

VEHICLE TO VEHICLE COMMUNICATION PROTOCOL FOR CO-OPERATIVE COLLISION WARNING

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ABSTRACT :

In vehicle to vehicle wireless communication protocol presents an overview of recently developing vehicular communication technology particularly describing Vehicle to Vehicle (V2V) communication using IEEE and ASTM adopted Dedicated Short Range Communication (DSRC) Standard. And in vehicle to vehicle wireless communication protocol, also discusses some of the application requirements and congestion control policies. Lastly, a real life implementation of V2V and DSRC standard that support it are analyzed.

KEY WORDS: DWP, WDM, Enhanced (Modified) DWP, Rerouting and MTV_WR.

1. Introduction

Traffic accidents have been taking thousands of lives each year, outnumbering any deadly diseases or natural disasters. Studies show that about 60% roadway collisions could be avoided if the operator of the vehicle was provided warning at least one-half second prior to a collision. Human drivers suffer from perception limitations on roadway emergency events, resulting in large delay in propagating emergency warnings, as the following simplified example illustrates. In Figure 1, three vehicles, namely and, travel in the same lane.

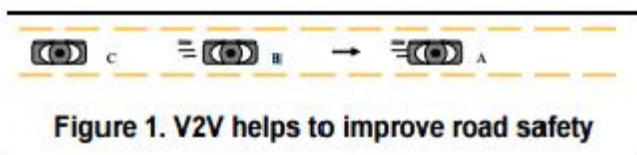


Figure 1. V2V helps to improve road safety

When suddenly brakes abruptly, both vehicles and are endangered, and being further away from does not make vehicle any safer than B due to the following two reasons:

1. Line-of-sight limitation of brake light: Typically, a driver can only see the brake light from the vehicle directly in front. Thus, very likely vehicle will not know the emergency at until brakes.
2. Large processing/forwarding delay for emergency events: Driver reaction time, i.e., from seeing the brake light of A to stepping on the brake for the driver of vehicle B, typically ranges from 0.7 seconds to 1.5 seconds, which results in large delay in propagating the emergency warning.

2. Hardware Implementation

The block diagram of the hardware implementation of the entire system is as shown in the Figure 1 & 2. ARM 7 is a microcontroller capable of performing various functionalities. The various functionalities of the components are given below:

The various functionalities of ARM 7 (LPC 2148) are

- 16bit/32bit ARM7TDMI-S microcontroller in tiny LQFP64 package
- 8 kb to 40 kb of on chip SRAM and 32 Kb to 512KB of on chip flash memory
- It supports ISP and IAP.
- Two 10 bit ADCs provide a total 6/14 analog inputs with conversion time as 2.44microsecond per channel.
- Single 10 bit DAC provides variable analog output.
- Multiple serial interfaces including two UARTs ,two fast I2C bus (400kbits/s) SPI and SSP with buffering and variable data length capabilities
- Up to 45 of 5v tolerant fast general purpose I/o pins in a tiny LQFP64 package.
- Up to 21 external interrupt pins are available .
- On chip integrated oscillator operates with external crystal from 1MHZ to25Mhz.
- Processors wake up from power down mode via external interrupt or BOD.

1 Ultrasonic sensor:

Ultrasonic sensor are basically used to measure the distances between the obstacle / object and the sensor. The ultrasonic sensor works on Doppler effect. It consist of a ultrasonic transmitter and a receiver. The transmitter transmit the signal in one direction. This transmitted signal is then reflected back by the obstacle and received by the receiver. So the total time taken by the signal to get transmitted and to received back will be used to calculate the distance between the ultrasonic sensor and the obstacle. Ultrasonic ranging module HC-SR04 provides 2cm - 400cm non-contact Measurement function, the ranging accuracy can reach to 3mm. The modules Includes ultrasonic transmitters, receiver and control circuit.

The basic principle of work:

- (1) Using IO trigger for at least 10us high level signal,
- (2) The Module automatically sends eight 40 kHz and detect whether there is a Pulse signal back.
- (3) IF the signal back, through high level, time of high output IO duration is The time from sending ultrasonic to returning.

