. Significant encryption systems have been put in place yet there is no current security model in place that is secured enough. Studies have also indicated that there is not yet standard put in place for V2V communication . Like so many artificial made and deployments, there are some concerns in widespread deployment of V2V but progress in technology and anticipated benefits can make V2V happen.

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