V2V COMMUNICATION PROTOCOL

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Abstract

The Project is aim to avoid the number of fatal roadway accidents by providing early warnings so that we can protect people from accidents as well as injury[3]. One major technical challenge in this our project is to achieve low latency in delivering emergency warnings in various road situations. Based on previous application analysis we design an effective protocol. Vehicle to vehicle communication protocol is based on wireless communication technology. V2V communication protocol is very simple to design because it is based on wireless technology[3]. Using NRF Transceiver module we communicate more than two vehicles. We alert the driver by using three ways like LCD alert, audio alert and LED alert. The distance measurement is provided by proximity sensor. A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact[4].

Keywords: *NRF module, Proximity sensor, Temperature sensor, Voice playback module, LCD display, LED, Buzzer, Keys, Arduino Nano.*

1. INTRODUCTION

The amount of road accidents increased day by day so many human lives injured in this road accidents so we specially focused on the technologies that can reduce road accidents[1]. Vehicle to vehicle communication protocol is very simple to implement because it is depend on wireless communication. Arduino is heart of our project. We use Arduino nano in this project. Arduino controls entire process. The NRF transceiver module is used for transmitting as well as receiving the signal. We communicate more than two vehicles using NRF transceiver module[1]. Our system is very simple to use for alerting purpose. The distance measurement between two vehicles is done by using proximity sensor[2].

The main objective of our project is to alert the driver when he closes to the front vehicle. During night times some of the vehicles such as car, bus, truck may break down at the highways, this causes greater chances of accidents in this cases our system is very useful. We alert the driver using three ways like audio alert, LCD alert and buzzer alert.

2. REVIEW OF EXISTING SYSTEMS

In 1997 alone more than 6.7 million motor vehicle crashes on US highways[6]. The type of human errors that cause crashes were identified as recognition, decision and performance errors. Due the rear end crashes in 1997 1.9 million rear end crashes are happened on nation highways[6]. Many accident cases which involved entering or leaving a driveway of parking place happened to take place at a parking spot. Out of these few were involved turning left and others were involved turning right.

In existing technology of V2V communication there is no NRF communication between vehicles. Existing technology is time consuming[6]. There is no combination of alerts in previous technology like audio, LED and LCD display.

3. PROPOSED SYSTEM

This project proposes a vehicle-to-vehicle communication protocol for cooperative collision warning. Emerging wireless technologies for vehicle-to-vehicle (V2V) and vehicle to- roadside (V2R) communications such as DSRC are promising to dramatically reduce the number of fatal roadway accidents by providing early warnings[10]. One major technical challenge addressed in this project is to achieve low-latency in delivering emergency warnings in various

road situations. Based on a careful analysis of application requirements, we design an effective protocol, comprising congestion control policies, service differentiation mechanisms and methods for emergency warning dissemination[8]. Simulation results demonstrate that the proposed protocol achieves low latency in delivering emergency warnings and efficient bandwidth usage in stressful road scenarios.Fig no.1 shows the basic block diagram of actual system.

3.1 BLOCK DIAGRAM

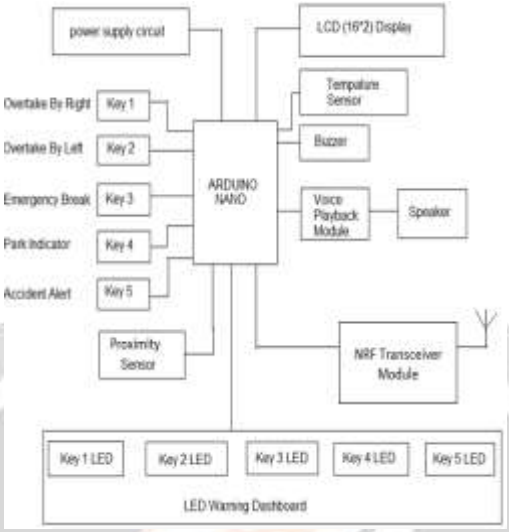

Fig no.1 Block Diagram of V2V Communication Protocol

3.2 MODULES DESCRIPTION

I) Arduino nano:

Arduino nano is heart of our project. In this arduino nano 14 Digital I/O pins of which 6 provides PWM outputs, Analog input pins are 8, 2KB SRAM, 32KB flash memory, 1KB EEPROM memory and clock speed is 16 MHz.

II) NRF Module:

NRF transceiver module is used for transmitting as well as receiving the signals.

- 2.4GHz RF transceiver Module
- Operating Voltage: 3.3V
- Range : 50 – 200 feet
- Communication Protocol: SPI

III) Temperature sensor (LM 35):

We are using LM 35 as it is a low cost temperature sensor and it does not require signal conditioning. LM 35 is a precision integrated circuit temperature sensor whose output voltage is linearly proportional to temperature.

