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Survey Paper on Computerized Cough Analysis by Using Wavelet for Pneumonia Diagnosis

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Abstract- Abstract-Respiratory diseases, such as pneumonia, bronchitis leading causes of child death in the word .out of this pneumonia are cause the million children death each year around the word. One of the challenged faced in consistent diagnosis of childhood pneumonia in remote regions is difficulties arising from field deployable and laboratory facilities as well as trained healthcare worker. In this paper we address such issue and to identify the pneumonia based on the mathematical analysis of cough sound. We used the wavelet-based mathematical tool which is a useful for crackle detection work in lung sound analysis. Such feature can be added with other mathematical feature and develop the automated classifier to separate pneumonia with other respiratory diseases. Cough and crackle sound is sign of pneumonia. Cough sounds allow us to diagnose pneumonia with adequate sensitivity and specificity.

I. INTRODUCTION

Cough is a justification system to the body which clears the respiratory tract from outside materials which are inhale accidentally and create internally by infections. It is a common symptom appearing in respiratory diseases such as pneumonia, the foremost of death is occouring in children which is less than five years of age. It has been estimate that pneumonia shall causes over 1.5 million deaths in each year, with more Than 96% of cases occurring in the well developing countries.

Main reason behind them is the facility which is available having low cost instrument, field-deployable and diagnostic technology is most challenges key in struggle pneumonia Mortality. Currently does not have special method or standard

is an available for pneumonia diagnosis even in hospitals. [1], The process which is available is not simple, but rather a grouping of clinical, radiological, and laboratory diagnostics that is often difficult to get to much of the population affected

by the disease. Address such issue then developing an automated cough sound analysis method to diagnose pneumonia. This Will possible to develop the system which has inexpensive, noncontact, way of testing pneumonia cases without the help for widespread training in the field. aim to build a higher [1].specificity and maintain sensitivity at >90%.That study is a combination of several geometrical features, few of which are widely used in speech signal processing, such as [4],formant frequencies (FF) and Mel Frequency Cepstral Coefficients (MFCC). Work shown in this paper we intend the different class of features inspired by the adventitious lung sounds known as crackles, which is normally found in pneumonia and regularly observed more in the chest musculature using stethoscopes. We recorded cough sound signal with sound proof room in free-air outside the mouth and analyzed the (wavelet decomposition), targeting crackle-like components. We then combined the two feature sets and developed pattern recognition technology to diagnose childhood pneumonia.

[5].Wavelets transform can provide a best way of resolve the nonstationary signals such as the crackle sound in both time and frequency domains. Wavelet having the capability to attention on restricted signal structures with a zooming procedure is efficient in detect singularities between signals, and a powerful multiresolution analysis tool to detain changes in frequency characteristics at any instant in time. The diagnosis of childhood pneumonia using cough sound analysis is a like new research area. Our aim to explain the wavelets can be very effective in decomposing cough sounds and developing features definite to pneumonia.

II. OBJECTIVES

The Objective of this project listed below

A. Extract the feature of cough sound using the wavelet for diagnosis of pneumonia
B. To archive more accuracy of system
C. To make system more flexible and robust

III. LITERATURE SURVEY

A. [1]The paper by U. R. Abeyratne

in this research paper explains the cough sound analysis can be used to diagnose the child hood pneumonia. In this method the

computerized study of cough signal and respiratory sound can be collected using microphone that does not require any direct contact with subject. Then segmentation had done using the manually from this find out mathematical feature, Such as non gaussianity and mel cepstra from cough sound. In this method differtiation of pneumonia and non pneumonia sound can done using logistic regression classifier

B. [6]The paper by F. Ayari

works going on in this paper show that lung sounds analysis can done using wavelet transform The objective of this paper for lung sounds analysis can be done using adaptive filtering and wavelets show with one desertion moment can successfully detect .the pathological changes of the lung which produce sounds with measurable regularities. Local regularity can allows us to detect some important components of adventitious sounds which are difficult to detect by the physician ears due to their short duration. to analyze lung sound it can uses the mathematical tool lipschitz continuity function which can detect the maxima position and minima position regular lung sound waveform pattern. Numerical results show that normal lung sound is not regular than as compare to the crackle lung sound

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C. [13]The paper by M. Du

work going on this paper explain that Crackle sound classification and detection will based on matched wavelet analysis This is new method for crackle detection which is depends upon the 'matched' wavelet transform. Based on the Crackles sound can be detected using the envelope of the signal at optimal scale, and it can be classified based on energy distribution with scale.

D. [4]The paper by vinayak swarnkar

"In this paper Automatic segmentation of pneumonia cough and non-contact sound recordings done in pediatric wards'' In this paper developed a method which can differentiate non pneumonia and pneumonia cough segments automatically during the pediatric sound recordings. Method is based on extracting statistical features such as non-Gaussianity, Shannon entropy, and mel frequency cepstral coefficients to describe cough characteristics. These features then used to train a time delay artificial neural network classifier to detect coughs segment in the sound recordings. From this proposed method achieve the sensitivity, specificity of 93%, 98%, respectively.

