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Detection and Localization of Heart Sound Using Adaptive Learning Technique

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***Abstract*— In the field of artificial intelligence, adaptive learning technique refers to combinations of artificial neural networks. In this thesis the adaptive learning technique is been implemented to carry out the Detection and Localization of heart sound. It can be implemented in the NS2 and MATLAB In ns2 part logic will identify the sound of heart and in matlab part heart sound is detected. The issue of Detection and localization of heart sound source is discuss in this thesis in new algorithm for estimating heart location, based on adaptive learning technique introduced and describe.**

***Keywords*— Detection, Localization, Sound, Adaptive Learning Technique.**

I. INTRODUCTION

Sound localization is the process of clarifying the location of a sound source. Sound localization is a listener's ability to identify the exact location or origin of a detected sound in direction and distance. The brain utilizes slight differences in strength, spectral, and timing cues to allow us to localize sound source .localization can be express in terms of 3-dimensional position, the azimuth or horizontal angle, vertical angle or elevation and distance or velocity.

Fig.1. Human sound localization

For a better understanding of a task of sound source localization different process steps have to be identified. Under the assumption of listening passively to the environment without use of any active localization technique the following scheme can be established.

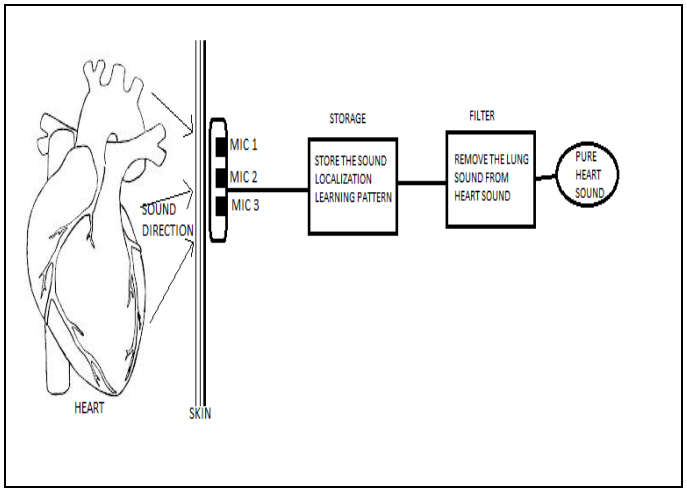

Fig. 2. Schematics of the Heart sound Localization Process

The sound localization is used to localize a sound source in three main items: first is the environment second is the noise and the third is the source itself. The environment could be quiet, noisy, and reverberant. Suppose a signal has to propagate through a medium in which noise is present. This noise could be any type either other sound or reverberations of the source itself. It is remarked that only mentioned external noise. Finally, the various attributes like directivity, constancy or the type of signal like random noise carries by sound itself. This brings a lot of uncertainties in a passive localization system. For simplification the sound source is supposed to be an Omni directional point source. Stethoscope sound localization technique is used to detect the sound of heart. The localization scheme is detect the direction of heart sound and after that we will use the sound filtering technique to differentiate heart sound from lung sound.

II. PROBLEM FORMULATION

A lot of research has been work out on the locations of heart sound, But still there are being many problems to provide pure heart sound because heartbeat is an unavoidable source of interference of lung sounds recording. So, to overcome these problems a proposed adaptive learning technique is used to detect and localize the sound of heart in different sounds. In sound localization various sound devices with different sound are deployed in front of object. The object having mics which detect the sound. The mics on the object follow the technique of adaptive learning

we can learn the object with the help of adaptive learning to detect the different sounds. Mic which receive high sound pitch it store the information of different sounds and object identify those frequencies which they want to use.

III. PROPOSED ALGORITHM

The algorithm of above work is divided into three parts:
A) Sound inputs
B) Algorithm Steps
C) Flow Chart

In sound localization four different sound speaker samples taken, they all are in active mode. They produce different sound signals and object listen the all different sounds and object can identify the sounds they want to use.

A) Sound inputs

Fuzzy inference is the process of formulating the mapping from a given input to an output using neuro fuzzy system. The mapping then provides a basis from which decisions can be made. Following figure gives the snap shot of NS-2 for sound localization and MATLAB for sound detection .

