ELECTRONIC BUZZER FOR BLIND PEOPLE

GROUP NO D9

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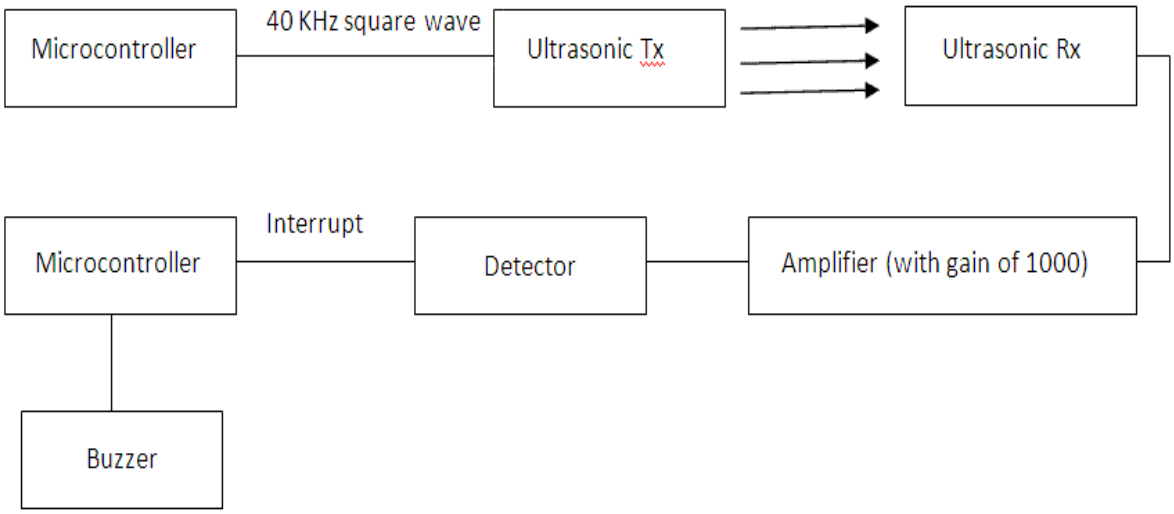
ABSTRACT

Main objective of our project is to alert a blind person whenever he gets nearby some obstacle. The idea we used is to sense obstacle using Ultrasonic Rx-Tx pair. Tx pair sends sonic booms at 40KHZ frequency and these booms are received by receiver whenever there is a obstacle in the path. Time of flight is then calculated which is scaled to give distance level of obstacle from sensor. 40 KHZ pulse to Tx and arithmetic calculation are done by microcontroller. Finally sound of different frequency is generated by Buzzer according to control signals send by microcontroller.

INTRODUCTION

Block diagram of system:



Basic five blocks:

