Inter Vehicle Communication System

Jayadev K, Binoy K. Varghese, Haritha Chandrasekhar, Vipin Venugopal

Abstract— Inter Vehicle Communication System was developed with the aim of reducing noise pollution. Inter vehicle communication system communicates between vehicles through RF signals. The RF signals are used to replace horns, whenever possible, thus it helps to reduce sound pollution due to Sound Horns. The RF signals along with IR signals also give the directionality. An LCD display system is also incorporated to distinguish between special vehicles like ambulances, fire engines etc.. IVCS is thus an effective way of communication between vehicles.

Keywords: - Communication, noise pollution, RF, Sound, Horns, LCD, IVCS.

I. INTRODUCTION

The cumulative impact of noise is sufficient to impair the hearing of a large fraction of the population over the course of a lifetime. Noise exposure also has been known to induce tinnitus, hypertension, vasoconstriction, and other cardiovascular adverse effects. Beyond these effects, elevated noise levels can create stress, increase workplace accident rates, as well as stimulating aggression and other anti-social behaviours. The most significant causes are vehicle and aircraft noise. So there arises an urgent need to reduce the noise effects. **Inter Vehicle Communication System** was developed with the aim of reducing the same. Inter vehicle communication system communicates between vehicles through RF signals which helps to reduce sound pollution due to Sound Horns. This RF signals along with IR signals also give the directionality.

How it works: Whenever horn is pressed, the system looks for the 'type' of obstacle. It then sends out normal Sound Horn if human presence is detected. Otherwise, Radio Frequency signals are sent, which are received by the nearby vehicles. In addition to this, the system sends Infra-red signals, which are received by the vehicles in the line of sight of the sending vehicle in the forward direction. The IVCS systems in the other vehicles in the receiving range respond to this by activating the front buzzer and back buzzer depending on whether both IR and RF signals are present or not. That is, if both IR and RF signals are received, the back buzzer is activated, thereby indicating the driver that the vehicle behind has given the 'horn'. In the absence of IR signal, the front buzzer is activated indicating 'horn' from vehicle elsewhere. Moreover, the horn from 'special' vehicles like ambulances, fire engines and police vans are distinguished from others by the LCD display in the system.

Manuscript Received on October 2014.

Jayadev K, UG Student, Department of Electronics Engineering, Govt. Model Engineering College, Kochi, India.

Binoy K. Varghese, UG Student, Department of Electronics Engineering, Govt. Model Engineering College, Kochi, India.

Vipin Venugopal, UG Student, Department of Electronics Engineering, Govt. Model Engineering College, Kochi, India.

Haritha Chandrasekhar, UG Student, Department of Electronics Engineering, Govt. Model Engineering College, Kochi, India.

If the IVCS comes into action, a whole lot of issues concerning health, pollution etc. due to the effect of noise can be reduced. A largely noise free atmosphere can be achieved. The IVCS thus is an effective method of communication between vehicles

II. SYSTEM OVERVIEW

A. *Block Level Description*

A brief block diagram representing the system is shown in Figure 1.

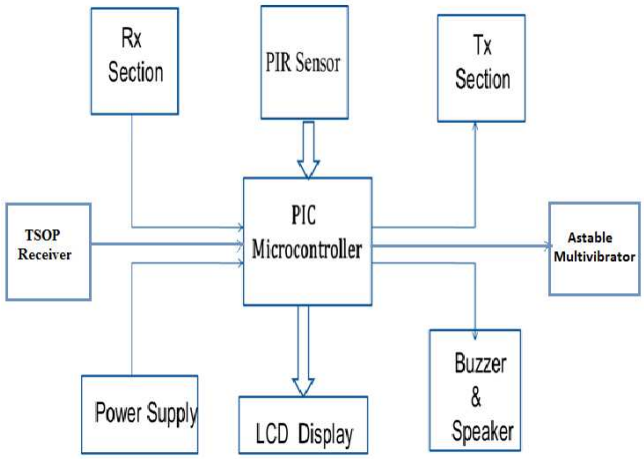

Figure 1: Block Diagram

- **PIC Microcontroller**

This is the brain of the entire system which controls all the actions. The microcontroller used is PIC16F877A from Microchip.