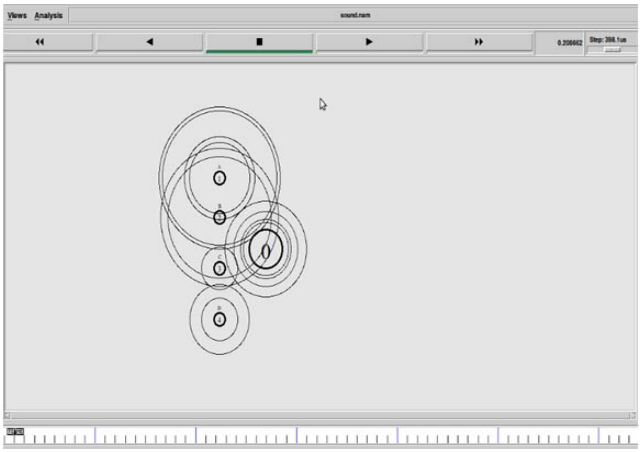

Fig. 3. Different sound samples

B) Algorithmic steps:

Step-1. Applying adaptive learning technique to detect the Heart Sound in Chest.

Step-2. We modified the TFCM algorithm and call it adaptive learning technique.

Step-3. According to the comparison results, the classification performance of the future method was best among all the classifiers.

Step-4. In this research we use the concept of digital signal processing by which we detect the sound of heart by applying the adaptive learning technique.

Step-5. We can capture the voice come from body then process that digital signal using low pass and high pass filter and then compare that signal spectrum with database stored spectrum.

C) Flow Chart

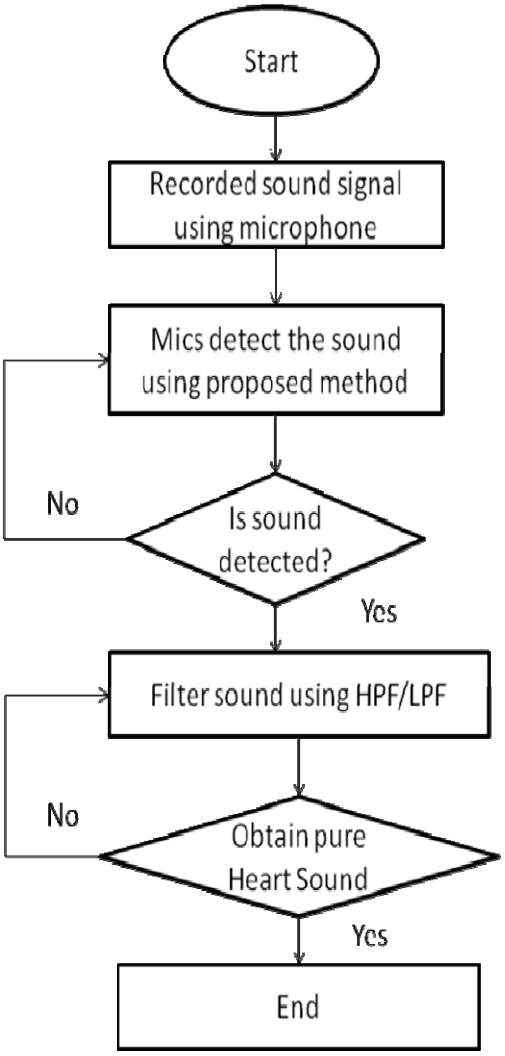

Fig. 4. Flow Chart

IV. EXPERIMENT AND RESULT

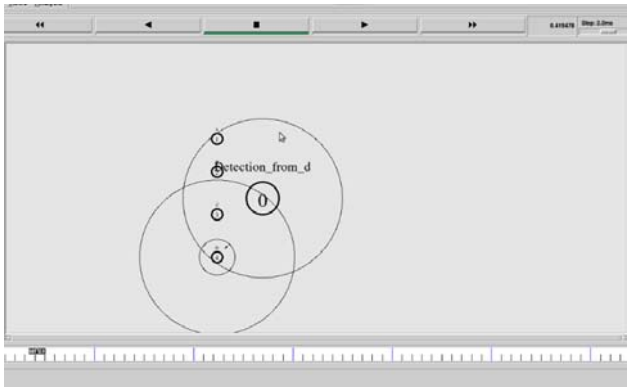

Fig. 5. Sound localization for speaker D

Figure 5, represents that when all the sound samples are in active mode, object D can be localize. Object wants to hear only particular MIC sounds all the other sounds are haring are disabled.

