

# Horn Detection System for Deaf Drivers By Tensity and Directions

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**Abstract**—this paper introduces a horn detection system that can be recognizing the horn sound and its tensity. As the direction of horn sound during the driving is important try to show the direction of sound too.

This system can help deaf persons during the driving. Deaf persons are most vulnerable people in driving. Car accidents are always ambushing the deaf persons. Using the horn is very necessary in a safe driving but whereas the deaf person can not sense this alarm it can be dangerous for them.

The purpose of this system is recognizing the voice upon to the frequency of it. In continue we designed and introduced this system.

**Keywords**-Voice Recognition; Voice Detector System; Microcontroller; Deaf persons

## I. INTRODUCTION

We consider tone waves with constant frequency and work with this voice as input of system. Each voice has specific frequency such that we can use of this property to detect the voice. With the help of a microcontroller and a voice detector system we can calculate the frequency.

The base of the calculating of frequency is the counting of vibration in the unit of the time, for this purpose we use a microcontroller with counter to counter the change of input values per second.

For detecting the voice we use a sensitive voice sensor, capacity microphone. As the sounds wave in environment caused vibration in eardrum until we hearing the voice, there is an acoustic diaphragm in this microphone till vibrates when face with acoustic waves.

Now that is enough, changing these mechanical variations to such parameters that are sensible for our system, for this purpose we use an amplifier in our circuit. This amplifier changes the sound waves to sensible parameters for our circuit such that voltage, current or other values, then these values enter as input parameters for frequency meters circuit and then was sent to microcontroller.

The frequency meter has such design that is not sensitive to domain of voice just is sensitive to change of voltage level and on the other hand is zero crossing filter. The polyester capacitor is in entrance of circuit do the isolation from domain values. [1], [3].

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## II. FREQUENCY METER CIRCUIT

With counting number of reached pulse in time unit, we can calculate the sound `s frequency. We can show these values in LCD monitor. The program can measure signal frequency in range 0 -1000 kHz.

This is signification that the figure of entrances wave is not important as it is triangular or other shapes, because we change it to rectangle wave. This rectangle wave enters to micro-controller as input value.

Such as it is important for us to calculate the frequency and signal time we must use of external crystal to synchronize it.

In “Fig. 1” you can see the frequency meter circuit. System design is such that can be adjusted for wide range of frequency for this purpose we consider two operational mode for our circuit. The first mode is measuring the frequency and the second is setting mode. In the setting mode was defined three range of frequency that can be change for our application. For example the ranges can be defined as 1 to 2 KHz or 4 to 5 KHz.

This system can measure the input signal in range of 1 to 1000 KHz. All signal after passing the isolation capacitor level and zener diode and NOT gate change to rectangle pulses. This pulse easily can detect by microcontroller. As time is important for measuring we use external crystal. In this system we use AVR microcontroller.

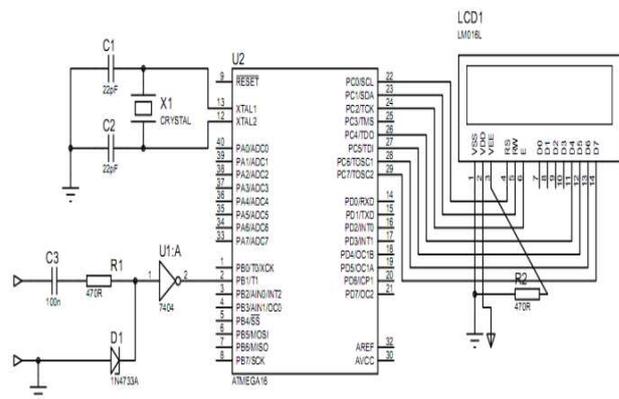


Fig.1 Frequency Meter Circuit

The procedure of this system can show in OPC diagram, Operating Process Diagram. In figure "Fig. 2" this diagram was shown. [3], [4].

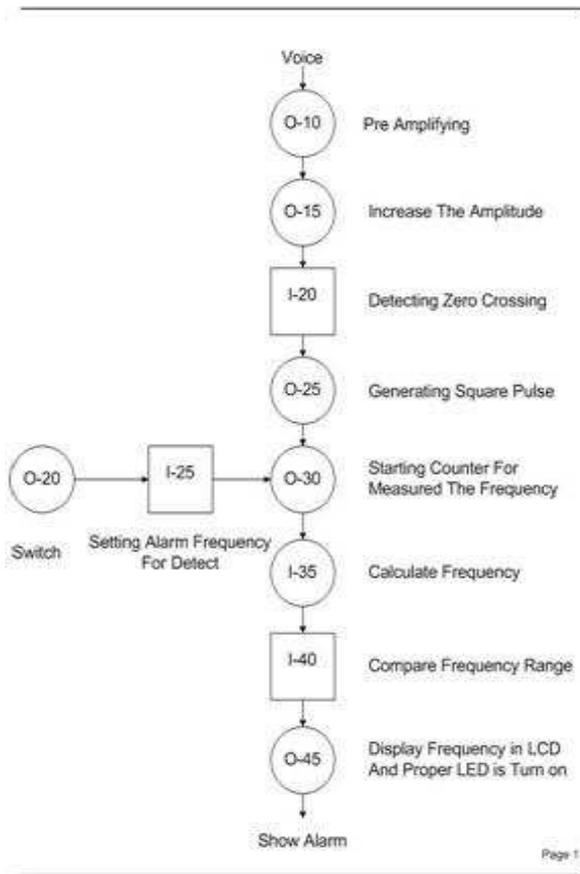


Fig. 2 OPC Diagram of System

III. SOUND CREATING CIRCUITY

Sound is a mechanical wave that is an oscillation of pressure transmitted through a solid, liquid, or gas, composed of frequencies within the range of hearing and of a level sufficiently strong to be heard, or the sensation stimulated in organs of hearing by such vibrations.