Test distance = (high level time x velocity of sound (340M/S)) / 2

2 RF Transmitter/Receiver (Tx/Rx):

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK). This RF module comprises of an **RF Transmitter** and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a frequency of 434MHz. An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps - 10Kbps. The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter.

H12E (Encoder IC)

A popular example of an Encoder is the Holtek Encoder H12E used for parallel to serial conversion. It is a type of CMOS IC with 8 address pins and 12 data pins. It is basically an 18 pin IC. It is used in [RF communication](#) where it converts the 12 bit parallel data to serial form. It consists of an Enable pin which is active low pin and when set low, the transmission is enabled. The H12E encoder sends 4 words at a time. In other words, till the pin is set low, the encoder transmits several cycles of each 4 words and stops the transmission once the pin is set high.

H12D (Decoder IC)

Decoders are digital ICs which are used for decoding. In other words, the decoders decrypt or obtain the actual data from the received code, i.e. convert the binary input at its input to a form, which is reflected at its output. It consists of n input lines and 2^n output lines. A decoder can be used to obtain the required data from the code or can also be used for obtaining the parallel data from the serial data received. The H12D is a CMOS IC which is used in RF communication. It is paired with the H12E and receives the serial output from the Encoder. The serial input data is compared with the local available addresses and in case of no error, the original data is obtained and the VT pin goes high to indicate a valid transmission. It consists of a single input pin to receive the serial input and 12 output pins with 8 address pins and 4 data pins. It also has 2 built in oscillators and its features are same as that of H12E encoder IC.

3 Liquid crystal display:

LCD is used in a project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD.

LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

3. Block Diagram

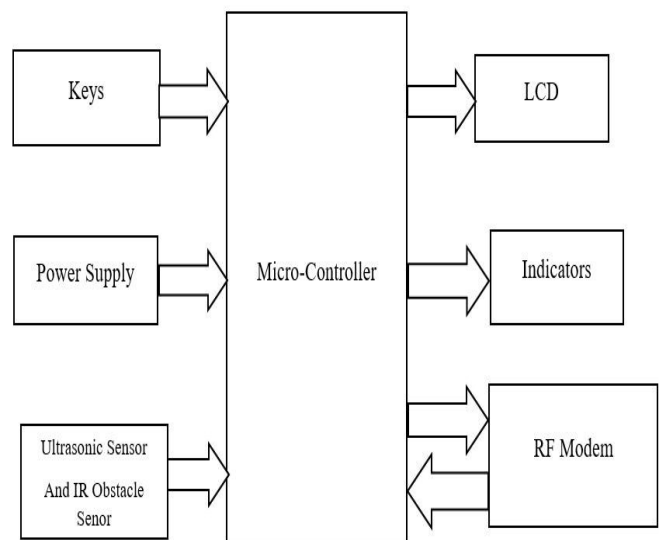


Fig 1. Block diagram of vehicle 1

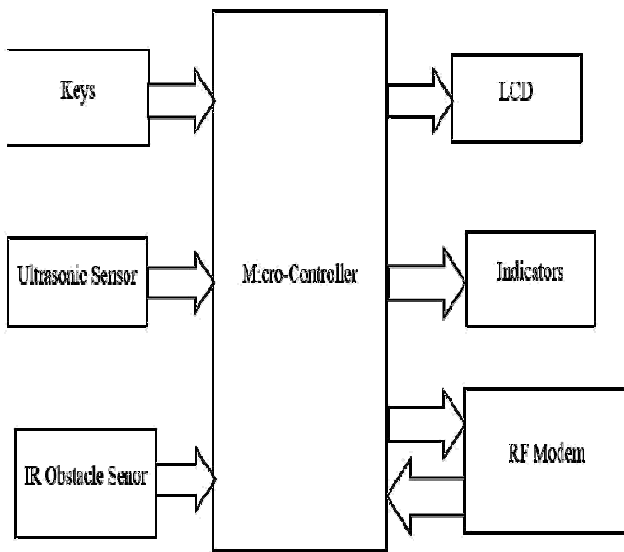


Fig 2. Block diagram of vehicle 2

4.FLOW CHART

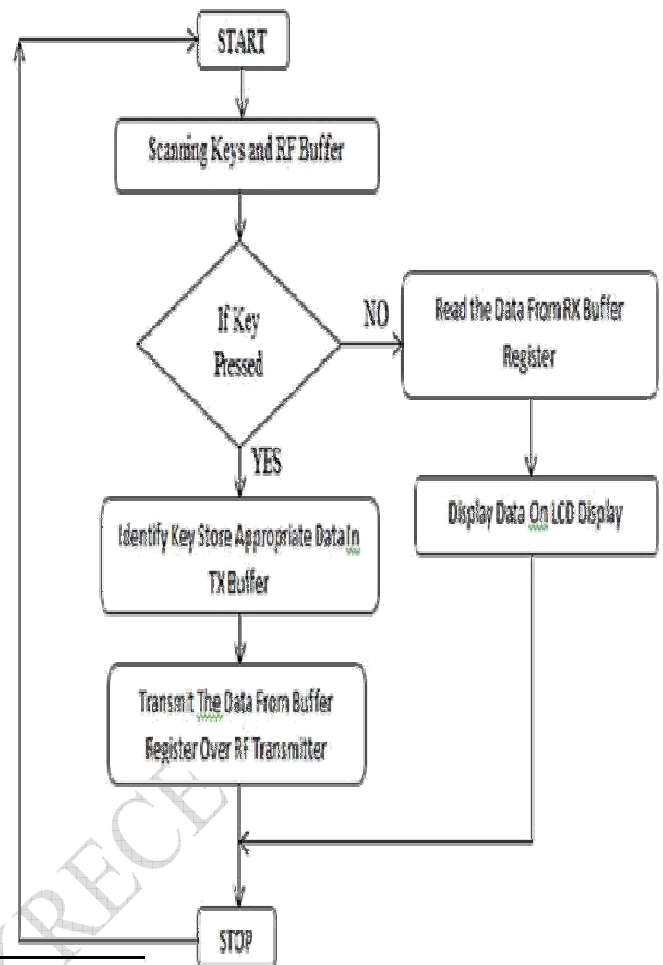


Fig3.flowchart of Vehicle to vehicle communication protocol

5. Application

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

6. Advantages

- Do not Required Horn While Overtaking.
- It Will Reduce Noise Pollution Due to Un-Necessary Honking.
- Emergency Breaking Will Alert Other Vehicle's to Avoid Collusions.
- It Will Reduce Number of Road Accident's Small, Easy and User Friendly System

7. Future Scope

In future our project can be implemented using ZigBee instead of RF Transmitter and Receiver which has Better Rang Than RF Tx and Rx and Reliability.

We can include GSM and GPS System to Identify the Location of Vehicle which get damaged due to accident or any other reasons Informed by other vehicle by pressing button.

8. Conclusion

In this project we are able to communicate two vehicles to avoid collisions instead of honking we press the defined button for overtaking and many other purpose. Vehicle can also inform about the emergency breaking, damaged or faulty vehicle on road.

Using this system there is no need of honking and it will also decrease noise pollution.

REFERENCES

- 1 International Journal of Scientific and Research Publications, Volume 4, Issue 3, March 2014
- 2) X. Yang, J. Liu, F. Zhao, and N. H. Vaidya. A Vehicle-to-Vehicle Communication Protocol for Cooperative CollisionnWarning. Technical report, University of Illinois at Urbana- Champaign, Dec 2003
- 3 I. Chisalita and N. Shahmehri. A Peer-to-Peer Approach to Vehicular Communication for the Support of Traffic Safety Applications. In 5th IEEE Conference on Intelligent Transportation Systems, Singapore, pages 336–341, Sep. 2002.

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