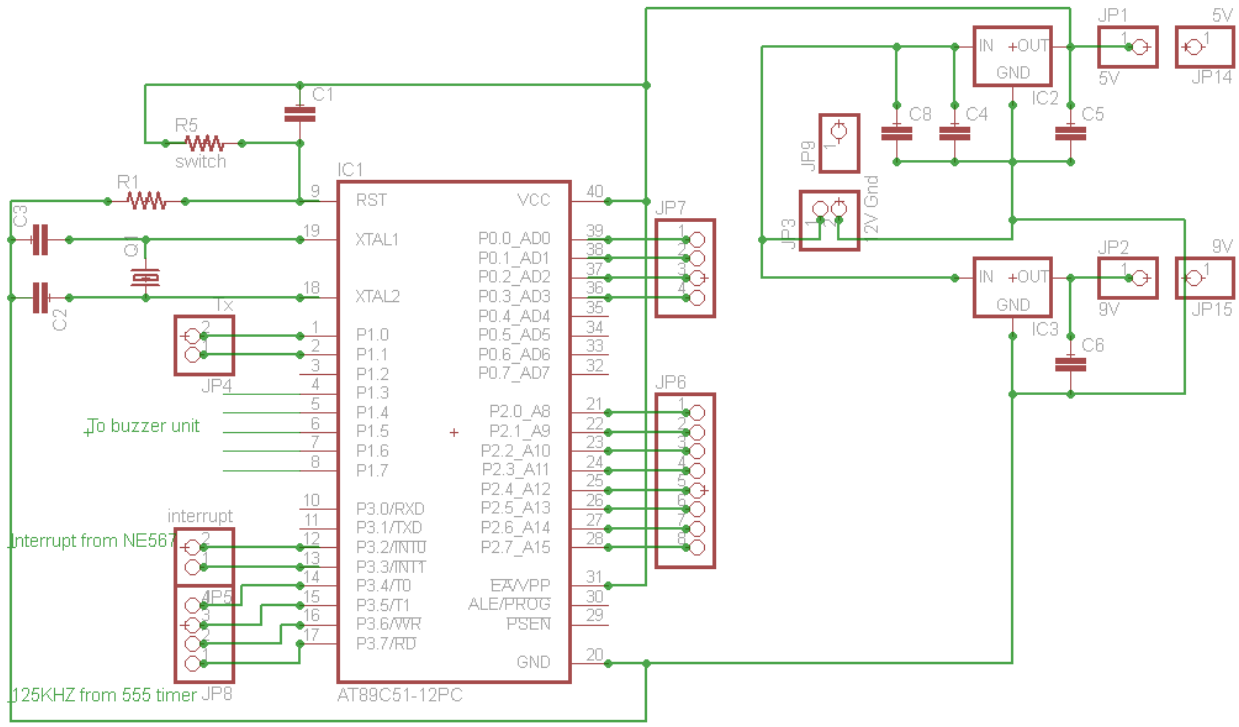
Controller board (microcontroller), Transmitter unit, Receiver unit, Detector, Buzzer unit.

CONTROLLER UNIT

It is consist of microcontroller 89C51, LM 7805 and LM 7809 voltage regulators, NE555 timer. NE555 timer is used to generate 125KHZ square wave which is required by counter in the microcontroller to generate 40KHZ in form of bursts of 1ms in an interval of 60ms.

LM 7809 and LM 7805 are voltage regulators used for +5V and +9V power supply. 89C51 microcontroller is programmed to generate 40KHZ in form of 1ms bursts and to send a signal to BUZZER unit according to the distance level calculated when interrupt from DETECTOR unit is encountered.

Circuit Diagram:



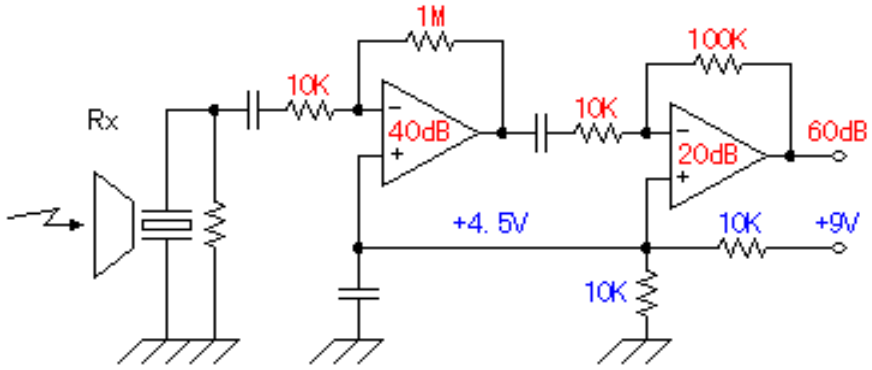
A 24 MHZ crystal with 33pf capacitors is used to give clock to microcontroller and 2.2 microfarad capacitor with VCC and resister with GND is used as reset to microcontroller. The pulse 40KHZ is generated at pin P1.0 and is send to TRANSMITTER unit. Four control signal are send to BUZZER unit to generate output at different frequencies. 12V input supply is converted into 5V and 9V in this unit by voltage regulators 7805 and 7809.

ULTRASONIC RECEIVER UNIT

The ultrasonic signal which is received by sensor is amplified by 1000 times(60dB) of voltage with the operational amplifier with two stages. It is 100 times at the first stage (40dB) and 10 times (20dB) at the next stage.

