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TO DETECT THE VARIOUS TYPES OF DISEASE USING THE NON HUMAN SPEECH SOUND PROCESSING

FEATURE EXTRACTION AND NON HUMAN SPEECH SOUNDS ANALYSIS

R.Gideon Joseph Raj
Department of ECE,
Sri Ramakrishna Institute of Technology
Coimbatore.

A.Aravind
Department of ECE,
Sri Ramakrishna Institute of Technology
Coimbatore.

K.Chandru
Department of ECE, Sri Ramakrishna Institute of Technology Coimbatore.

A.Dinesh
Department of ECE, Sri Ramakrishna Institute of Technology Coimbatore.

***Abstract*—In the previous experiments on the human sound and non-human sounds processing has resulted on the detection of the type of sounds and the origin of the sounds and related to the detection of the emotions of the human subjects. In this paper we have improvised and enhanced the process by extracting the feature of the subject's sound signals from the non-human speech sounds and analyzing these sounds with the neural network and to detect the type of disease the subject is undergoing.**

Keywords*—human non-speech sounds, acoustic feature extraction,dataset classification.

I. INTRODUCTION

In these days the number of population in the world is increased at the rate of 1.09% per year down from 1.12% in 2017 and 1.14% in 2016. The Number of Disease in this world also increases at a rapid rate which is equal to the rate of growth in population. This rapid increasing rate of disease also lead to the death of millions of people every year. Among this few commonly known diseases affects the people even without their knowledge which would turn into life killing disease in future. Children at the age group of 12-16 are more vulnerable to these kinds of disease and are affected very easily. This could affect their routine life in long term if not being treated properly.

To find the kind of disease, the subject must be identified with the kind of infection or the disease the subject is affected. Previous experiments on humans were made for other basic purpose alone. The existing systems has been experimented for testing the emotions of the subject, type of sound and their origin, Environmental sound classifying and the detection of sleep destruction. There are no previous experiments that is used to identify the disease. This is the Reason for our project to detect the type of disease and to make the subject aware about the problems which could be lead because of the type of infection.

For this project the human non-speech sounds of the affected people such as asthma, wheezing, OSA snore, common sold flu etc. are processed with the help of MATLAB and then these signals are trained with the neural network. This project system could also find the normal infections like dusty cough, sneezing, normal snore etc. Whenever an Input signal is given to the system, these signals are being processed and the features are extracted. These features are then sent to the Probabilistic Neural network for classification and the type of disease is classified and detected.

In the existing model two techniques are used A discrete cosine transform (DCT) expresses a finite sequence of data points in terms of a sum of cosine functions oscillating at different frequencies. DCTs are important to numerous applications in science and engineering, from lossy compression of audio e.g. MP3 and image e.g. JPEG. Image Compression Using the Discrete Cosine Transform Andrew B. Watson NASA Ames Research Center.

The discrete cosine transform (DCT) is a technique for converting a signal into elementary frequency components. It is widely used in image compression. Here we develop some simple functions to compute the DCT. Like any Fourier-related transform, discrete cosine transforms (DCTs) express a function or a signal interms of sum of sinusoids with different frequencies and amplitudes. Like the discrete Fourier transform(DFT), a DCT operates on a function at a finite number of discrete data points. The obvious distinction between a DCT and a DFT is that the former uses only cosine functions, while the latter uses both cosines and sines (in the form of complex exponentials).

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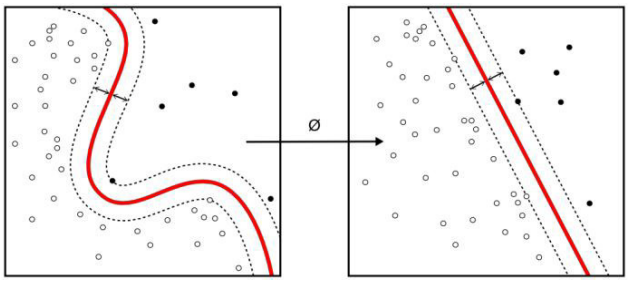
However, this visible difference is merely a consequence of a deeper distinction: a DCT implies different boundary conditions from the DFT or other related transforms. In particular, a DCT is a Fourier-related transform similar to the discrete Fourier transform (DFT), but using only real numbers. The DCTs are generally related to Fourier Series coefficients of a periodically and symmetrically extended sequence whereas DFTs are related to Fourier Series coefficients of a periodically extended sequence.