- **Transmitter Section**

The transmitter section consists of an encoder circuit and an ASK transmitter module. The encoder circuit converts the 4 bit parallel data into serial form and transmits it in the form of Radio Frequency waves.

- **Receiver Section**

The receiver section consists of a decoder circuit and an ASK receiver module. The decoder circuit converts the serial data received by the receiver module into parallel form.

- **PIR Sensor**

The Passive Infrared sensor is used to detect humans and stray animals that accidently jump in front of the vehicle. The sensor has an active low output.

- **Astable Multivibrator**

The Astable Multivibrator circuit generates a 38KHz square pulse for infrared transmission. This is done so because the TSOP receiver can only receive a 38KHz wave.

- **TSOP Receiver**

The TSOP receiver is used to detect infrared wave transmitted by the vehicle coming from back. The TSOP receiver can only detect a square wave of 38KHz.

- **LCD**

A 16×2 LCD is used to display all the corresponding alerts

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.

when police or other special vehicles sounds the horn. The LCD is directly interfaced to the microcontroller.

- **Buzzer and Speaker**

The Speaker is used for producing the external sound when the horn is pressed and the PIR sensor is high. The speaker is actually the normal horn of vehicle circuit. There are two buzzers, back and front buzzer used inside the vehicle. They produce the sound corresponding to the signals it obtains through the microcontroller.

- **Power supply**

The power supply circuit provides the necessary 5V DC supply for the entire system. The 12V DC supply from the vehicle's battery is regulated to 5V.

B. System Working Algorithm

The device operates in two modes depending on whether accident is detected(accident mode) or not(normal mode).

