Detection and Identification of Common Murmurs in Human Heart

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Introduction

According to the World Health Organization, heart diseases continue to remain one of the four major non communicable diseases in the world. Therefore early recognition of heart disease is an important goal in pediatrics. Heart murmurs are the results of underlying pathological changes in heart valves (Gupta *et al.* 2005). At present stethoscopes are used by medical professionals to detect and identify those (Leung *et al.* 2000). The main objective of this research is to implement a system where by a person can use a stethoscope themselves to check the condition of their hearts. This will save time and money. Professionals can use these systems to confirm their decision and also as an alternative to the traditional method. Recently, many research efforts have been carried out to apply artificial intelligence (AI) to auscultation based methods for rigorous detection/classification of heart murmurs but with low accuracy (Ana *et al.,* 2010). Most of the proposed systems have been using ECG or an Electronic Stethoscope for the implementation. In this project the input is obtained through an Acoustic Stethoscope and the system is implemented with a different procedure. For such circumstances, an 'intelligent stethoscope' with decision support abilities would be of great value. Here the aim is to develop an inexpensive screening device that can assist in the diagnosis of heart disorders where systolic murmurs and pulmonary stenosis murmurs are mainly focused.

Methodology

MATLAB was used as the main technology. MATLAB (matrix laboratory) is a numerical computing environment and fourth-generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, artificial neural networks and also interfacing with programs written in the same language. The heart sound was given as the input to the computer using a microphone. As it is very low it has to be amplified using an amplifier. Then the amplified heart sound is sent to a computer audio port.

Data is acquired from pre-recorded sources like a CD drive and the internet. Then the system was tested using 15 patients and results were documented. The stethoscope and an amplifier were used to develop the hardware part. Sound was recorded using a sound recorder and sent to the software.

The details of the equipment and software used for this research project are:

1. Acoustic Stethoscope chest piece
2. Analog-to-digital converter
3. MATLAB software

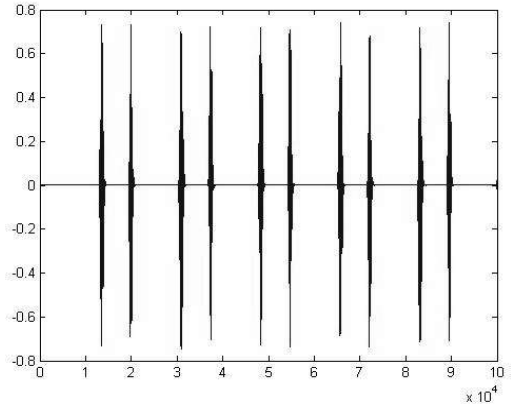

Figure 1. Time domain obtained of normal heart sound using MATLAB Software

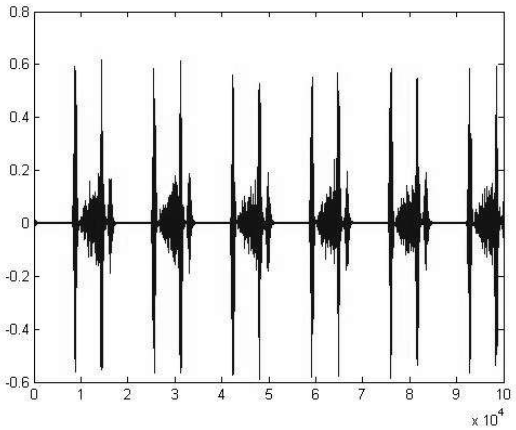

Figure 2. Time domain obtained of pulmonary stenosis murmur heart sound using MATLAB Software

Results and Discussion

The developed system provides many facilities to a health service department. Health officers have unique user names and passwords in the system and also access levels according to their position. A medical officer can use the system as a confirmation of his/her decision.
Graphical representation will provide a better understanding about the reports in a clear manner. Emphasized capability in the developed system is the prediction about heart murmurs. Early diagnosis of heart disease is very helpful in preventing fatal incidents. When using this system, heart disorder analysis will be reliable and also it is an easy method for medical professionals.

Conclusions

The system proposed in this report is to implement an automated system to detect heart murmurs using heart sounds. A stethoscope is used to get the heart pulse and it is amplified and input to the computer. Secondly, receiving sound is recorded and a user is able to hear the sound. A clear heart sound with low noise is sent to segmentation and compared with its samples. Results are given stating the presence or the absence of a heart murmur and in the cases of its presence the type of the murmur is also given. As for future work, the system can be developed to identify many types of heart murmurs.

References

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