II. EXISTING MODEL METHODS

A. *support vector machine*

In machine learning, support vector machines (SVMs, also support vector networks) are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. Given a set of training examples, each marked as belonging to one or the other of two categories, an SVM training algorithm builds a model that assigns new examples to one category or the other, making it a non-probabilistic binary linear classifier. An SVM model is a representation of the examples as points in space, mapped so that the examples of the separate categories are divided by a clear gap that is as wide as possible. New examples are then mapped into that same space and predicted to belong to a category based on which side of the gap they fall. Often happens that the sets to discriminate are not linearly separable in that space. For this reason, it was proposed that the original finite dimensional space be mapped into a much higher dimensional space, presumably making the separation easier in that space. To keep the computational load reasonable, the mappings used by SVM schemes are designed to ensure that dot products may be computed easily in terms of the variables in the original space, by defining them in terms of a kernel function



III. PROPOSED SYSTEM

The Drawbacks if the existing model is being rectified with help of the Probabilistic Neural network and Haar wavelet transformation.

A. *Haar Wavelet Teansformation*

Haar wavelet transform implementation is theoretical invertible. However, due to the finite register length of the computer system, inversion errors could happen and it would result in unsuccessful image reconstruction. In practical cases, the wavelet elements will be rounded to the nearest integer in the discrete transformation stage. This makes the lossless compression impossible.

A developed algorithm called Haar wavelet transform which is based on the wavelet theory is developed and it needs significantly fewer arithmetic and memory compared to the convolution based discrete wavelet transform. The Haar - based DWT conspire separates the high-pass and low-pass wavelet filters into a sequence of many filters. These decomposed filters are then converted into a sequence of upper and lower triangular filters.

This technique is used to separate the component present in the spatial image. The signals are decomposed into different subband images, namely, Low Low, Low High, High-low, and High High with LWF for embedding the messages in the pixel coefficients of subbands.

Haar scheme is a technique to convert DWT coefficients to Integer coefficients without losing information. LL subbands contains the significant part of the spatial domain image. The edge information of input signal is contained in the High-frequency subband. These coefficients are selected as reserved space foe hiding the text data.

Forward in DWT

Step1: Column wise processing to get H and L

H = (Co-Ce) and L = (Ce+ [*H/2]*)

Where Co and Ce is the odd column and even column wise pixel values

Step 2: Row wise processing to get LL,LH,HL and HH,

Separate odd and even rows of H and L,

Namely, Hodd – odd row of H, Lodd- odd row of L

Heven- even row of H, Leven- even row of L

LH = Lodd-Leven ,LL = Leven + [*LH / 2]*

HH = Hodd – Heven ,HL = Heven + [*HH / 2]*

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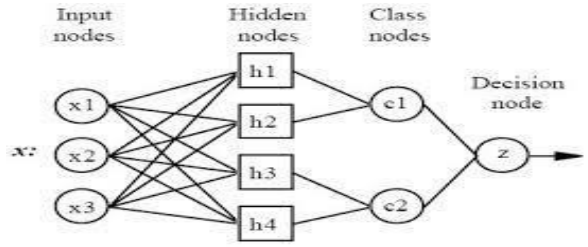
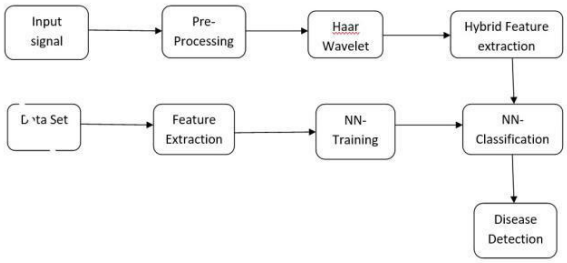
B. Probabilistic Neural Network

A probabilistic neural network (PNN) is a forward feed neural network which is widely used in classification and pattern recognition problems. In the PNN algorithm, the parent probability distribution function of each class is approximated by a Parzen window and a non-parametric function. Then, using PDF of each class, the probability of a new input data is estimated. In a PNN, the operations are organized into a multilayered feed forward network with four layers such as Input layer, hidden layer, pattern or summation layer and Output layer.