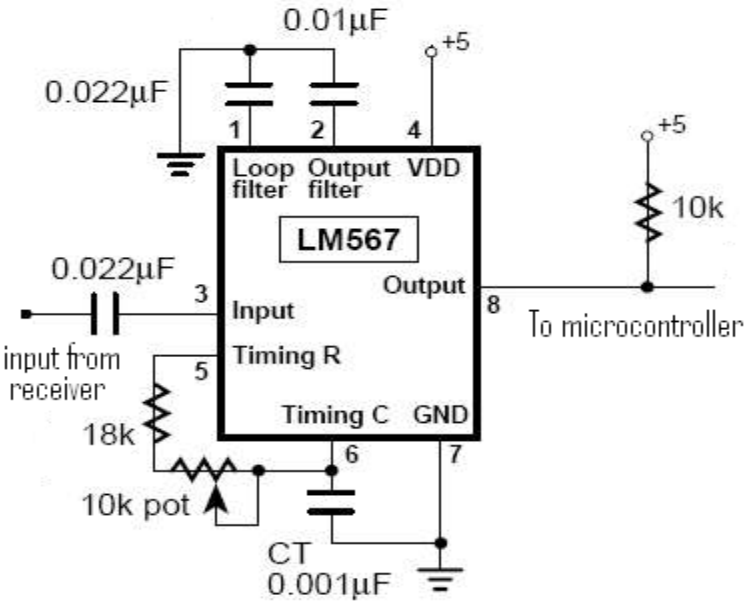
For this we used LM833 low noise operational amplifier IC with +9V power supply.

Signal amplification circuit



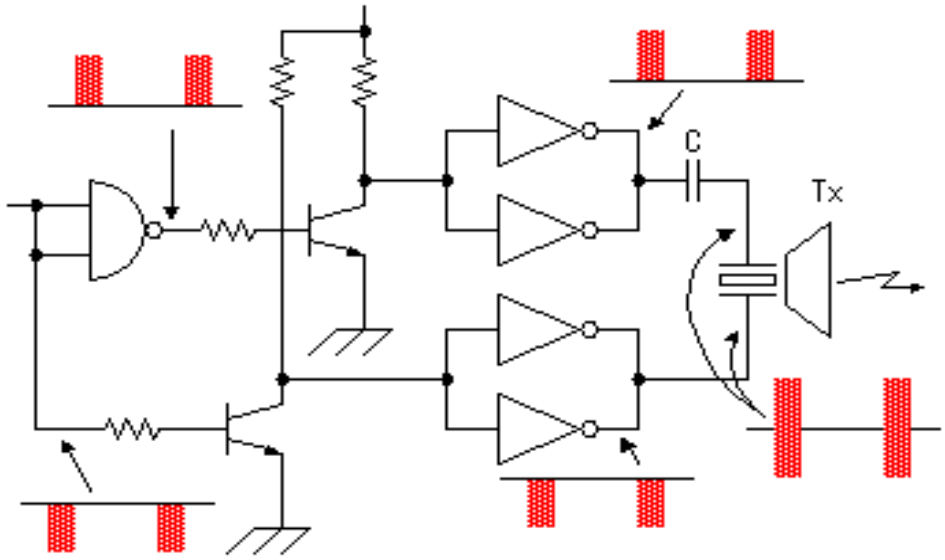
DETECTOR UNIT

This unit uses NE567 tone decoder. The amplified input of receiver unit is fed to this unit at pin 3. This tone decoder is locked for 40KHZ and will generate an interrupt whenever input signal is of frequency 40KHZ



ULTRASONIC TRANSMITTER UNIT

Transmitter circuit diagram



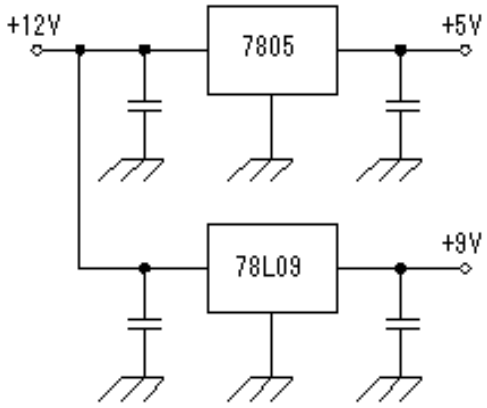
The inverter is used for the drive of the ultrasonic transmitter. The two inverters are connected in parallel to have more transmission electric power. The phase with the voltage to apply to the positive terminal and the negative terminal of the sensor has been 180 degrees shifted. Because it is cutting the direct current with the capacitor, about twice of voltage of the inverter output are applied to the sensor.