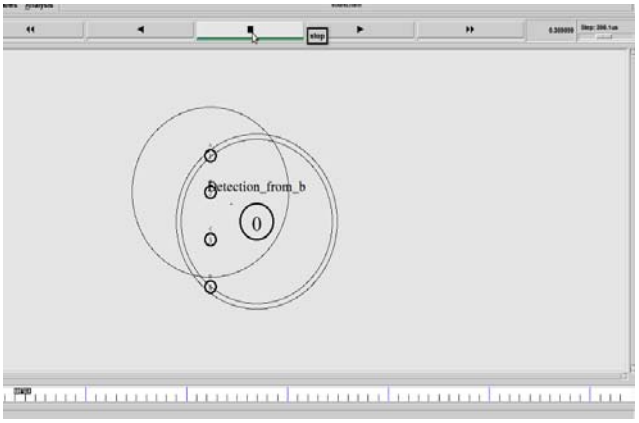

Fig. 6. Sound localization for speaker B

Figure 6, represents the sound samples of object B , when all the sound speaker are in active mode object B can be localized. Object wants to hear only particular MIC sounds all the other sounds are hearing are disabled.

Heart Sound Detection

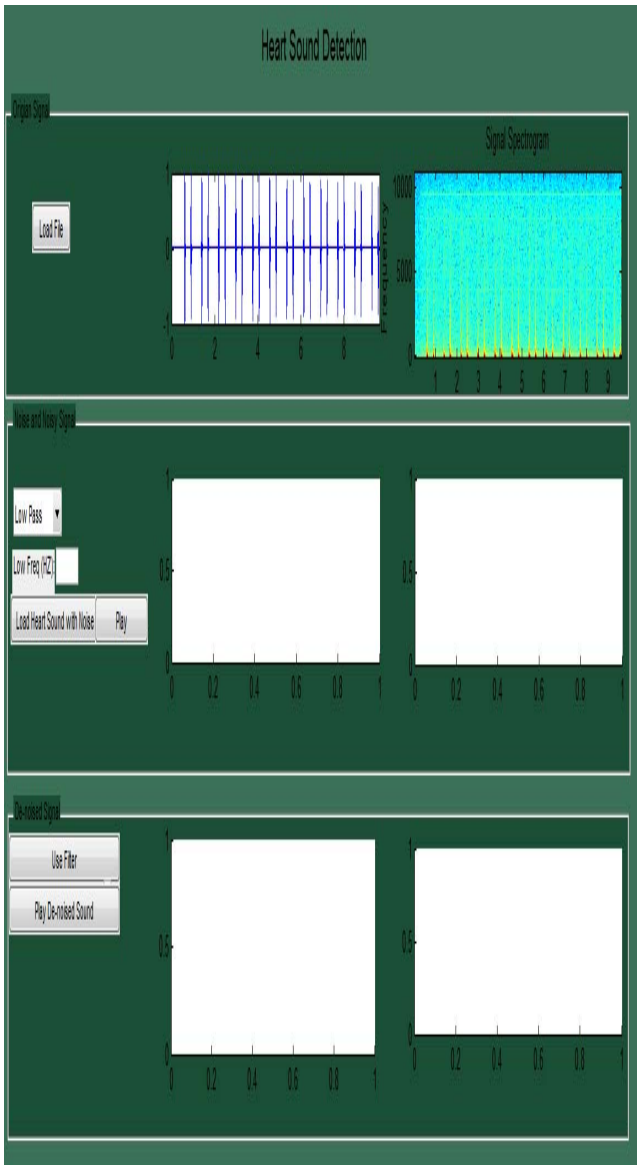

Fig. 7. Heart sound with original sound

Fig 7, depicts the heart sound sample is loaded in the matlab. It gives the frequency time graph and signal spectrogram. In this parameter load the original heart sound.