E. [5]*The paper by Yosuf Amrulloh, Rina Triasih*

in this research paper show that Pneumonia and asthma can be differtiate in pediatric Population based on cough sound analysis.This paper explains that Pneumonia and asthma are the common diseases in pediatric population. The diseases showing few similarities of symptoms that Cough is the major symptom of pneumonia and asthma. The audio of cough sounds may carry vital information which correlated with the diseases. This technique obtains the sound features such as Shannon entropy, mel frequency cepestral coefficient, bispectrum score and kurtosis. This features then used to develop artificial neural network classifiers. [4].Using this classifier achieved specificity, Kappa and sensitivity of 100%, 0.89 and 89% respectively. The physical examination findings show that more than 50% of asthma subjects had respiratory rate higher than threshold and 30% of them had sub-costal retraction. Study in suggested adding fever to improve the specificity of pneumonia diagnosis. However, 44.4% of asthma subjects had fever. The physical examinations also show that crackles sounds is not specific to pneumonia.

IV. BACKGROUND

A. Continuous Wavelet Transform

The continuous wavelet transform uses signal and an analyzing function .it is different approach for simultaneous find out time and frequency signal. Wavelet has the advantage

That it allows superior perceptible localization of frequency component to analyzed signal than commonly used short time Fourier transforms (STFT). Wavelet analysis allows to use long time windows function when we need the more specific low frequency signal. It can produce the exact representation for nonstationary signals with discontinuities like cough and crackle sounds. [4].The continues wavelet transform is given by

$$CWTxi\ (a, b) = xi, \psi\ a,b = \int xi\psi a,bdt$$

where *a* is the dilation parameter and *b* is the translation. The

Dilation parameter is alike to the scale, which determines the timescale resolution of the resulting CWT operation. By analyzing *xi*

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over a different range of scales, CWT offers multiresolution frequency filtering capability to target specific frequency bands. This change to dissimilar crackle types (coarse and fine) based on two cycle duration (2CD) of the detected crackles. Fig. 2 shows a time-domain example of an infant expiratory crackle in comparison with various wavelets such as [1]. Du,morlet , Mexican Hat,Daubechies and Paul. It can be observed that crackle waveform has some similarity to the basic shape of the various wavelets.

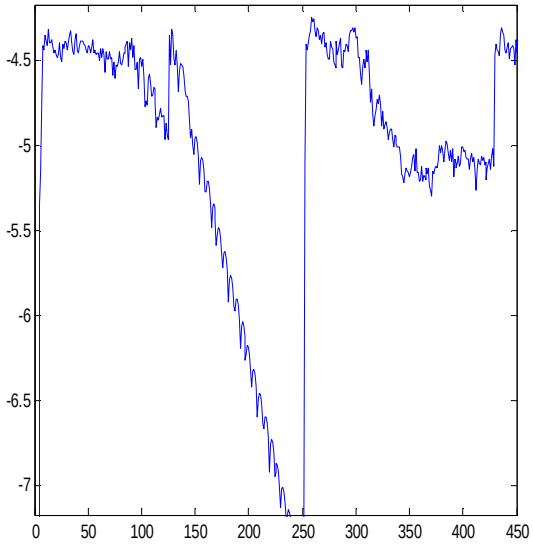

Figure 1: MFCC Plot of pneumonia signal

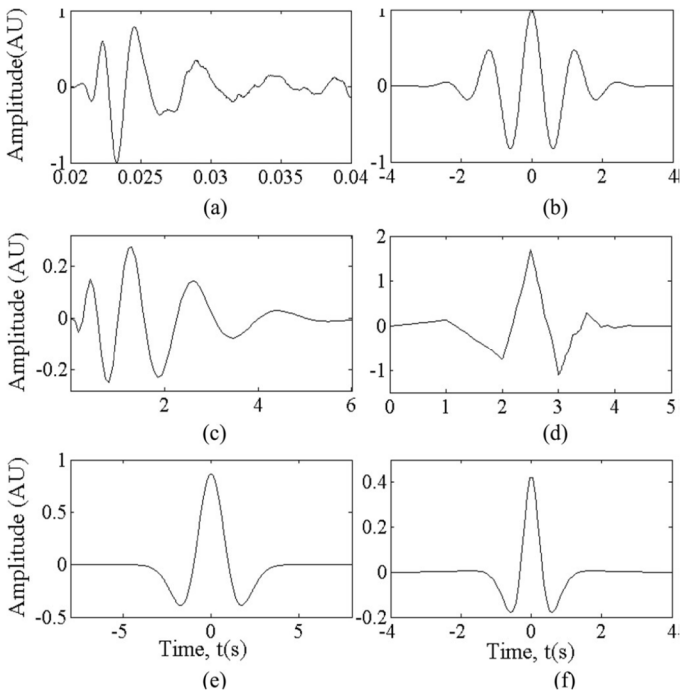

Figure 2: Side-by-side comparison of (a) example infant expiratory crackle. With various wavelets: (b) Morlet, (c) Du, (d) Daubechies3, (e) Mexican hat, (f) Paul