C. Block Diagram



D. Types of Diseases classified

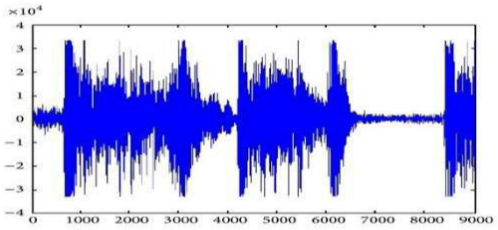
Asthma:

Asthma is a common long term inflammatory disease of the airways of the lungs. It is characterized by variable and recurring symptoms, reversible airflow obstruction, and bronchospasm. Symptoms include episodes of wheezing, coughing, chest tightness, and shortness of breath. These episodes may occur a few times a day or a few times per week. Depending on the person, they may become worse at night or with exercise.

Symptoms:

Asthma is characterized by recurrent episodes of wheezing, shortness of breath, chest tightness, and coughing.

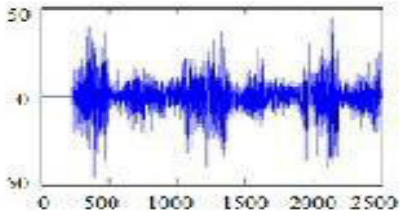
Asthma signal:



Wheezing:

A wheeze is a continuous, coarse, whistling sound produced in the respiratory airways during breathing For wheezes to occur, some part of the respiratory tree must be narrowed or obstructed, or airflow velocity within the respiratory tree must be heightened. Wheezing is commonly experienced by persons with a lung disease; the most common cause of recurrent wheezing is asthma attacks, though it can also be a symptom of lung cancer, congestive heart failure, and certain types of heart diseases.

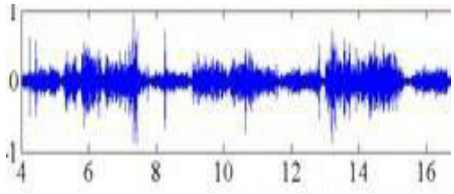
Wheezing signal:



cold cough:

The common cold and the flu may seem very similar at first. They are indeed both respiratory illnesses and can cause similar symptoms. However, different viruses cause these two conditions, and your symptoms will gradually help you differentiate between the two

Cold Cough signal:



Obstructive sleep apnea:

Obstructive sleep apnea is the most common type of sleep apnea. It occurs when the soft tissue in the back of the throat relaxes during sleep and blocks the airway, often causing you to snore loudly. Snoring may be a sign of a more serious condition known as obstructive sleep apnea (OSA). OSA is characterized by multiple episodes of breathing pauses greater than 10 seconds at a time, due to upper airway narrowing or

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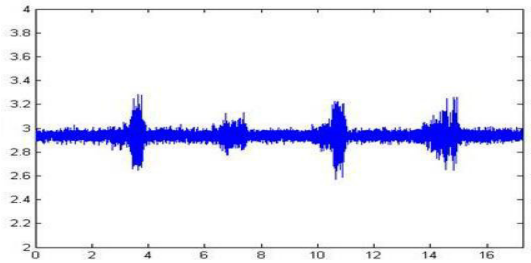
collapse. This results in lower amounts of oxygen in the blood, which causes the heart to work harder. It also causes disruption of the natural sleep cycle, which makes people feel poorly rested despite adequate time in bed.

Obstructive sleep apnea symptoms:

Loud or frequent snoring, Silent pauses in breathing. Choking or gasping sounds, Daytime sleepiness or fatigue,Unrefreshing sleep, Insomnia.

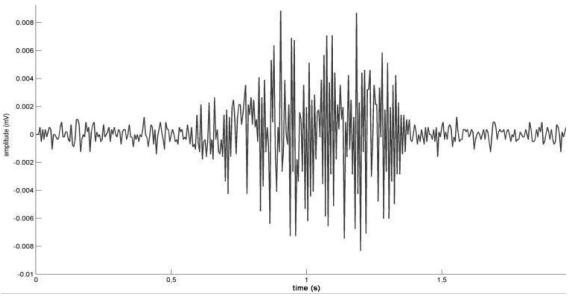
OSA snore signal:



Sneezing:

A sneeze, is an expulsion of air from the lungs through the nose and mouth, usually caused by particles irritating or itching the nasal muscles. A sneeze expels air heavily from the mouth and nose in an explosive action resulting chiefly from irritation of the nasal muscles. Sneezing is possibly linked to sudden exposure to bright light, sudden change (fall) in temperature, breeze of cold air, a particularly full stomach, or viral infection, and can lead to the spread of disease.

