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Energy Conservation using Voice Recognition

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Abstract
Conserving Energy is one of the most important issues in all Arab countries and the rest the world. Roads are designed to connect cities, and these roads are constructed and lightened to make the driving more safely and more easily. To reduce the energy consumption, there must be a systematic way to turn the street lights ON or OFF based on the traffic condition. The idea of the work is to design a system that has the capability to turn the lights ON only when cars passing through for some period of time. Our system is designed for the highways streets for example the road that connect any two large cities. We implemented the proposed system using Matlab, and the results show the strength of the proposed system.
Keywords: recognition, energy, voice, lights, highways

Introduction

Voice recognition is defined as the process of taking a spoken word as an input and analyze it and to make a decision. This process is important to virtual reality because it provides a fairly natural and intuitive way of controlling the simulation while allowing the user's hands to remain free **(3)**. We implement a voice recognition technique in the area of energy consumption; by examine how car sounds can be recognized in order to switch the street lights ON, which consequently we can reduce the energy consumed by street lights.

Definition 1[1]: *Voice recognition is "the technology by which sounds, words or phrases spoken by humans are converted into electrical signals, and these signals are transformed into coding patterns to which meaning has been assigned"*.

While the concept could more generally be called "voice recognition", we focus here on the car sounds, and thus we call it a *car sound recognition*.

Definition 2: *A car sound recognition is the process of converting car sounds into signals in order to switch the street lights ON sequentially, and switch them OFF when there is no car.*

In this context, the main entities here are: (i) street lights and (ii) car sounds. The difficulty in using car sounds as an input to a computer simulation lies in the fundamental differences between the forms of human speech and the forms of car sounds. While computer programs are commonly designed to produce a precise and well-defined response upon receiving the proper (and equally precise) input, the car sounds are imprecise, which make the wok harder compared with human voice **(6-7)**. On the other hand, each car sound is different, and thus we expect different signals, which we need to implement a powerful approach that has the ability to recognize cars sounds with high variability.

The aim of this paper is to design a suitable voice recognition system that has the ability to detect the voice of each type of the cars and have the ability to control the electrical power of the road. In this paper, we try also to save the power in the street by control the lamp using our voice recognition system. The structure of this paper is given as follows.

Voice Recognition System

In this section, we present the proposed system. The main components of the proposed system are: (i) Mic as a detector, (ii) Amplifier circuit, (iii) Multiplexer, (iv) Attenuation circuit, (v) PC, and (v) Relay. The block diagram of sound recognition system is shown in figure (3-1),

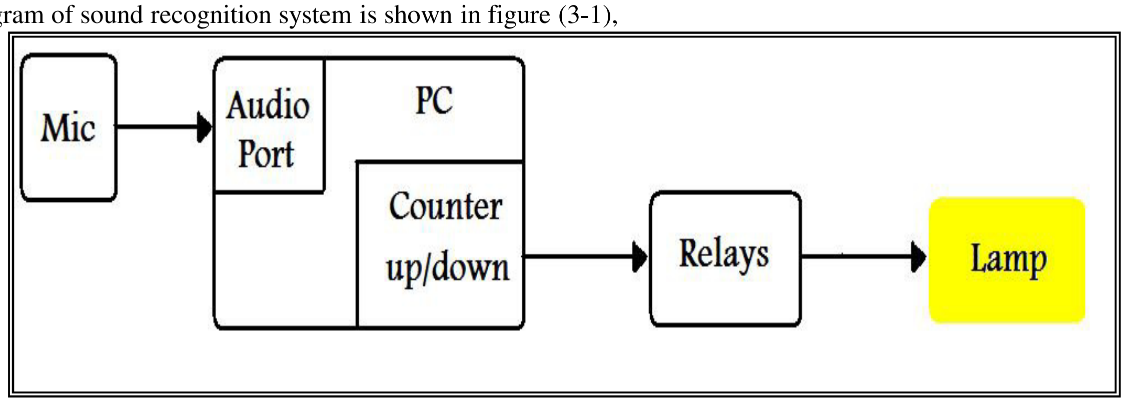

Figure (3-1): block diagram of car sounds recognition system

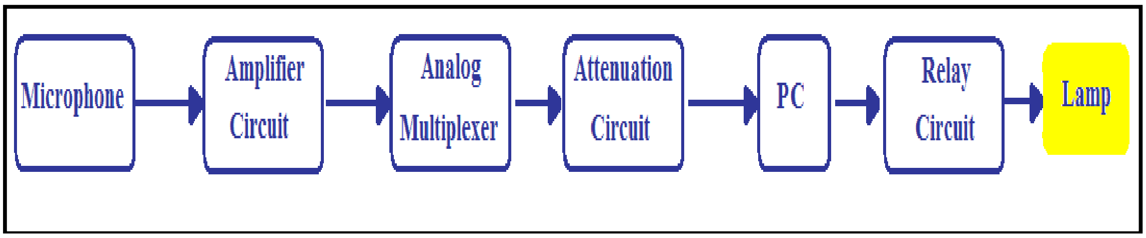

Figure (3-2): General block diagram of our system

First, the sound capture device is the Mic detector, and the amplifier raises the power level of the incoming weak signal so that it can be acceptable by the other units of the proposed system.