Wavelet feature of cough sound can be extracted is given by
The process will applied for slant wavelet transform following computation is used to calculation of CWT.[1]
Computation of CWT

1) Let *x* denote an RMS normalized cough sample.
2) Apply CWT on scales. Let *ci* represent wavelet representation of *x* on the *i*th scale, where *i* = 1, 2, 3, . . . , etc.
3) Segment each ci to equal non overlapping sub segments and calculate the energy concentration by sum of absolute Values in each segment, cij , where *j* = 1,2,3, . . . ,etc Each cough sample, *c*i
4) For each ci , calculate the slopes for each *cij* along the time Axis. For the first segment, it is the ratio of *cij* : *ci*(*j*+1) . For
5) Repeat for each ci for all cough samples

V. CONCLUSION

From this review paper survey we have studied that By investigating wavelet features of cough sounds to improve the classification of performance. along with Wavelet features can capture many other transient properties of a cough in addition to the existence of crackle sound. the method we propose will be useful in diagnosing pneumonia in remote regions of the world

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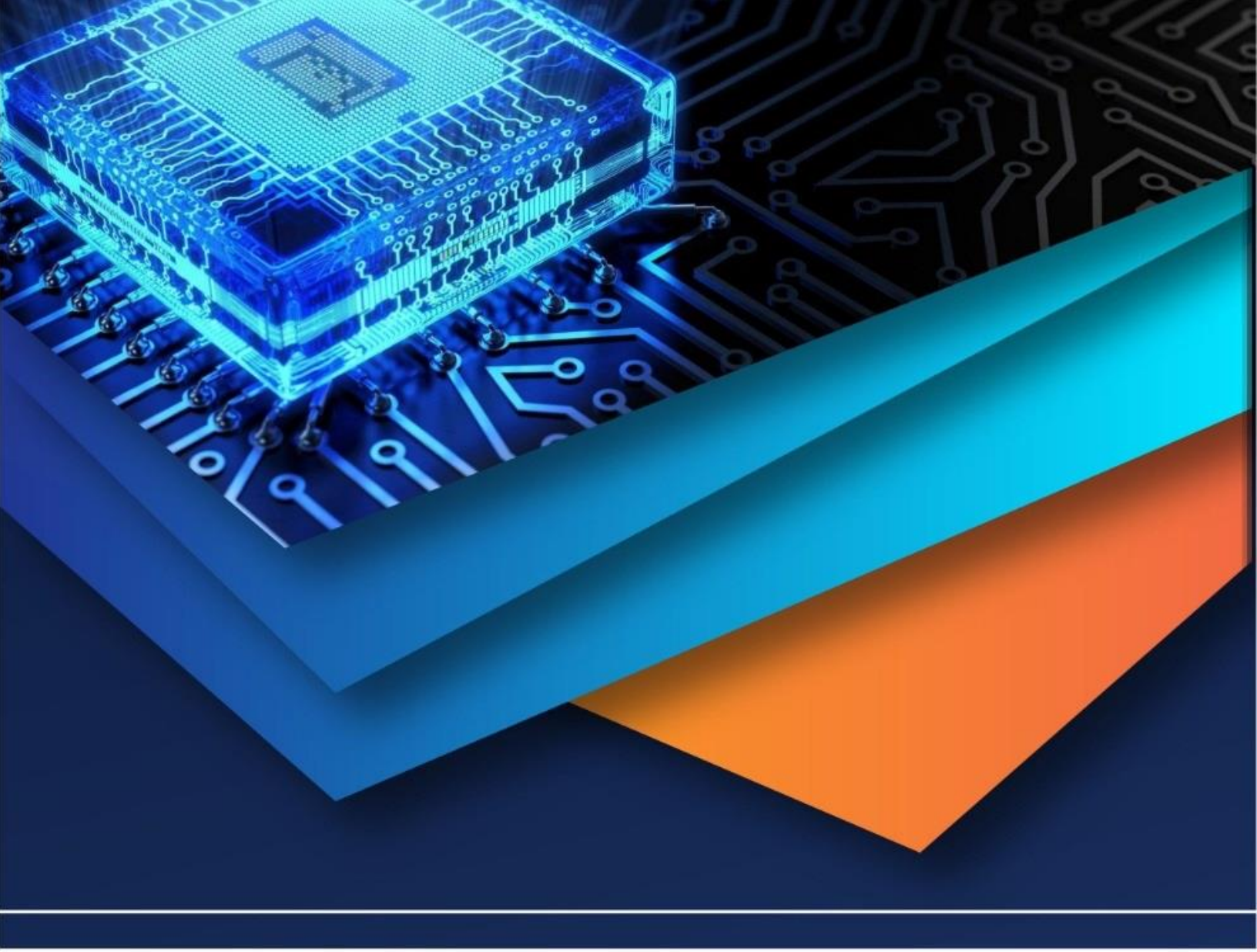

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