IV) Voice playback module:

Voice playback module is used for stored the audio message. Voice playback module supports 2GB sd card max or SPI flash 64MB max. We use WTV020SD voice playback module.

V) LDC display:

LCD is an electronic display module. It is 16x2 LCD display. It is a 16 characters and 2 lines display. It is a 4 bit or 8 bit MPU interfaces. Weight of LCD display is approximate. In LCD each character is displayed in 5x7 pixel matrix.

VI) 8 OHM Speaker:

We use speaker for audio alerts. It is a 8 cm full range speaker with good bass reproduction, balanced frequency response and high efficiency. Specially suitable as built in speaker for music reproduction.

3.3 FLOW CHART

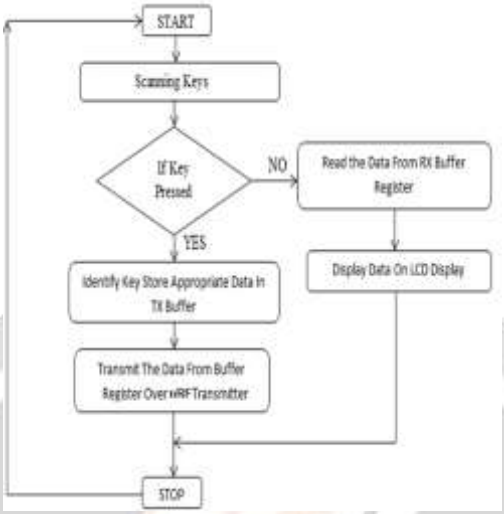

Fig no. 2 V2V program flow

3.4 KEY FUNCTIONS

Key1: OVERTAKE BY RIGHT
In this project Key1 will used to request second vehicle for OVERTAKING BY RIGHT SIDE.
Key2: OVERTAKE BY LEFT
In this project Key2 will used to request second vehicle for OVERTAKING BY LEFT SIDE.
Key3: EMERGENCY BREAK
In this project Key3 will used to ALERT all surrounding vehicles that EMERGENCY BREAKING is happened in vehicle and you should slow down your vehicle.
Key4: PARK INDICATOR
In this project Key4 will used to ALERT all surrounding vehicles that is EMERGENCY HAPPENED AND VEHICLE PARKED AT ROAD and you should slow down your vehicle.
Key5: ACCIDENT ALERT
In this project Key5 will used to ALERT all surrounding vehicles that ACCIDENT HAPPENED ON and you should slow down your vehicle.
LED1: Warning (Overtaking By Right Side)
When there is request to overtake by right side Signal received at NRF Receiver Then LED1 will be Turn ON&OFF for 5 times with 500ms of time interval.
LED2: Warning (Overtaking By Left Side)
When there is request to overtake by Left side Signal received at NRF Receiver Then LED2 will be Turn ON&OFF for 5 times with 500ms of time interval.
LED3: Warning (Emergency Break)
When there is Emergency Break Signal received at NRF Receiver Then LED3 will be Turn ON&OFF for 5 times with 500ms of time interval.
LED4: Warning (Park Indicator)
When there is Park Indication Signal received at NRF Receiver Then LED4 will be Turn ON&OFF until vehicle not move away with 500ms of time interval.
LED5: Warning (Accident Alert)
When there there is Accident Alert Signal received at NRF Receiver Then LED5 will be Turn ON&OFF for 5 times with 500ms of time interval.

4. KEY COMPONENTS

Major components used

1. Arduino NANO
2. Proximity Sensor
3. Buzzer
4. NRF Transceiver Module
5. LCD Display
6. Temperature Sensor LM35
7. Voice Playback Module
8. Speaker
9. LED'S
10. 12v DC Battery

5. ADVANTAGES

- By this technology, peoples drive will be more comfortable and easier.
- The case of accidents will be very less.
- Any problem occurred by one in driving will be informed to others so they can be aware of it while driving.
- Efficient design for Anti-Collision of Vehicle.
- Quick response time
- Fully automate system thus Reduces Collision of Vehicle.
- Robust system.
- Highly flexible.

6. APPLICATIONS

- Can Be Used To Reduce Road Accident.
- It Can Be Used To Reduce Noise Pollution Due To Horn.

7. CONCLUSION

These system will improve the road safety as well as comfortable vehicle driving. By this technology people drive will be more comfortable and easier. Any problem occurred in our vehicle then our system will be informed to others so they can be aware of it while driving. It is efficient design for anti-collision of vehicle.

8. REFERENCES

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