Design Simulation and Implementation of Embedded System based Dual Horn using Wireless Technology

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ABSTRACT

Noise pollution due to excessive honking on expressways is on an increase due to the impulsive and at times errant behavior of drivers. Besides it is difficult at times due to various factors to completely avoid honking in the no honking zones. These factors contribute to the noise-pollution and at a stage today it is prudent and need of the moment to keep the noise levels well under check. Taking advantage of the advances in the wireless field, the use of dual-horn aims to bring down the noise levels effectively not only on expressways and streets free of pedestrians but also in the no honking zones as well. The system uses short range RF MODULE [T5/R5] for the purpose of communication between the vehicles. The major feature of this device is the low cost and relatively less hardware.

GENERAL TERMS

Algorithm, Flow Chart, Hardware, Simulation, Embedded System

KEYWORDS

LCD, Microcontroller, Relay, RF Module UART, WI-FI, Zigbee

1. INTRODUCTION

The system uses AVR ATmega 64 family of microcontroller chip for programming purpose. A relay acting as a switch is used to decide the mode of operation. Mercury wetted relays if used, are useful to obtain noiseless switching, excellent slew rate and the contact bounce is absent thus improving the switching quality [3].The driver can communicate with the vehicles ahead of it without actually honking. A switch is pressed depending on, the vehicle to which the honking message needs to be conveyed .This is done using a RF module operating in the ISM range for wireless communication. The RF module that is used for transmission and reception purpose works in a non-licensed range 0f 300-510 MHz across the globe. [7]A LCD/speaker system along with led's will prompt the driver ahead with an appropriate message by the vehicle behind him.

2. BLOCK DIAGRAM

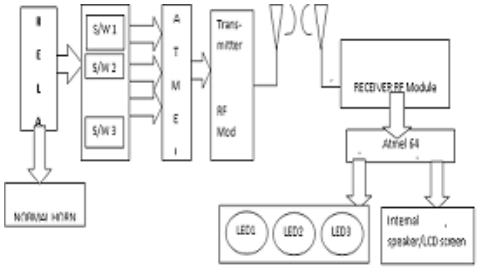

Fig. 1-Block Diagram of the System

2.1 DESCRIPTION OF BLOCK DIAGRAM

The dual-horn technology is an effort to bring down the noise levels and contribute towards developing an eco friendly system. This technology can be implemented in four wheelers. The basic components consist of relay, a radio frequency (RF) module, microcontroller and a LCD/speaker. The function of this device is to ensure that when a person honks in the regions stated above; the horn is heard/message displayed within the other vehicle in a specific distance and orientation thus avoiding any unnecessary noise pollution.

3. DESIGN AND IMPLEMENTATION

The system has been successfully tested using hardware and on software. Embedded C as well as assembly language is used for programming purpose and the output has been simulated on KIEL software as well as observed on the LCD screen.

Program in embedded c

```
#include<avr/interrupt.h>
#include"uart.h"
#include"LCD_mega128.h"
#include<util/delay.h>                          //header
for delay
ISR (USART1_UDRE_vect)                          //ISR for
transmitter
{
        If((PIND&(1<<6))==0)
        //condition if switch 1 is pressed
        {
                UDR0='B';                       //to
transmit the char'B'
                _delay_ms(500);
        }
        else if((PIND&(1<<7))==0)
        //condition if switch 2 is pressed
        {
                UDR0='L';                       //to
transmit the char'L'
                _delay_ms(500);
        }
        else If((PINE&(1<<6))==0)
        //condition if switch 3 is pressed
        {
                UDR0='R';                       //to
transmit the char'R'
                _delay_ms(500);
        }
}
ISR (USART0_RX_vect)                            //ISR for
receiver
{
        unsigned char ch;
        ch=UDR0
        UDR1=ch;
        lcd_putchar(ch);
        _delay_ms(1000);
}
Int main (void)
{
        DDRD&=~((1<<6)|(1<<7));
        //set the 6th and 7th bit of port D;
        PORTD|= (1<<6)|(1<<7);
        //pull-up for port D pins;
        DDRE&=~ (1<<6);
        //set the 6th bit of port E;
        PORTE|= (1<<6);
        //pull-up for port E pin;
        uart1_init ();
        uart0_init ();
        lcd_init ();
        //to initialize LCD display;
        lcd_putchar ('n');
        _delay_ms(5000);
        uart_tx_str ("uart1 has initialized/n");
        //to check initialization;
        sei ();
        while (1) ;}
        //to enter into infinite loop;
```