The power supply voltage of this circuit is +9V. Since C-MOS inverters are used, it is possible to do ON/OFF at high speed comparatively.

For this circuit C-MOS NAND GATE cd4011 and Inverter cd4069 are used. 40KHZ pulse generated by microcontroller is fed to this unit which is amplified and fed to transmitter so that we can transmit more power.

POWER SUPPLY UNIT

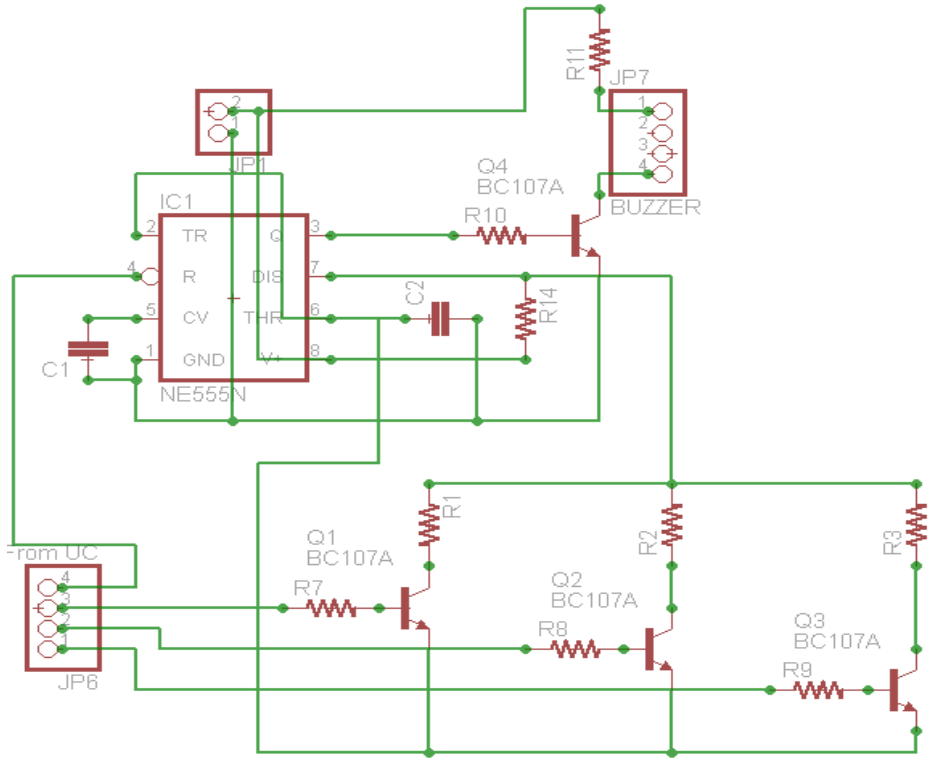
Circuit Diagram



The voltage of +5V and +9V are made with +12V power supply using the 3 terminal regulators. LM7805 and LM7809 respectively.

+9V supply is used for the transmitter, receiver and buzzer unit. And +5V supply is used for Controller unit (Contains microcontroller 89C51) and Detector unit (Contain NE5567 tone decoder).

OUTPUT UNIT BUZZER



In this unit Buzzer is used to produce sound as an output. It is operated at three different frequencies according to the distance level estimated by microcontroller. NE555 timer is used to generate three different frequencies and npn transisters to switch between these frequencies. Npn transister just switches in between three resister values so that 555 timer can generate different frequencies.

This unit is operated at +9V power supply and four signals from controller unit are fed into this unit, three of which give information about the distance of detected obstacle and one is enable control to 555 timer IC.