Part of wasted energy in vibration is change to sound. We can name of frequency, wavelength as important properties of sounds. Frequency is the number of occurrences of a repeating event per unit time.

For creating tone waves we can use many devices. For better testing we design a sound creating circuit and we use AVR microcontroller. For creating sounds with microcontroller we using of internal timer and one base of micro.

By changing this base alternately to one and zero and programming for it we can create Sound frequency and change it to sound waves by microcontroller. In the "Fig. 3" the sound creating circuit was shown.

In this system we use C language for programming AVR microcontroller. [5], [6], [2].

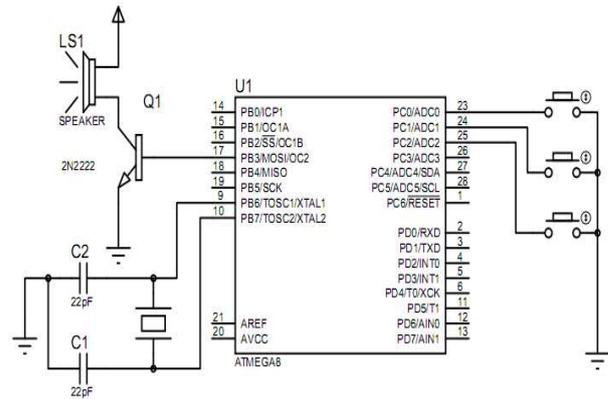


Fig. 3 Sound Creating Circuit

IV. HORN OF CAR DETECTOR

It is difficult to detachment horn sound from other sounds. For this purpose we use a sound sensor, microphone, for perception the sound. This input voice is being filtered for the horn voice frequency range. By this procedure we can recognize horn sound.

As we want to equipped deaf `s car by this device it is necessary for us to compatible device voltage with car voltage (12 V). This device can mount on a car near the dashboard. In "Fig. 4" we show a template design of this device. In this device three LED light for showing the frequency range, low, mid and high were embedded.

When the horn was sensed the green light will be turn on and displaying name the amount of frequency in LCD monitor. It is possible that detect police whistles same as horn and displaying visual alarm instead of it. [4]

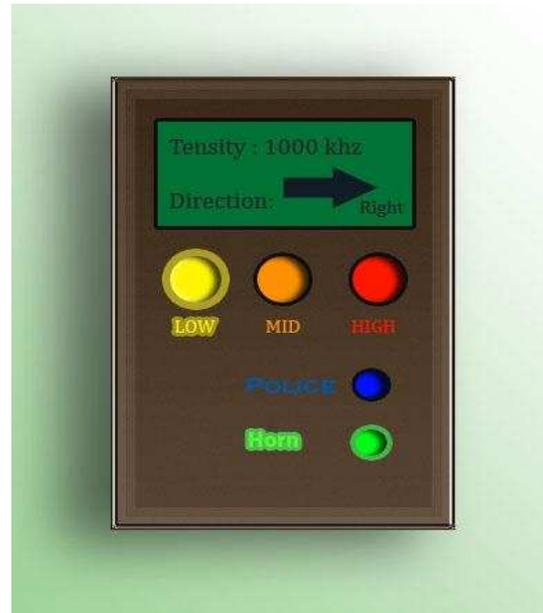


Figure 4- Template design of Horn car detector

## V. RESULTS

In order to construct this device we face with some problems such as noise. Noise is a term often used to refer to an unwanted sound. In science and engineering, noise is an undesirable component that obscures a wanted signal. For optimizing this device we must omit the noise that there are some algorithms for it but in this device we didn't work on them.

The sound sensor must inserted on the body of car and at least need 3 sound sensor in behind and two sides of car for better perception.

## CONCLUSION

A voice detector system is an instrument for detecting sound `s wave and change it to other format. In this paper we introduced a voice detector system and testing it with input

voice. We use this system for deaf `s cars and improving their driving by showing visual alarm instead of hearing it. We can easily compatible this system with car voltage and adding other parameters like GPS and RFID tags and other utility like it.

## REFERENCES

- [1] Winder, Steve, "Analog and Digital Filter Design", USA: Newnes, 2002.
- [2] Gadre, V. Dhananjay, "Programming and Customizing the AVR Microcontroller", USA: McGraw-Hill, 2001.
- [3] Barrett, F. Steven, Pack, J. Daniel "Atmel AVR Microcontroller Primer: Programming and Interfacing", USA: Morgan & Claypool, 2008.
- [4] Oppenheim, V.Alan, "Signals and Systems", USA: Prentice-Hall, 1983.
- [5] M. Young, M. Valley "Atmel AVR ATmega16 Datasheet, The Technical Writer's Handbook", CA: University Science, 1989.
- [6] Atmel AT45DB161D Data Flash Datasheet