Stills Murmur and Non Stills Murmur Automated Identification in Children

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***Abstract*-Murmur is a vibratory heart murmur. A heart murmur is unusual sound which may be heard. Most of this murmur is happened because of blood flowing through the structure of the heart. Many children have this murmur during their age of 2 to 7 while in sleeping. But we cannot predict which sound be obtained it. It gives unwanted reference to the cardiology consolation. It affects their parents emotionally and finance. In our project, we developed an algorithm for increase the accuracy level. It is used for differentiate the affected heart murmur is from true heart murmur. The algorithm is used to analysis the murmur and extracts the features in the murmur analysis. Bacterial foraging optimization algorithm combined with SVM is used for classification. The results show that the proposed algorithm increases the accuracy of prediction compared with the existing.**

***Index Terms*-Bacterial foraging optimization algorithm, computer algorithm, SVM, Murmur analysis**

1. INTRODUCTION

Murmur is unusual heart sound. We classified the murmur into two steps.1.innocent murmur 2.Abnormal murmur. We concerned the innocent stills murmur. If they have the innocent murmur there is no problem at all. It makes harmless sound. It happens because of the normal blood circulation through blood vessels. If we have the innocent murmur they won't have another symptoms while in sleeping and in normal day times. It is observed that maximum of 40%-90% affected by is problem. [1]-[3]. It does not need any other treatment. It will be cured by their growth.

Murmur should be described as musical term of pitches in low level [1]-[5], It should be extracted in the form of a diamond shape in the form of the pure tone. In still murmur because of "Distinctive auditory" the duration is short Mostly the level of murmur is identified by using stethoscope. Many specialists used this kind of materials for their primary clinic. But successful output does not obtained from the true heart disease to develop a algorithm for identification. Some of the algorithm is used to differentiate the affected murmur from the normal heart sound. Three steps have to be followed in order to analyze the accuracy level. They are, segmenting, Extract the feature, Classification algorithm

Initially, the heart murmur is taken from the data set. Then, the heart murmur is separated as heart sound (s1), and heart sound (s2). If the segmentation of the heart sound is located successfully the feature should be extracted for the purpose of classification. In children, it have the high rates

We used Artificial neural network (ANN) algorithms to extract the features of s1 and s2. Principle component algorithm (PCA) and blind source separation (BSS) are used to differentiate the stills murmur and non-stills murmur [17], [19] in the existing systems. Each ANN is a trained matrix and has a standard form. It is trained with the single murmur and compared with the training matrix and finally compared to the normal heart murmur.

In this project, we are explaining the segmentation algorithm for locating the heart sounds and used for the accuracy of classification. Initially we focused on the analysis of successful murmur also introduced the specific features like the spectral width and diamond –shaped detected output. Finally, identify the level of the correlation and the accurate information

2. RELATED WORKSAND RESULTS

Stills murmur analysis algorithm is analyzed step by step as per the flow chart. In this flowchart, initially algorithm is used to separate and locate s1 and s2. If the segmentation is successful the feature should be extracted. ANN is used to classify the process by using the software of MATLAB

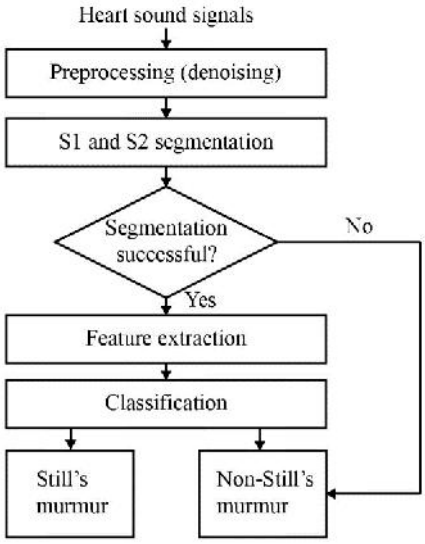

Fig.1. Flow chart of the algorithm

2.1. Data Set:

Initially, heart sounds are recorded from the data set. They are recorded from the five chest parts such as the right upper sternal border (RUSB), left upper sternal border (LUS.B),

Left middle sternal border (LMSB), left lower sternal border (LLSB). It is an analog signal with 16 bits and 8000 Hz frequency.

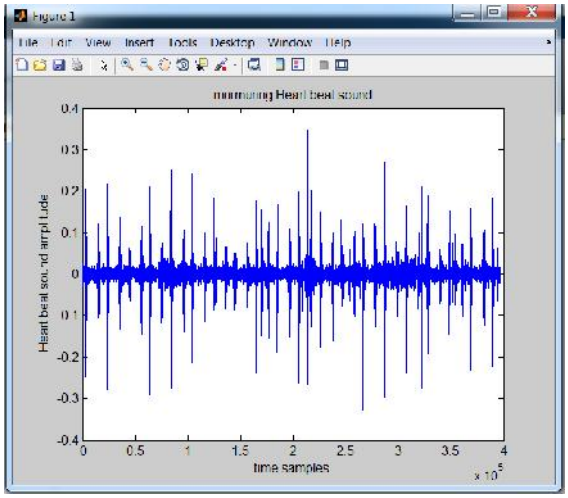

Fig.2. Murmuring heart sound

2.2. Preprocessing

Preprocessing is nothing but remove the unwanted signals (or) sound.