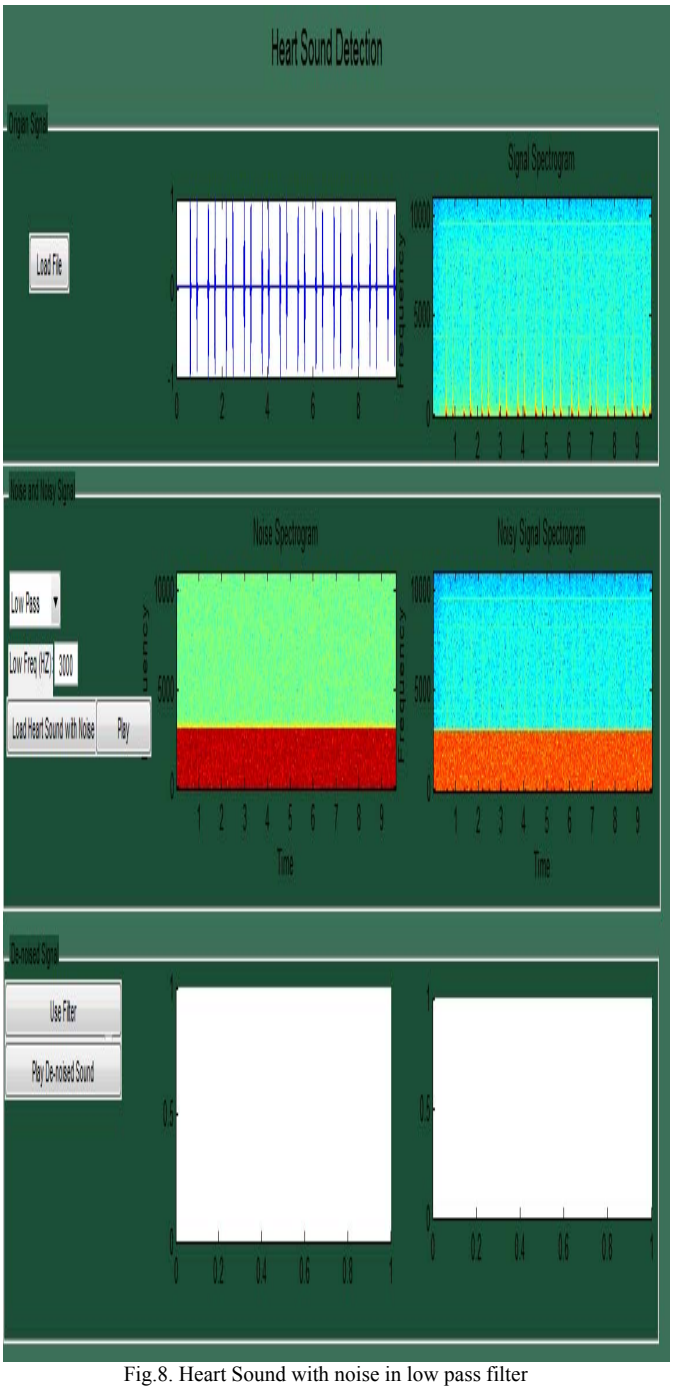

Fig.8. Heart Sound with noise in low pass filter

Above figure 8, represents the noisy signals, firstly we use low pass filter with 3000Hz frequency it gives the input of the signal is 0 to 5000Hz. In this spectrum load the heart sound with noise, click on play option to listen the heat sound with noise on low level filter. It gives the heart sound with noise and lower level of heart beat sound in low pass filter.