3.1 COMPARISON OF OTHER WIRELESS PROTOCOLS

Many other wireless techniques can be used for this system depending on the user. The table below gives comparison of these techniques for choosing the wireless model for short range:

STANDARD	BLUETOOTH	ZIGBEE	WI-FI
Maximum signal rate [7],[2]	3 Mb/s	250kb/s	54kb/s
Nominal	10mts	10-100mts	100mts

range[2]			
Nominal TX power[2]	0-10dBm	(-25)dBm-0dBm	0-20dBm
Channel bandwidth[2]	1Mhz	0.3/0.6Mhz;2 Mhz	22Mhz
Encryption[2]	E0 stream cipher	AES block cipher	RC4 st cipher, block ciphe
Data protection[2]	16-bit CRC	16-BIT CRC	32-bit CRC
Performance[9]	720kbps	250kbps	11Mbps
Power Consumption(PC) [11],[14]	Modern devices have very low PC as compared to the classic devices	O.39 watts over 24-hr period.	0.87 watts over 24-hr period.
Relative noise immunity[21],[6]	Average. Can be improved by FHSS	Average	Good
SNR[19],[20]	20dB	5Db	25Db
Cost[12],[10]	5$	1.5-2.5$	75-250$(mode

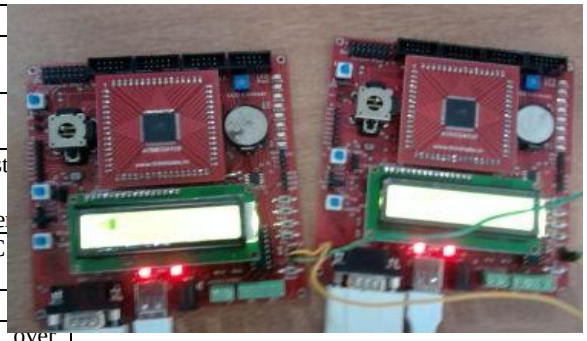

Fig. 2-Basic connection of two AVR kits

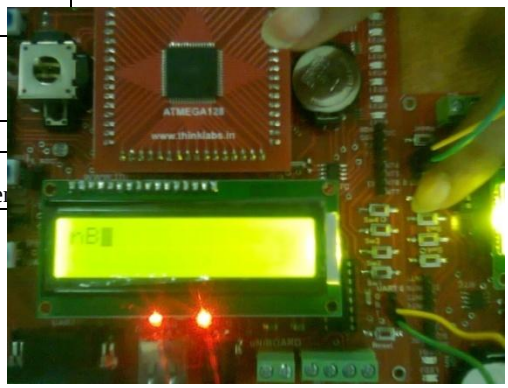

Fig.3-O/P when switch 1 is pressed

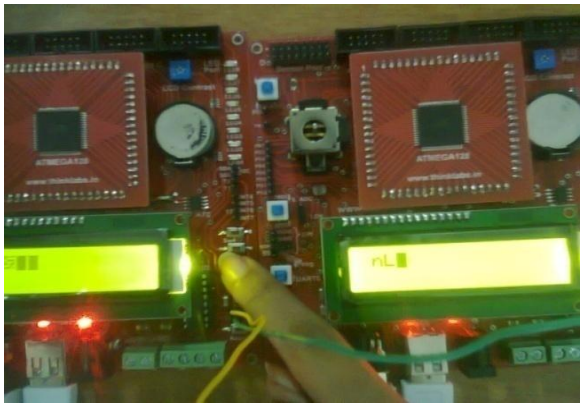

Fig.4-O/P when switch 2 is pressed

3.2 CONSIDERATIONS OF VARIOUS RF MODULE PARAMETERS

The various parameters for consideration while using a RF MODULE are specified:

Sr no:	STANDARD	RF MODULE:
1.	Nominal range[15]	Up to 300mts
2.	Error detection and correction capability[13]	RF- High anti interference and error detection capability where errors can be detected even in worst conditions.
3.	Cost [16]	5-10$
4.	Max signal rate[18]	Very high
2	Channel bandwidth[15]	T5-10khz R5-230khz
6.	Performance[9]	1.6Mbps
7.	Power consumption[17]	17.2KW
8.	Relative noise immunity[5]	Excellent for small ranges but decreases with increase in range.

