iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 3 **Issue:** II **Month of publication:** February 2015

DOI:

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

www.ijraset.com Volume 3 Issue II, February 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

A Review Paper on Segmentation of Heart Sound for Wavelets

Prof. Bagwan Faruk[1], Prof. Raviprakash Shriwas[2], Mr. Nitesh Vihirkar[3]
[1'2] *Department of EXTC J.D.I.E.T Yavatmal, Maharashtra, India*
[3] *Final year EXTC J.D.I.E.T Yavatmal, Maharastra, India*

Abstract: Heart is the important parts our bodies and each component of heart reflects the heart sound. Based on the heart sound the wavelet shrinkage method is used to reduce the noise in the sound. This method consist of two phases the first phase identifies the timing of sound signal i.e. s1 & s2. The second phase discriminates among the s1 and s2 using frequency information. The calculating the energy of PCG signal by wavelet, segment the PCG signal; calculate the different parameter for segmentation.
Keywords: Wavelets, PCG signal, Segmentation, etc.

I. INTRODUCTION

The survey of World Health Organization (WHO) in 2003, the cardiovascular disease (cvd) finds approximate 73 million deaths worldwide which is equal to 78% of all death globally. These facts shows that the prevention of such disease most important. The heart sound contain four components namely s1, s2, s3, & s4. This component plays important role for detection of the heart disease. The efficiency of detection heart sound totally depends on quality of heart sound. During normal cardiac cycle two normal audible sound i.e. s1(lug) and s2(dug). In the abnormal cases the heart could be other signal activities in between this two sound signal. This activities is called abnormal sound namely s3 and s4 or murmurs, click and snaps. In general, the PCG signal activities are s1, s2, s3, s4 and murmurs, click and snaps. The first and second heart sound is normally called fundamental sound and s3 it may be noted as physiological sound for subject under the age. So our intension is to detect a signal cardiac cycle within a given PCG signal and in order to segment into different parts. And calculate the different results and compare the standard results [1, 2].

II. LITERATURE SURVEY

Some authors are used to different wavelets for denoising of the PCG signal. The differences between these wavelets are described below. There are many types of wavelets available such as Haar, Daubechies, Coiflets etc. with different properties among which one select according to the requirement.

A. Haar Wavelets

This wavelet also known as first order daubechies wavelet, which wavelet function resembles a step function. In haar wavelet transform decomposes a discrete signal into two sub signals of half its length. One signal is a running average or trend, the other signal is a running difference or fluctuation. And this paper the author used this wavelet.

B. Daubechies Wavelet

Ingrid Daubechies is an inventor of the daubechies wavelets family. He examines compactly supported the orthonormal wavelet, making wavelet analysis in discrete time possible. The scaling function for Daubechies wavelets exist up to order 20. Analytical expressions the higher order daubechies function are not easy. Generally daubechies wavelet is chosen to have the highest number of vanishing movements. The number of vanishing movements or number of zero movements denotes the daubechies function. The larger number of vanishing movements betters the frequency localization of the decomposition. T he daubechies wavelets is compactly supported by orthogonal wavelets.

C. Coiflet Wavelet

With the request of Raman Coifman the Daubechies build this wavelet. This wavelet supported orthogonal compactly wavelets with the highest number of vanishing movements for both the wavelets. The coiflet wavelet is more symmetric and more vanishing movements then the daubechies wavelet [3].

Standards	Haar	Daubechies	Coiflet
Inventor	Alfred Haar	Ingrid Daubechies	Ingrid Daubechies request on R. Coifmen
Year	1909	1988	1995
Function used	Step function	Scaling function	Scaling function
Decomposition level	Low	Moderate	High

Table (1): Comparision between Haar, Daubechies, Coiflet Wavelets.