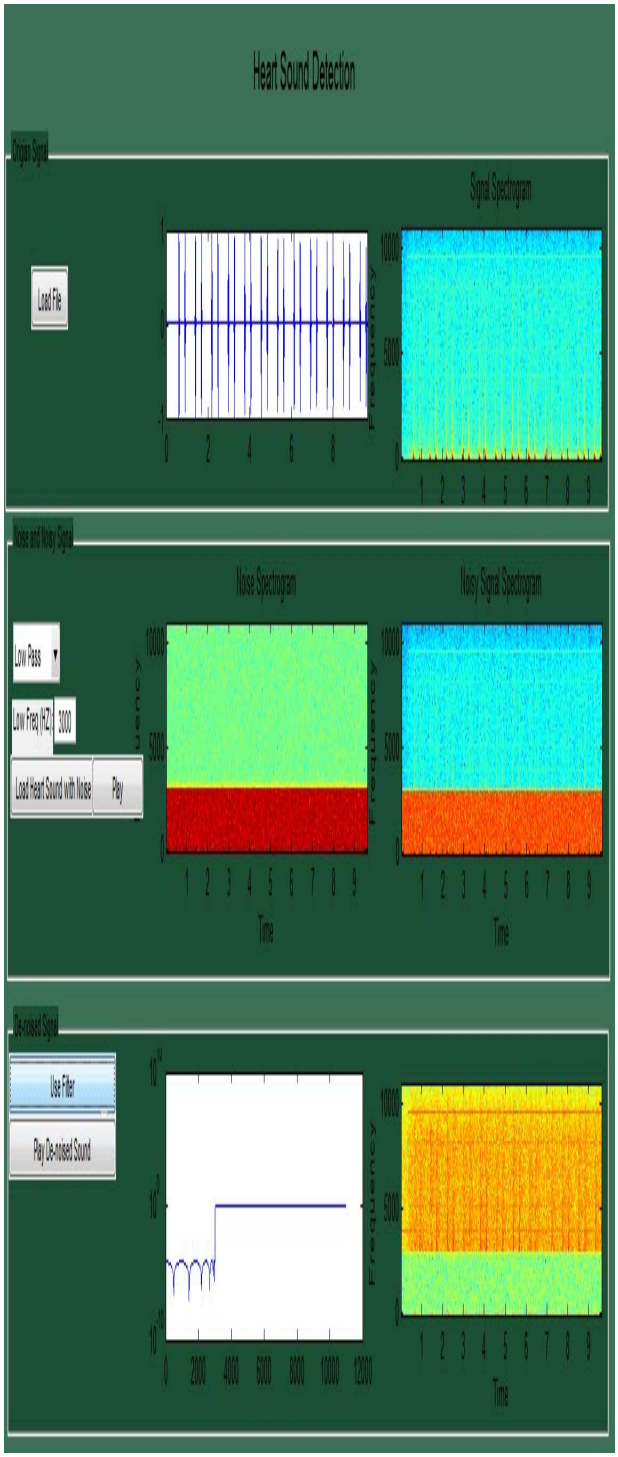

Fig. 9. Heart Sound without noise in low pass filter

The results shows in figure 9, depicts the heart sound filtered with low pass with low frequency 3000Hz than its frequency is shown in the graph with time. In this parameter use filter to neglect the noisy data and play the de-noised sound.

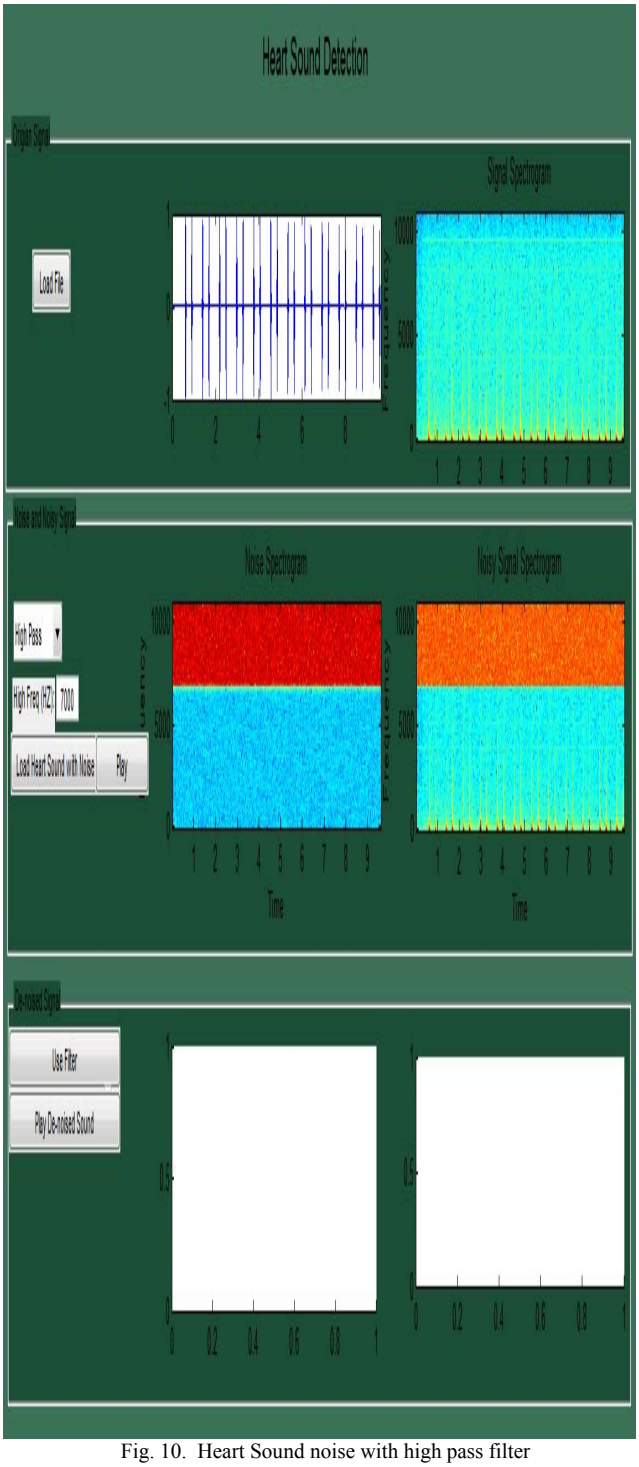

Fig. 10. Heart Sound noise with high pass filter

Figure 10, includes the processing of noisy signals through high pass filter with 7000Hz frequency it gives the input of the signal is 5000 to 10000Hz. In this spectrum load the heart sound with noise, click on play option to listen the heat sound with noise on high level filter. It gives the heart sound with noise and higher level of heart beat sound in high pass filter.