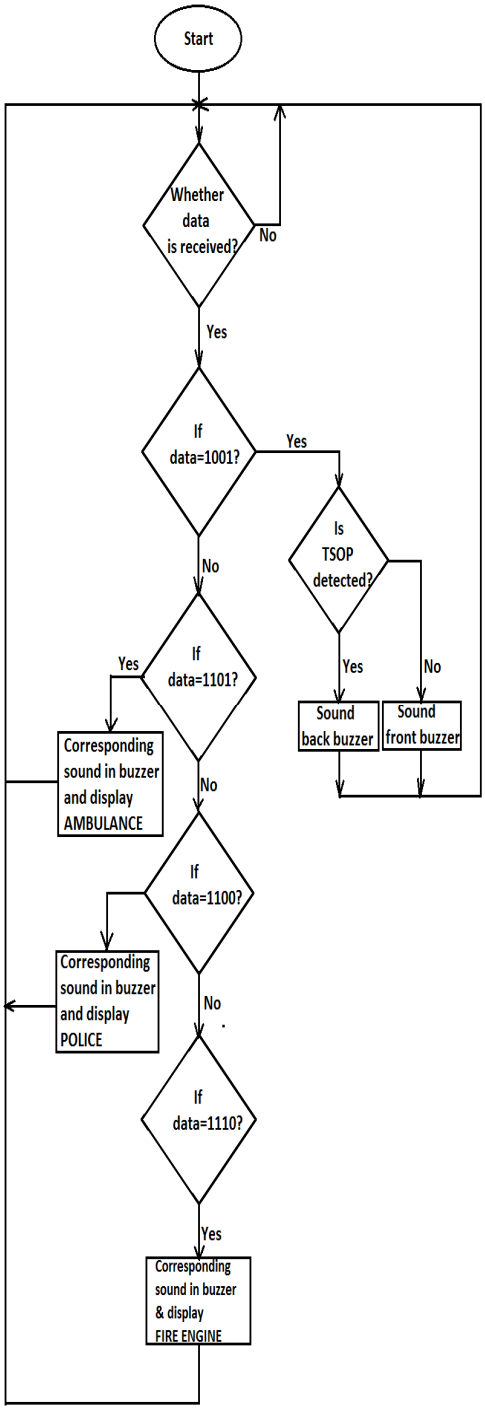

Figure 2: System Flow- Receiver Section

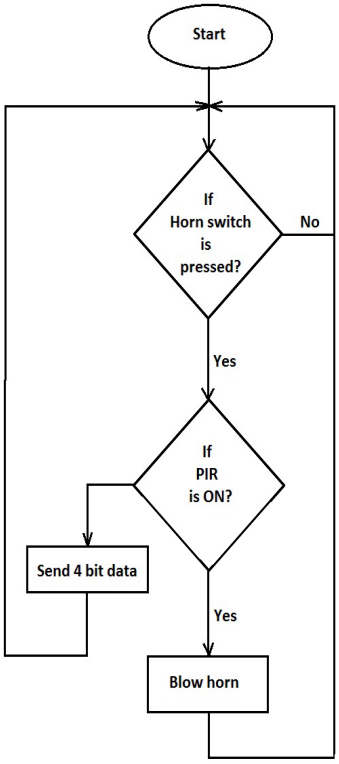

Figure 3: System Flow-Transmitter Section

The work flow in the system is depicted in Figures 2 and 3.

III. HARDWARE DETAILS

The hardware associated with the system are explained as follows:

A. PIC 16F877A

PIC is a family of modified Harvard architecture microcontrollers made by Microchip Technology. PIC-16F877A serves the following functions in IVCS:

- PIR Sensor interfacing
- Accessing the RF Receiver and Transmitter Section
- Accessing the IF Receiver and Transmitter Section.
- Control of sound horn, front Buzzer and back buzzer.
- Monitors LCD display.

B. Power Supply

A stable DC power is necessary for the proper working of the electronic systems. The required DC power is derived from battery cell and voltage regulator. The 9V cell is used to generate the required 5V supply. The output of IC 7805 is 5V. The capacitor across the output provides high frequency decoupling which keeps the impedance low at high frequencies. In IVCS Power supply powers all the units in the system. The car battery usually provides 12V dc voltage. PIR sensors, RF transmitter and receiver module, PIC, LCD Display, IR module etc. need 5V dc voltage.

C. Transmitter and Receiver

The RF module comprises of an RF Transmitter and an RF Receiver. The transmitter/receiver (Tx/Rx) pair operates at a

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.

frequency of 434 MHz An RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. Maximum range is about 1.2 Km.

D. PIR Sensor

A passive infrared sensor (PIR sensor) is an electronic sensor that measures infrared (IR) light radiating from objects in its field of view. They are most often used in detectors. In IVCS it is used for detecting human presence (Motion detector) and correspondingly the microcontroller has to decide whether normal horn or RF signals have to be sent. It requires 5-9 V input voltage. It has up to 6m range. All objects above absolute zero emit heat energy in the form of optical radiation When human obstruction is detected, the PIR sensor can provide an output of 5V magnitude. This will be monitored by the microcontroller each time when switch is pressed. The corresponding decision will be taken by the controller to send signal through RF or to blow the horn.

E. LCD Display

A 16×2 LCD is used to display all the corresponding alerts when police or other special vehicles sounds the horn. The LCD is directly interfaced to the microcontroller. LCD has 3 control lines- RS, E and R/W. The RS, RW and E pins are connected to the RB4, RB5 and RB6 respectively. All the data pins are used here and they are connected to the PORTD.

F. Astable Multivibrator

In IVCS, we have included a feature for the directionality of the vehicle from which horn is produced. When RF signals are transmitted, actually we don't get an idea from where the sound produced, whether from a vehicle behind us or a far off vehicle. In order to facilitate the direction along with the RF signal a simultaneous infrared pulses of frequency 38 KHz is generated and is send through the IR LED connected in front of our vehicle. Then the vehicle just front of it can detect that the vehicle just behind has produced the sound. At this time the back buzzer inside the vehicle will sound. In all other cases it's the front buzzer that produces the sound. This is one of the highlighting features of IVCS. The astable multivibrator using 555 IC is used for generating the pulse. The receiver of this IR pulse is a TSOP receiver

G. TSOP Receiver

In IVCS, TSOP 1738 is used for receiving the pulses. The TSOP 1738 is a member of IR remote control receiver series. This IR sensor module consists of a PIN diode and a pre amplifier which are embedded into a single package. The output of TSOP is active low and it gives +5V in off state. When IR waves, from a source, with a centre frequency of 38 kHz incident on it, its output goes low. The TSOP receiver is placed at the back of every vehicle. It receives signal when the back vehicle send the signal and this is monitored by the microcontroller and correspondingly back buzzer sounds

H. Buzzers and Speaker

The Speaker is used for producing the external sound when the horn is pressed and the PIR sensor is high. The speaker is actually the normal horn of vehicle. There are two buzzers, back and front buzzer used inside the vehicle. They produce the sound corresponding to the signals it obtains through the microcontroller. When ambulance, police or fire engine signals are received, the two buzzers produce a combined effect to indicate those special signals.