Programming part:

- Our requirement is to detect the obstacles which are at different distances. We are using ultra sonic sensors and these sensors work only at 40KHZ. To detect the obstacle we are sending bus of 40 KHz pulses for 1 ms and then wait for 60 ms to detect if there is any reflected pulse. If there is no pulse then we again start sending the bus of pulses and if there is any reflected pulse the receiver receives it and generates an interrupt. This interrupt goes to microcontroller and according the time delay in the reflected wave we calculate the distance of the obstacle. There are three ranges which we are detecting. So, one of the Buzzer gets activated and blind person can know what is the range of obstacle by hearing buzzers of different frequencies.

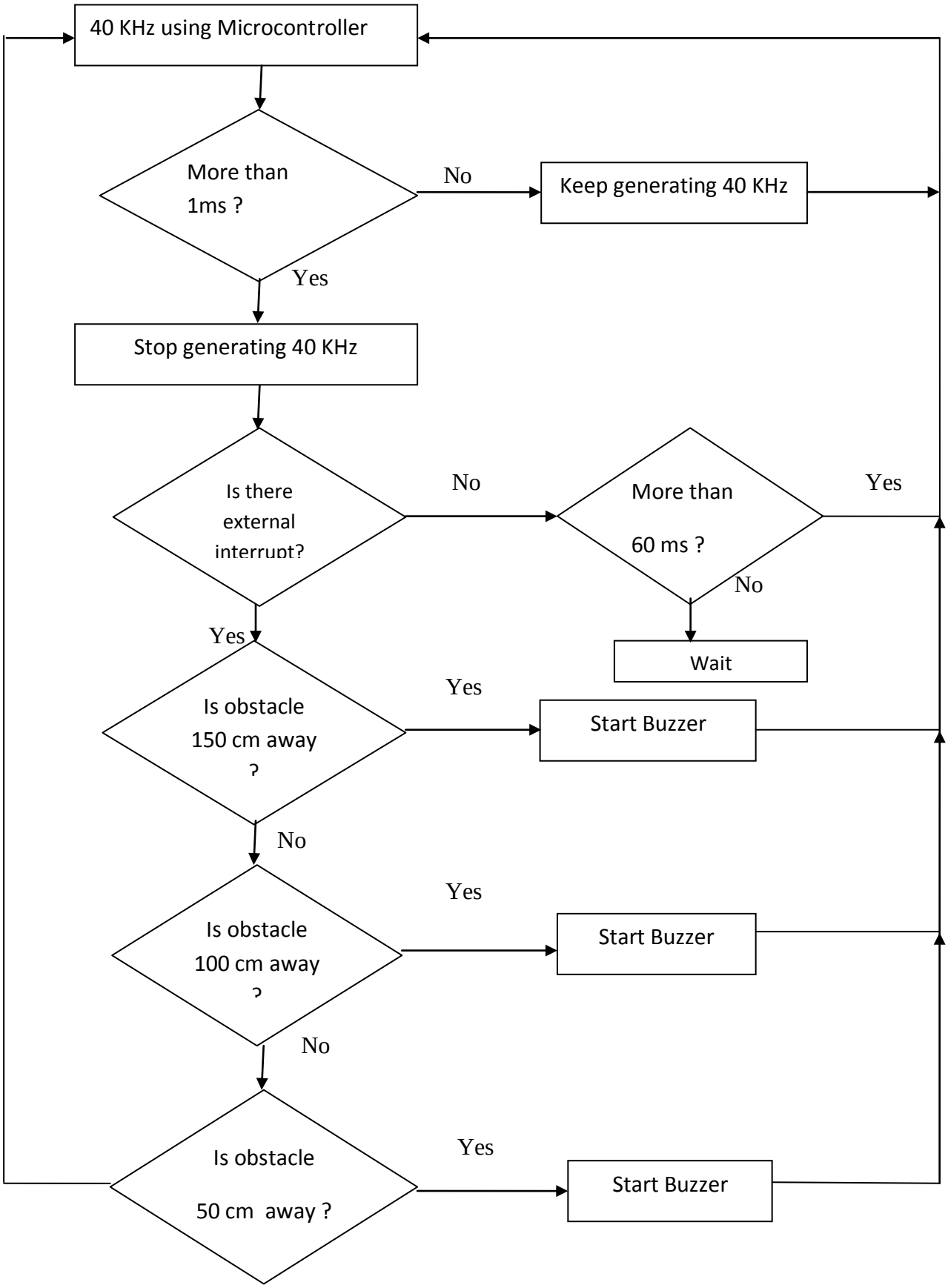
1. We have generated 40KHZ square wave using timer of microcontroller.