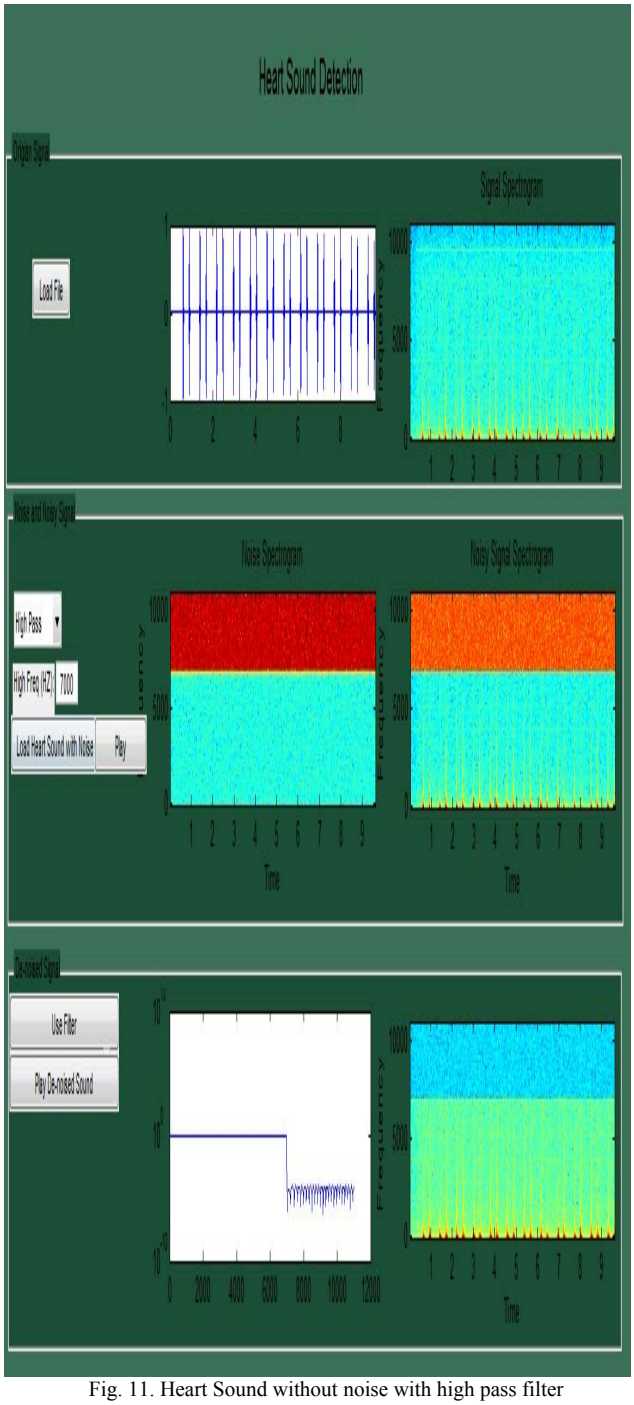

Fig. 11. Heart Sound without noise with high pass filter

Figure 11, shows the filtration of Heart sound with high pass with high frequency 7000Hz than its frequency is shown in the graph with time. In this parameter use filter to neglect the noisy data and play the de-noised sound. After playing the De-noise sound, listen the sound very careful after using filter heartbeat is very pure and sound of the heartbeats level high.

V. Conclusion

Heart sound analysis for detecting diseases is difficult when heart sound gets overlapped with other different sounds (lungs sounds, chest sound) because the heart and other sounds signal overlap in the time and frequency domains, removing other sounds interference from respiratory sound recordings is a big challenging and difficult task. This method is one of the efficient computerized method to detect and eliminate the other segments From HS. It can help respiratory sound researchers to bring about improvements to monitoring and diagnosis of respiratory disease. The potential usefulness of any method for removing other sounds from heart sound work on its ability to perform in a clinical setting. Manual inspection by visual means of the reconstructed signals confirmed that heart sound has the dominant sound with no perceptible other sounds in the background. Also, the proposed technique in this paper is far more efficient than other techniques for removing the other different sounds. This paper presents a best method for heart sound localization and detection from (lungs sounds, chest sound) other different sounds.

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