Experimentation and results

In this section, we present the experimentation and results. We built the hardware given in the previous section and interfaced it with the PC through the parallel port. The steps run by the proposed system and a MATLAB code are given below:

- The algorithm recognizes car sound and analyzes it.
- The counter starts count up.
- The lamp is turned on if the recorded sound is a car sound.
- If the car leave the section of the high way, the counter will count down till last car, then the lamp will be turn off.

Figures below show the training samples that are used as templates for comparison purposes, where the 8th curves represent the signals of different sound cars that will be used by our system. First, the system captures car sounds, Recorded signals have been read with MatLab **(1)** as a real array with Wavread Command. The software calculates the following statistical characteristics of these signals: (i) Mean of the sound frequencies and (ii) The standard deviation and modes of these arrays in the time domain **(8-9).** We divided the FFT of the input signal for the recorded car sound into a number of bins (i.e. N bins), and the statistical characteristics are calculated and compared locally with characteristics of the template signals in the database. We used a simple similarity to map the over all values of the statistical characteristics into the interval zero – one, where the value zero represents no similarity between the two signals and the value one represents the high similarity between the two signals.

Result Charts

The following figures shows the time domain representations for the training wave files

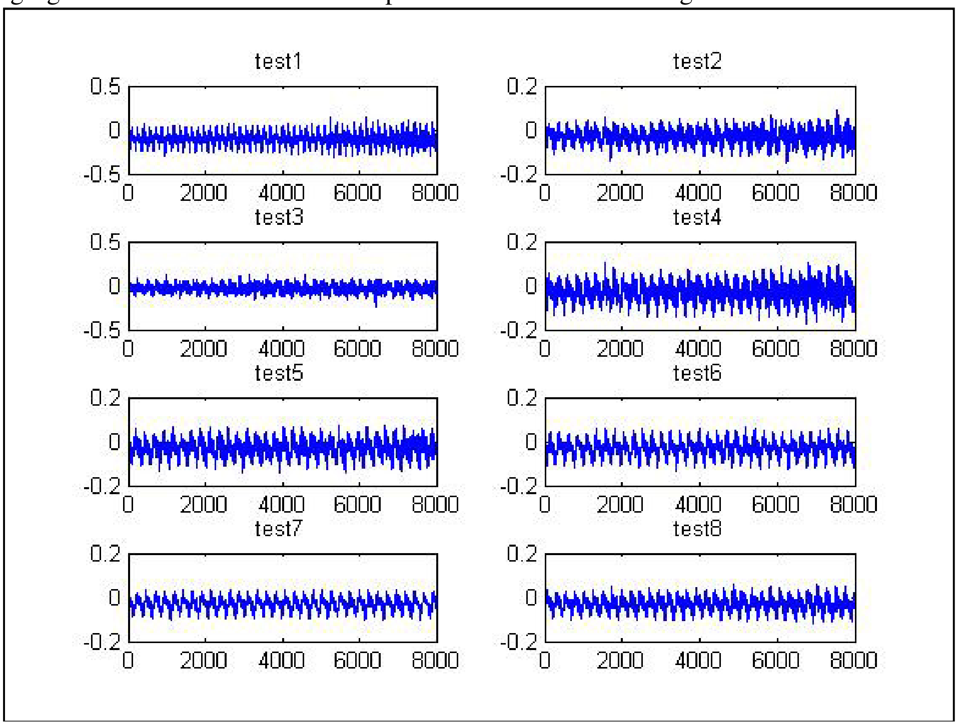

Figure (4-1): training samples from 1 to 8

In this study, it has been aimed to find some useful information using for voice recognition of the car sound. And as it has been seen both in tables and figures there are a lot of useful information to use. Especially statistics can be used for recognition parts parameters **(10).** And as it has been in the figures some letters are very similar. The correlation coefficient is quite meaningful for these letters. So the process for these letters' recognition will be much harder.
Figures (4.2), (4.3) represent the sample number 1 and its Fourier transformation.