III. PHONOCARDIOGRAPHY

The phonocardiogram (PCG) signal is the heart sounds signal develop by the vibration of heart and thoraxic system. These signals contain large information of heart conditions and can be used in diagnosing different pathological conditions of heart valves. This analysis of heart sounds using the study of the timing and frequency spectra is known as phonocardiography. Normally heart sound is short lived burst of vibrations energy having transient characteristics which are primarily associated with the valvular and ventricular vibrations [4]. The normal heart sound signal shown in figure (1)

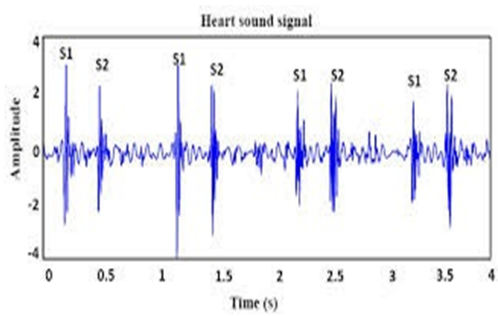
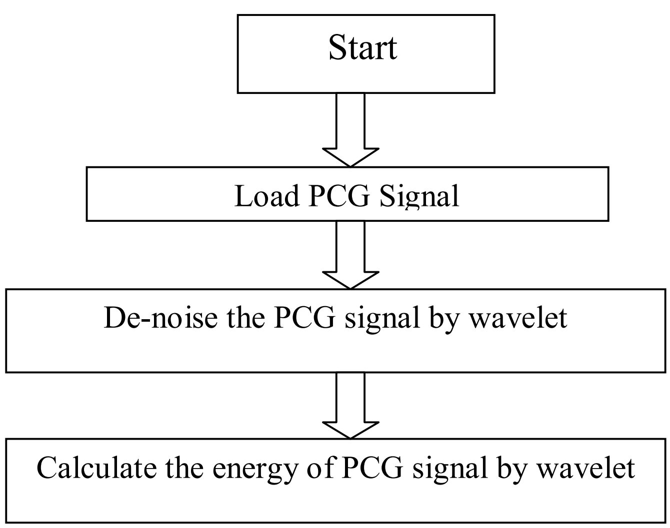


Figure (1): Heart sound signal

IV. FLOWCHART

The author loads the normal heart sound signal. Then loaded sound signal de-noise using different wavelet in five stages then calculate the maximum value then find the approximate coefficient and details of coefficient of heart sound and then calculate different parameters SNR, PSNR, NRMSE value.



International Journal for Research in Applied Science & Engineering Technology (IJRASET)

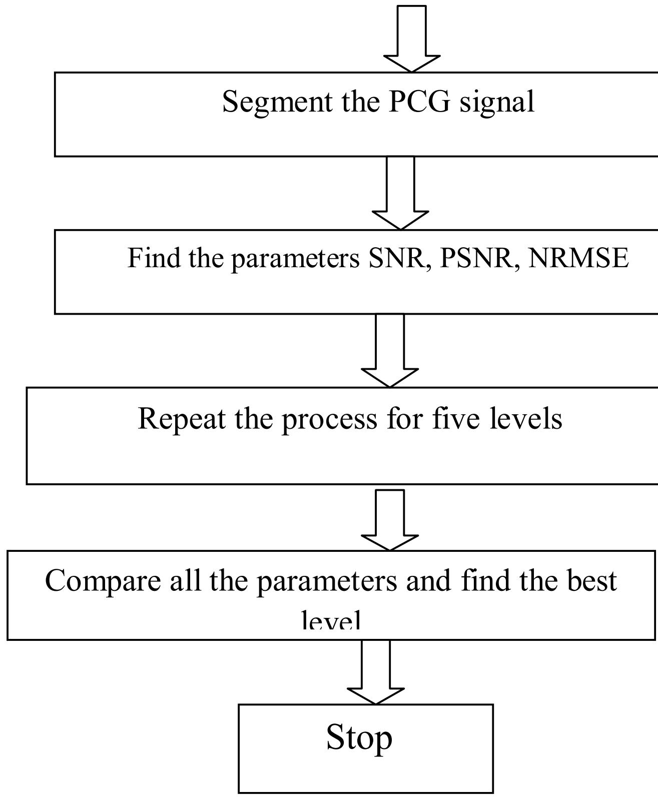


Figure (2): Flowchart

V. DENOISING PCG SIGNAL BY WAVELET

Raw Phonocardiogram (PCG) signal contains variety of noise components and artifacts that disturb its expression from the expected structure. The aim of the propose wavelet based processing procedure is to provide a noise reduction scheme for analysis of the heart sound traces. PCG signal offers useful information of heart and it has use extensively for detection of heart disease. But it's usually corrupted and weak with different kinds of noise such as breath and lung sound, environmental noise which lead to the low signal to noise ratio. The heart sound two kinds of noise should be removed, first heart sound murmurs and other sound occur during breath movement. These two kinds of noise interferes the extraction of the heart sound. So using the wavelet shrinkage method two noises removed [4].