2. To generate the 40 KHz for 1 ms and then delay of 60 ms we are using counter whose external frequency is 125 KHz. This frequency is generated using 555 timer IC.

3. If there is any interrupt, the microcontroller will calculate the distance using the counter and decides which frequency's buzzer it has to start.

4. If there is no interrupt then, after 60 ms the microcontroller will again starts the sending the 40 KHz pulses.

Flowchart of program is given on next page

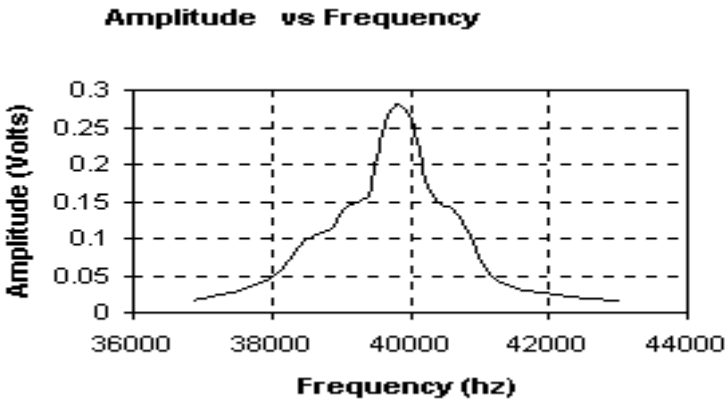

40 KHz using Microcontroller
More than 1ms ?
No
Keep generating 40 KHz
Yes
Stop generating 40 KHz
Is there external interrupt?
No
More than 60 ms ?
Yes
No
Wait
Yes
Is obstacle 150 cm away ?
Yes
Start Buzzer
No
Is obstacle 100 cm away ?
Yes
Start Buzzer
No
Is obstacle 50 cm away ?
Yes
Start Buzzer

SENSOR DESCRIPTION:

- Ultrasonic Transmitter receiver pair (Tx T40-16 846S and Rx R40-16 846S) Black pin is live pin with respect to other.

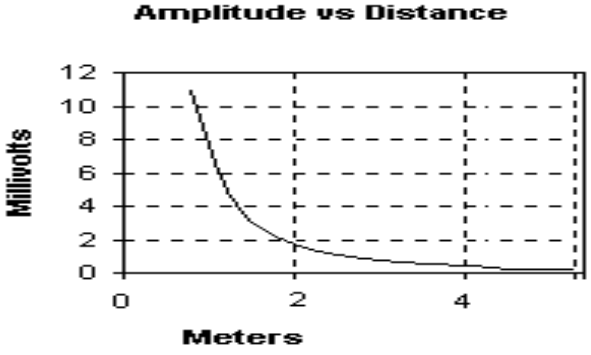
Observed Characteristics:

1.



Tx Rx Pair works well at 40 KHZ

2.



RESULTS AND CONCLUSION

Ultrasonic sensors are able to produce 10mV- 2mV output when receive sonic booms from 10cm-200cm distance respectively. In receiver unit amplification of 1000 is achieved successfully. Since Tx-Rx pair works at 40KHZ , pin P1.0 produces 1ms bursts of 40KHZ which are successfully amplified to 18V peak to peak (then fed to Tx). Tone decoder generates interrupt when encounter frequency around in between 39-41KHZ. Buzzer switching is also done by control signals from microcontroller according to distance of obstacles. Distance is measured within maximum error of 5-10cm. Also these sensors works well when obstacle is perpendicular to the propagation direction of sonic booms send by Tx.

References:

1. www.interq.or.jp/japan/se-inoue
2. www.e-arsenal.net/robotics