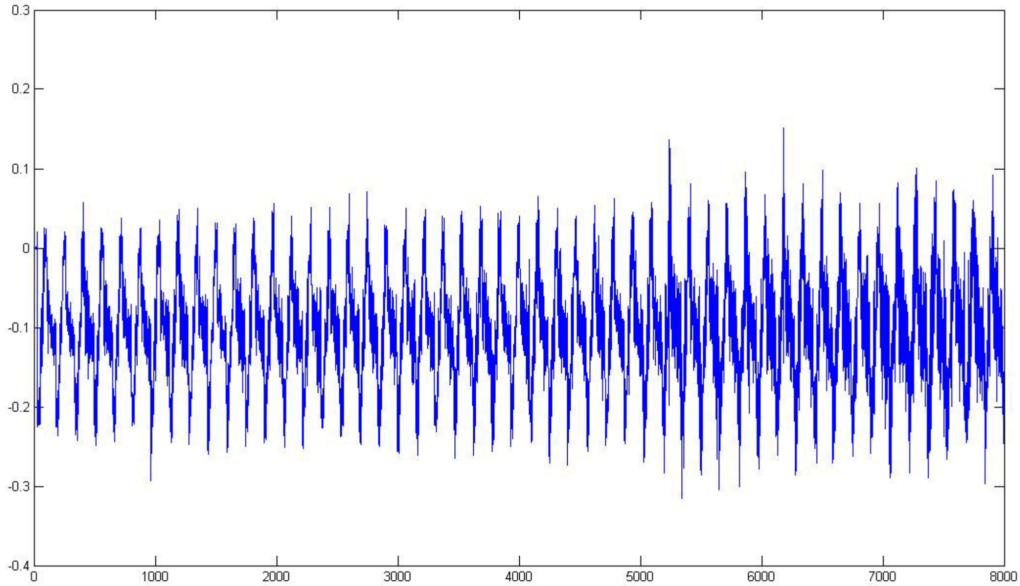

Figure (4-3) sample number 1

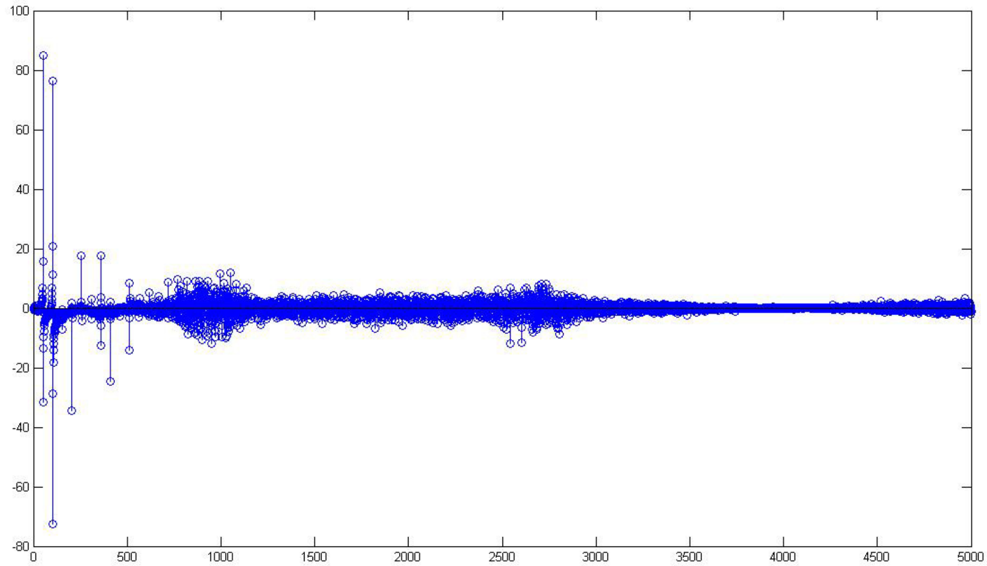

Figure (4-4) Fourier transformation for sample 1

Conclusions
At the beginning of our work, we set a goal to recognize car sound, at the end the sound car recognized. We both worked very hard as a team on this work to accomplish our goals.
In short there was no task that was done by one individual. From our practical results we can successfully design an Implementation of voice recognition system which has the ability to recognize the car sound from other sounds. The system will be used to reduce power that used to light the high way.

In our work the results which are discussed shows that it is possible to distinguish car voice from other sounds, however, limitations to the current state of the work. Firstly, it isn't real time. We need to record a wave file, and run program for results. This is quite trivial however. But secondly comes the issue of the constants in my code. At the current time, we do not have the resources to collect a larger data-set to see how these would perform.
Also, it is unclear that the constants that we have choose and used are the best. More research is necessary to uncover answers to both of these questions. Looking at the work as a whole, however, we would deem it a success.

References

[1] Jim Baumann, "Voice Recognition using MATLAB"
[2] Leonard, Milt. 1993. "Speech-Recognition algorithm cuts memory, boosts accuracy". Electronic Design: October 14:pp 37-38.
[3] Steven Abney "Statistical Methods and Linguistics" University of Tubingen, 1995.
[4] Blahut, R. E. *Fast Algorithms for Digital Signal Processing*. New York: Addison-Wesley, 1984.
[5] Mathew M. D., "using auxiliary sources of knowledge for automatic speech recognition"**,** 2005
[6] http://www.maxim-ic.com/appnotes.cfm/an_pk/1108 Retrieved November 10, 2007
[7] www.datasheetcatalog.com
[8] Rowe, Standord H. II, *Network Technology & Service Integration* (5th Edition), 2002, Prentice-Hall, Inc., 2002
[9] H. Hermansky and N. Morgan, "RASTA processing of speech", IEEE Trans. on Speech and Audio Proc., vol. 2, no. 4, pp. 578-589, Oct. 1994.
[10] Vladimir Gurevich "Electrical Relays: Principles and Applications", CRC Press (Taylor & Francis group), London - New York, 2005, 704 pp.