A. Calculating the Energy of PCG signal

Calculating the energy of the PCG signal the heart sound filtered by the wavelet transforms for magnification of s1 & s2 components. The timing of s1 & s2 are determined by an automatic threshold and this sound label considering the interval between s1-s2-s1. Next step is using multiband Wavelet Shannon Energy (WSE) are used to segment s1 and s2 sound. In the WSE all the transform is applied to heart sound and calculate the third, fourth, fifth decomposition detail coefficient levels. After that this level are summed after the summation the normalized WSE is given by,

$$Es = \frac{1}{N}\sum_{i=1}^{N} x^2\, norm^{(i)}.\log x^2\, norm^{(i)} \qquad (1)$$

$$Pa(t) = \frac{E_s(t) - M(E_s(t))}{S\left(E_s(t)\right)} \qquad (2)$$

Where Pa(t) is the normalized average Shannon energy Es(t), the average Shannon energy M(Es(t)), is the mean value of Es(t), and S(Es(t)) is the standards deviation of Es(t). At the last stage after thresholding Pa (t), in which the threshold is selected manually

International Journal for Research in Applied Science & Engineering Technology (IJRASET)

time intervals between the sounds are examine and s1&s2 sounds are labeled.

B. Segmentation of PCG signal

The segmentation technique based on the homorphic filtering and uses k means clustering to denote detected cycle signal. The peak conditioning was performed to remove peaks in s1 & s2. K means clustering is the interval between s1 & s2 when peak was occurrence. The segmentation based on the energy profile E (n) of the PCG and it is given by

$$E(n) = \sum_{m=1}^{m} |Y(m,n)|\,2, \quad n = 1,2 \ldots. N \qquad (3)$$

When the fundamental activity presents in human being the local peak in E (n) will occur.

C. Parameters for Segmentation

1) *Signal to Noise Ratio (SNR):* It is the ratio of power of signal to the power of noise signal. When SNR is greater the denoising level of the signal is better.
2) *Peak Signal to Noise Ratio (PSNR):* This is used to measuring of amount of noise present in a signal and it is defined as the ratio between maximum possible power of signal and the power of corrupting noise that affect the fidelity of its representation and PSNR is usually expressed in terms of logarithms decibel scale.

PSNR =10*log10 (N *(x2)) Ediff (4)