IV. IMPLEMENTATION DETAILS

We have used simulating tools for testing the reliability of program code and other hardware. The following are the development tools used.

A. Proteus

Proteus is a Virtual System Modelling (VSM) that combines circuit simulation, animated components and microprocessor models to co-simulate the complete microcontroller based designs. This is the perfect tool for engineers to test their microcontroller designs before constructing a physical prototype in real time. This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC, switches and buttons. Proteus professional design combines the ISIS schematic capture and ARES PCB layout programs to provide a powerful, integrated and easy to use tools suite for education and professional PCB design. In checking the correct functioning of program code and the hardware like LCD, buzzer, 555 IC etc., we have depended this software.

B. MPLab IDE

MPLAB IDE is a Windows Operating System (OS) software program that runs on a PC to develop applications for Microchip microcontrollers and digital signal controllers. It is called an Integrated Development Environment, or IDE, because it provides a single integrated "environment" to develop code for embedded microcontrollers. In MPLAB IDE, we have used the HI- TECH C- Compiler for debugging and burning the program code into the microcontroller. We have also used the in circuit debugging mode using the ICD programmer in MPLAB IDE.

V. CONCLUSION

The Inter Vehicle Communication System thus gives a new dimension to communication between vehicles. It replaces Sound Horns efficiently. It works satisfactorily for a distance of less than 20m. Implementing this in all vehicles thus provides a noise-free and effective mode of communication . Several features can be added to IVCS like special buzzing sounds for ambulances, police vans, fire engines etc. Further, an ultrasonic sensor could be incorporated into this to measure the distance from the nearby vehicle and display it in the LCD screen. IVCS could also be implemented in two wheelers. By making use of GPS, the exact positioning of vehicles could be known and by using this in IVCS, it could also be exactly conveyed to the driver, from which vehicle the signal is being transmitted

VI. ACKNOWLEDGEMENTS

Firstly, we thank the Lord Almighty for providing us with courage and confidence to take up this project. This project would remain incomplete if mention of gratitude to the following people were forgotten, whose inspirations, suggestions, guidance and encouragement were invaluable for success. First and foremost, we would like to express our

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.

heartfelt thanks to our Principal **Prof. Dr. V P Devassia**. We would also like to thank **Dr. Jayasree V.K**, Head of the Department of Electronics Engineering, for the timely support and encouragement. We are extremely thankful to our project coordinator **Ms. Thushara H P** and our project guide **Ms Swapna P P.** Their valuable guidance, ideas and support towards our project kept us motivated from the beginning to the end

REFERENCES

[1] Aziz, A. , Hossain, M.S, Dept. of Electr. & Electron. Eng., Bangladesh Univ. of Eng. & Technol., Dhaka, Bangladesh ," *Inherent Inter-vehicle Signaling Using Radio Frequency and Infra-red Communication* ",Computer Modelling and Simulation (UKSim), 2012 UKSim 14th International Conference on 28-30 March 2012

[2] Theodore Willke, Patcharinee Tientrakool and Nicholas Maxemchuk, "A survey of inter-vehicle communication protocols and their applications," IEEE Communications Surveys Tutorials (2009), vol. 11, Issue 2, pp. 3-20, April 2009.

[3] Mohammed Ali Mazidi, *PIC Microcontroller And Embedded Systems: Using Assembly and C for PIC18*, Pearson Education, 2009 edition.

[4] Boylstead & Nashlsky, *Electronic Devices and Circuits*, Pearson Education, 9th edition.

[5] PIC16F87X datasheet www.microchip.com/downloads/en/devicedoc/30292c.pdf

[6] Holtek. (2000, April 11). "HT12E Datasheet." [On-line]. pp. 1-8. Available: www.ipic.co.jp/Pdffiles/ht12e.pdf [May 28, 2011].

[7] Holtek. (2002, November 8). "HT12D Datasheet." [On-line]. pp. 1-6. Available: www.ipic.co.jp/Pdffiles/ht12d.pdf [May 28, 2011].

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication Pvt. Ltd.