In this stage, we used some of the filter algorithms to remove the noise signal.

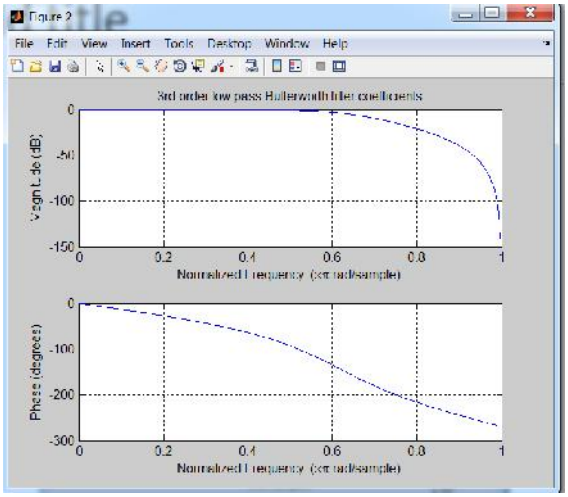

Fig.3. Low pass filter coefficients

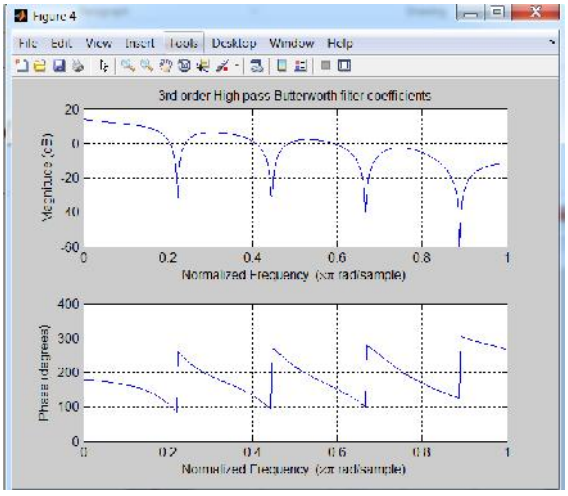

Fig.4. High pass filter coefficients

2.3. Segmentation and Detected Heart Sounds:

Shannon technique is used to detect the heart sounds. In this technique, we have the threshold level. It is used to separate the heart sounds s1 and s2. Maximum these sounds

have the form of frequency lower than 50ms. After using this technique we find the sound level of s1 and s2. After identification of the sound lobes the systolic interval period is calculated.

2.4. Feature extracted:

After separating the segmentation of s1 and s2 and move on to the extract feature process we extract the features of the stills murmur. It isclassified as time and the frequency domain

Is=systolic interval. It is demarcated by s1 and s2

Id=diastolic interval defined by s1 and s2 and is divided as I-stills and I-rest.

In the time domain,

We are extract the following 5 features, Diamond shaped envelope detector output and the intervals of IS, ID, I stills, I rest. Then we applied the two matched filters D-C filter and D-C filters. The C-D filter has the large output and the D-C filter has the small output's-D is matched with the stills murmur.

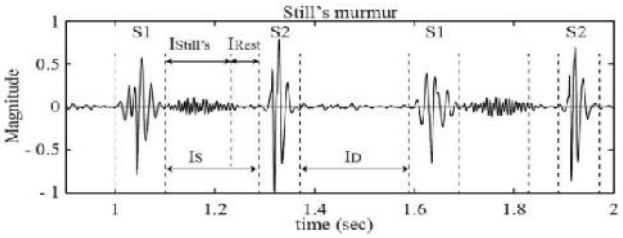

Fig. 5 shows the time window divisions to extract features. From the segmented S1 and S2, we estimate the systolic interval (IS) and diastolic interval (ID) excluding S1 and S2. IStill's is the possible location of Still's murmur within IS and the remaining interval is defined as IRest.

Then we find the width and the peak frequency of the signal in $I_{still.}$ If we have the stills murmur it has a pure tone and it is in the form of narrow spectrum and most of the murmur is generally distributed in the frequency domain. Initially we estimated the power spectral density in $I_{s\ tills}$ using the by theFilterand it is used to find the spectral width accuracy. Then we measure the spectral width using short time (FT).We find the mean between the minimum and the maximum values of the spectral value.