Sneezing Signal:



IV. SIGNAL ANALYSIS AND SIGNAL CLASSIFICATION

The above techniques and methods are future put forth into action for the above-mentioned signals. Each input signal [figure (1)] is initially sent into the pre-processing block where the pre-processing is done with the help of the median filters [figure(2)]. The output from the median filters are sent into the wavelet transformer where each signal are made into wavelet transforms and divided into lowpass filter signals [figure (3)] and high pass filter signals [figure (4)] as shown in figure3 & 4. Then the Features [figure(5)] from these signals are extracted and are fed into the NN classifiers.

On the other side the dataset containing the Disease signals feature extracted and then are fed into the NN network where the signals are trained to the Neural Network. At the classifier end, the given input signals and the dataset signals are classified in the Neural Network classifier and the final output is given out by detecting the type of disease.

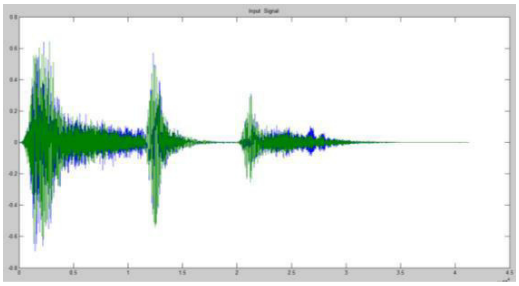


Figure 1: Input signal

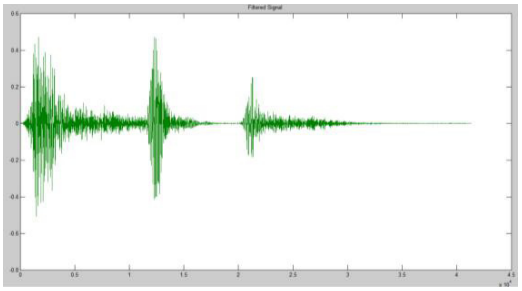


Figure 2:Pre-Processed signals

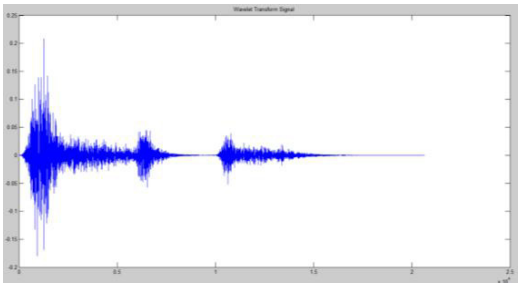


Figure 3: WT Low pass filter signal

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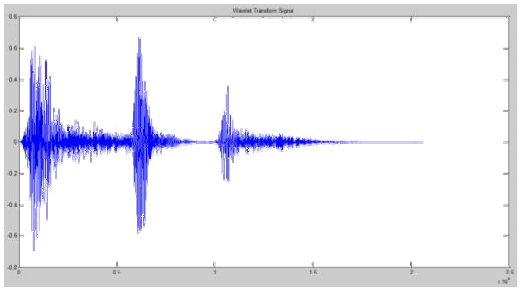

Figure 4: WT High pass filter signal

Figure 5: Feature extracted values

Figure 6:Output from the classifier with disease detection

Conclusion

In this paper we focus on the study of non-speech human sounds for classification and detection of type of disease that the subject is affected. Additionally, our simulation indicates that the signals that is being processed is noise insensitive even when the signals are acquired under the noisy environment.

We have also continued to work on the classifications of further diseases based upon the symptoms and type of signals exhibited. The features extracted from each signal differ depending upon the subjects level of infection by the disease. We have also concept of neural networks that can help us extend the concept to machine learning that will change itself with respect to the time and the change in the features. In our future works we would also investigate with the features of rare diseases.

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