3.2 DESCRIPTION OF THE SYSTEM

The function of the relay is to decide the mode of working. Relay can be in two states, either Normally OFF state or in the Normally ON state. When we select the switch to be in the ON position the horn gets connected to the RF transmitter/receiver that can transmit and receive signals in the range of 100mts [15]. In order to obtain a sensitivity of -93dBm and a

high data rate of 1.152Mb/s, packaged RF front-end IC chip set (transmitter and receiver) and a highly integrated transceiver RF module can be used.[5] A switch is pressed depending on the vehicle with which communication needs to be established. The output will be observed by the receiving vehicle which will tell its driver about the orientation of the vehicle, honking i.e. if LCD displays character 'B' then it is the person exactly behind and similarly 'L' is displayed when the vehicle towards left (behind) is honking and 'R' when switch is pressed by a vehicle which is behind him on its right side. Directional antennas can be used for deciding on the region in which the signal needs to be transmitted.

The implementation of this system has been realized by writing a program code in embedded c and then burnt onto the microcontroller. The Uniboard 1.1 version kit has been used for the hardware purpose. The output is displayed on the LCD screen. For a LCD device R, G and B sub pixels are the basic components of the panel. But it has got some disadvantages such as low resolution, low brightness and a poor appearance of the individual color pixel elements. To avoid this a LCD called as the hybrid LCD can be used to minimize the various disadvantages offered by the other type of LCD panels.[4]

However a speaker too can be interfaced to this system to hear the audio output instead of LCD Display or both features can be implemented.

4. ALGORITHM

1. The port pins 6 and 7 of port D and pin 6 of port E are set as input pins.
2. Enable the internal pull-up for these ports.
3. Initialize the led display and the serial communication port.
4. Press the switch.
5. Detect the switch pressed and transmit.
6. Receive the code.
7. Display on the LCD screen.

4.1 FLOW CHART

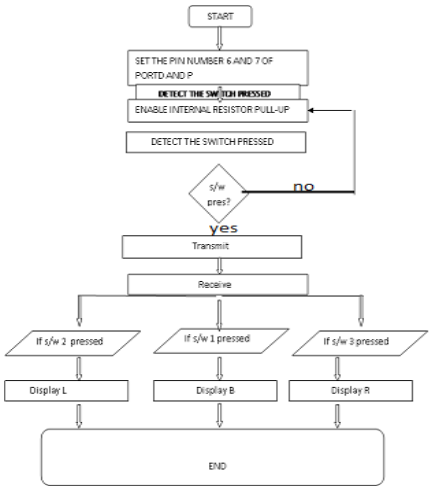

Fig. 5-Flow Chart

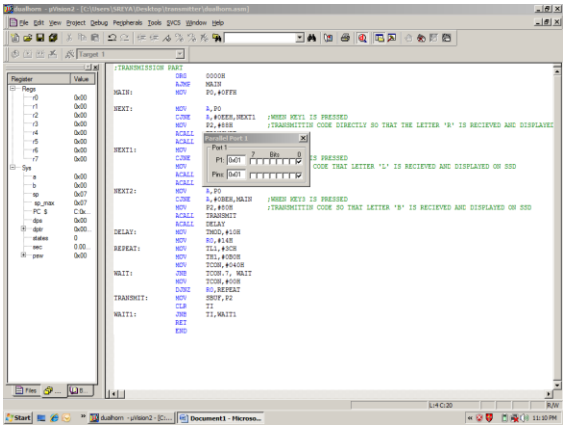

Fig. 6-O/P observed using KEIL software

5. LIMITATIONS

Although radio waves are propagated with reflection, diffraction and scattering, the wireless radio channel poses a severe challenge as a medium for reliable short-range communication. It is not only susceptible to noise, interference, and other channel impediments, but these impediments change over time in random ay due to transceivers movement[8] Thus the system may face limitations in terms of environmental noise interference . Apart from this the error in the transmission of codes is may result in a faulty code being transmitted. The receiver end failures too need to be accounted for with the bursty communication errors[6] Another major difficulty is in its operation when pedestrians as well as two - wheelers will be around as the horn is an internal horn and thus cannot be used in such areas.

6. CONCLUSION

Although this system is specifically designed for functioning on highways, in no honking zones and in areas that do not have disturbance from pedestrians; it can be used in other areas as well with slight modifications in the traffic system. If we have proper footpaths for walking, only zebra crossings for walking across the streets and separate lanes for two – wheelers we can use this effectively in cities as well. This is a definite measure to bring down the noise pollution by a great margin. This technology can be implemented using Wi-Fi and Bluetooth as well for wireless communication but a major drawback would be that Wi-Fi devices will face connectivity issues and Bluetooth may cause interference with the working of other simultaneous operations as well. However with proper strategy this system can be used largely for contributing towards an eco-friendly environment.

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