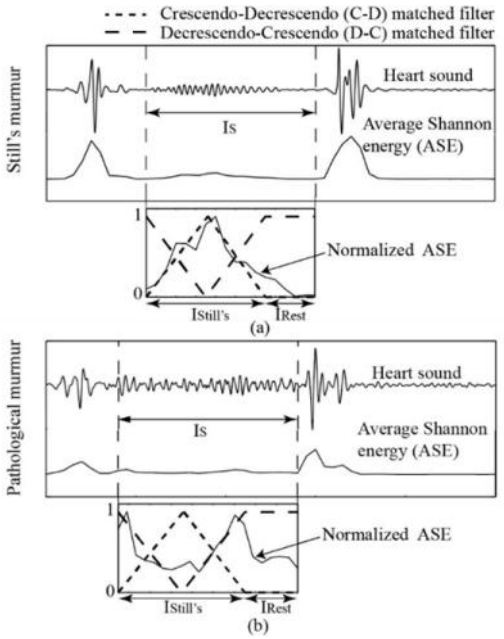

Fig. 6 Heart sounds, envelope signal, and C-D and D-C matched filters (a) Still's murmur: the ratio of the outputs of two matched filters = 2.25 (=0.2880/0.1278) (b) Pathological murmur: the ratio of the outputs of two matched filters

2.5. Classification

In previous state, we have to extract the feature then we used the classification algorithm of ANN with SVM to create the binary formation to classify the output as stills murmur or non-stills murmur.The network has a hidden layer with 40 nodes. ANN is used evaluate theby varying the number of nodes between 10 to 60, and then compared this feature extraction with the ANN training.

In pervious,

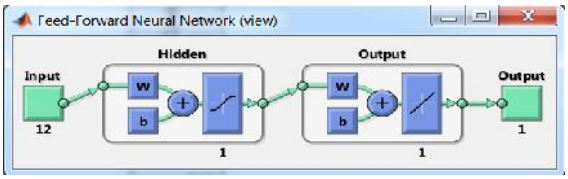

Fig.7. Block diagram of Artificial neural network,

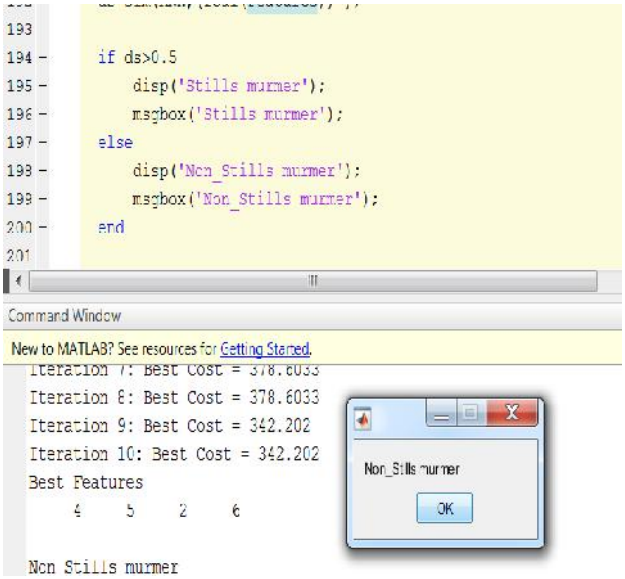

Fig.8. Murmur detection

The proposed Bacterial foraging algorithm with SVM has gained popularity in solving optimization problem. It is based on computational intelligence technique that is not largely affected by the size and non linearity of the problem. It has the advantages such as less computational burden, global convergence, less computational time and can handle more number of objective function.

Steps involves in this algorithm

- p: Dimension
- S: Population Size
- N_c: Life Time
- N_S: Swim Length Limitation
- N_{re}: Reproduction Steps
- N_{ed}: Elimination-Dispersal Steps
- P_{ed}: Elimination Rate
- dlt(i): random number on [-1,1]. where i from 1 to p.
- c(i): Step Size for the dimension.

Operation of bacterial foraging algorithm

$$J(i,j,k,l) = J(i,j,k,l) + J_{cc}\left(\theta^i(j,k,l), P(j,k,l)\right)$$

$$\theta^i(j+1,k,l) = \theta^i(j,k,l) + C(i)\frac{dlt(i)}{\sqrt{dlt^T(i)dlt(i)}}$$

$$J(i,j+1,k,l) = J(i,j+1,k,l) + J_{cc}\left(\theta^i(j+1,k,l), P(j+1,k,l)\right)$$

$$J^i_{health} = \sum_{j=1}^{N_c+1} J(i,j,k,l)$$

A.S1 and s2 segmentation evaluation

We have evaluated the segmentation of s1 and s2 by using sound lobe recordings and the tool of MATLABLot of subset sounds are available in the murmur library. The heart sound was considered to segmented true positive (TP) and true Negative (TN) and the incorrect heart sounds were defined in the term.

B.Evaluate the classification

We found the stills murmur and the non stills murmur recordings from various chest located parts. Then we used to extract the features using bacterial foraging optimization instead of ANN algorithm. It is assured that the proposed algorithm will give better performance and good accuracy

3. CONCLUSION

We developed the new algorithm for identifying the murmur and get the better result compared to the before analysis. IN future work, we will develop the newly classifier methods and improve the identification and the accuracy level.

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