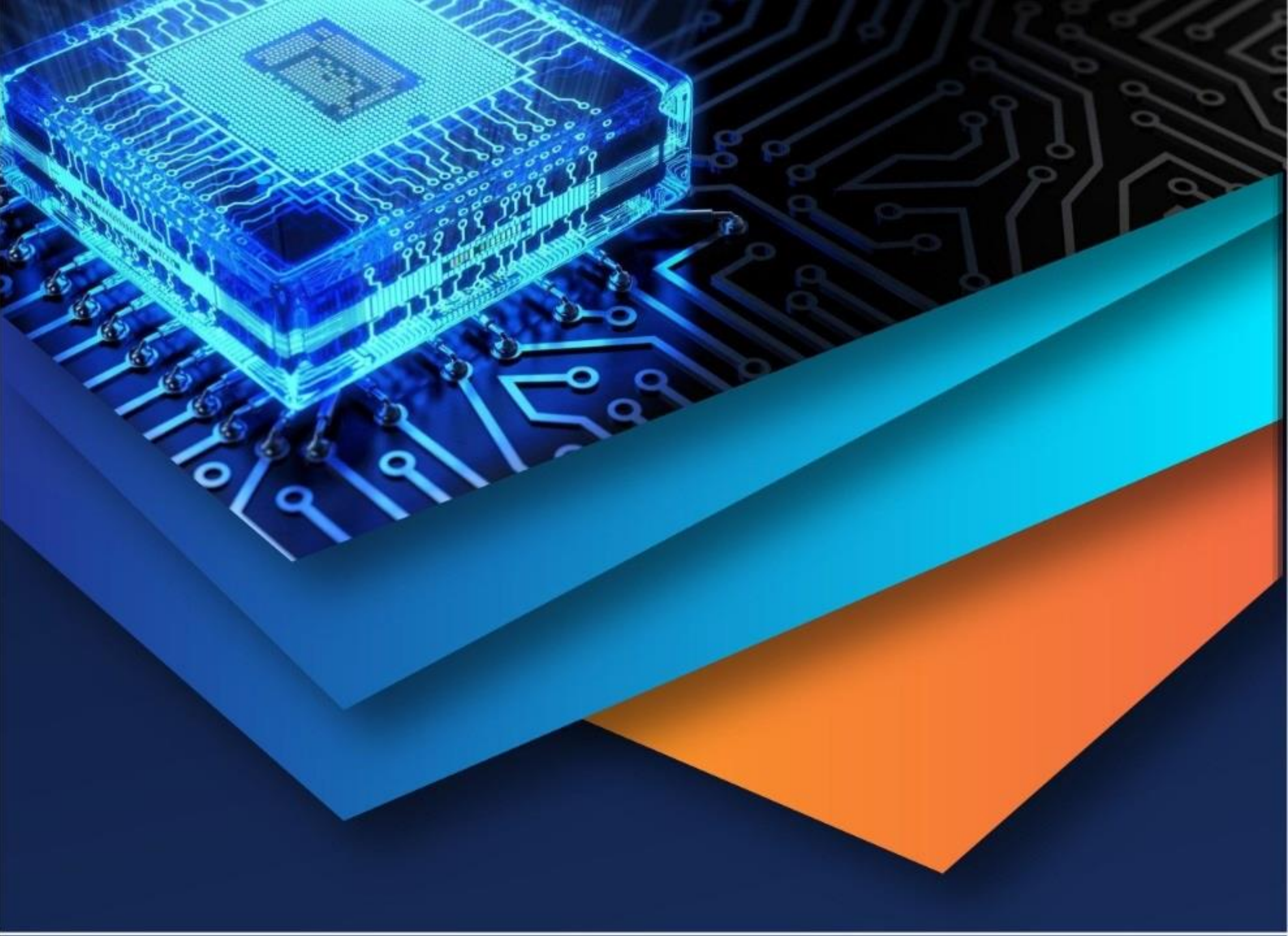
3) *Normalized Root Mean Square Error (NRMSE):* It is defined as the difference between values predicted by a model or an estimator and the values actually observed from model [6, 7].

VI. CONCLUSION

This paper presents the different types of wavelets for heart sound segmentations. The author Haar wavelet used for the denoising the PCG signal and gives the high SNR. The Daubechies Wavelet and Coiflets Wavelet are also gives high SNR but this wavelets are complex for calculation purpose.

REFERENCES

[1]Mohamed Lamine, Mawloud Guermoui, Mekhalfi, karim Ferroudji, Heart sound analysis using wavelets responses. (2013)
[2]E Delgado, M Vallverd, AF Quiceno, AM Matijasevic and G Castellanos-Domnguez(2008),
effective phonocardiogram segmentation using a nonlinear dynamic analysis and high frequency decomposition computers in cardiology 35, pp.161-164.
[3]Daubechies I (1990), "The Wavelet Transforms, Signal Analysis and Information Theory and Time-Frequency Localization Transformation and, Vol. 36, pp. 961-1005
[4]G.R.Sinha , R. M. Potdar, A Misal , and M. K. Kowar(2012), Comparison of wavelet Transforms for denoising and analysis of PCG signal I-manager's Journal on Communication Engineering And Systems Vol. 1 l, pp. 49-53.
[5]Zhi-dong zhao (2005), Wavelet shrinkage denoising by generalized threshold function, International conference on machine learning and cybernetics, pp.5501-5506.
[6]Abhishek Misal and Sinha G. R (2012). Denoising of PCG signal by using wavelet transforms Advances in computational research 4(1), pp 46-49.
[7]Ramaswamy Palaniappan, Cota Navin Gupta, and Sundaram Swaminathan(2005), Classification of Homomorphic Segmented phonocardiogram Signals Using Grow and Learn Network IEEE Engineering In Medicine and Biology 27th Annual Conference Shanghai, China, 4251.



10.22214/IJRASET

INDEX COPERNICUS 45.98

IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY