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SMART WIRELESS ELECTRONIC STETHOSCOPE

K M Manoj Kumar[1], K Lokesh Naidu[2], K Pavan Kumar[3], Bhimesh[4], T S Deepthi Murthy[5]

[1,2,3,4,5]*School of Electronic And Communication, REVA University, Bangalore(India)*

ABSTRACT

With an ordinary stethoscope it is troublesome for the doctor to dissect segments of the heart beats that he needs to hear, because of external disturbances traditional stethoscope needs more time to examine the heart beats but electronics wireless stethoscope reduces this time duration. An electronic stethoscope empowers the doctor out of the blue to dispense with by cutting edge electronic systems every single undesirable bit of the pulse cycle and bring into concentrate as it were those hints important to him at the minute. In this paper this electronic stethoscope is interfaced with ARDUINO through MATLAB. In this proposed work a Graphical User Interface (GUI) is developed for the analysis of heart beat in better way.

Keywords: Stethoscope, Heart rate, MATLAB

I. INTRODUCTION

Stethoscope is an acoustic restorative gadget broadly used by specialists to hear sound of the pulses. By analyzing these pulses, the doctors can analyze the patient cardiac condition. But the advanced stethoscope has a limitation in low affectability of sound that can be heard and powerless against outer commotion obstruction. The Addition of electronic circuits in acoustic stethoscope will reinforce the heart rate. The expansion of electronic circuits in the acoustic stethoscope is frequently called an electronic stethoscope. Electronic stethoscope uses a receiver and a intensifier electronic circuit that modifies the acoustic flag into electrical signals. Electronic stethoscopes can cover the lack of the less delicate acoustic stethoscope and can limit mistake investigation of the condition of the patient's heart.

To analyze the condition of the heart, the heart pulse generated by the electronic stethoscope can be imagined in a range and played repeatedly by specialists with an application. An idea to implement the electronic stethoscope in a simpler way so that a normal man can use without any expertise of analyzing the stethoscope signals.

II. RELATED WORK

The heart has the capacity to draw blood all through the body. The pulses delivered by the heart can be an indication of heart withdrawal by expelling the air-lub-name cadence. Human blood dissemination happens in heart organ which will further deplete the blood all through the body and lungs. Heart disappointment capacity to trigger diverse sorts of maladies in heart. Heart sickness is the main source of death in the Indonesian

populace. The activating variables for coronary illness can be caused by smoking, eating nourishments with intemperate supplement content, absence of activity and rest, and stress [1].

Investigation of cardiovascular variations from the norm can be distinguished in the distinction pulse beat (mumble). Mumble has a rehashing cycle in which at each cycle has a period traverse. In general, a malady caused by irregularities of the heart is a heart valve and innate irregularities. Mumble is an irregular heart sound caused by the brokenness that happens at the point when the heart valves don't work too. Mumbles can happen in systole or diastole [2].

The heartbeat of a healthy person is ranged from 20 Hz - 200 Hz. If the range reaches 1000 Hz or above that frequency range then it is considered as abnormal condition. The heartbeat sound can be separated into two types of sound called the lub-dub. Lub-sound occurs due to the closure of the atrioventricular that drain blood from the atria of the heart to the chambers of the heart (ventricle) and it avoids the flow of blood to brain [3]. The frequency range of lub sound is 30-45Hz.

The second sound type is called the Dub. This sound is produced due to the activities of the aortic and pulmonary which frees the blood circulatory system to the lungs and systemic. This valve is closed at the end of systole and valve atrioventricular before re-opening. Dub sound occurs almost simultaneously with the end of the T wave of the ECG. The resulting sound S2 is the frequency range of 50-70 Hz. S3 heart sound in accordance with the cessation of charging atrioventricular. S3 sound is very weak and below 30Hz, while the S4 has a correlation with the contraction of the abnormal heart sound in the frequency range of 1000 Hz will give voice murmurs. This sound is occurs when the valves are not opened perfectly for the flow of blood throughout the body. This causes the blood to passes through the stenosis and cause the flow of blood back and forth. Blood flow in the high-speed passing lane narrow (stenosis) will produce a murmur. Murmurs can also be caused by leakage of the septum that separates the left and right halves of the heart so that blood flow from the left ventricle to the right ventricle thus distorts the systemic circulation [4].

III. PROPOSED WORK

Cardiac cycle consists of a P wave; R, S, T and U are related to the electrical activity within the heart.

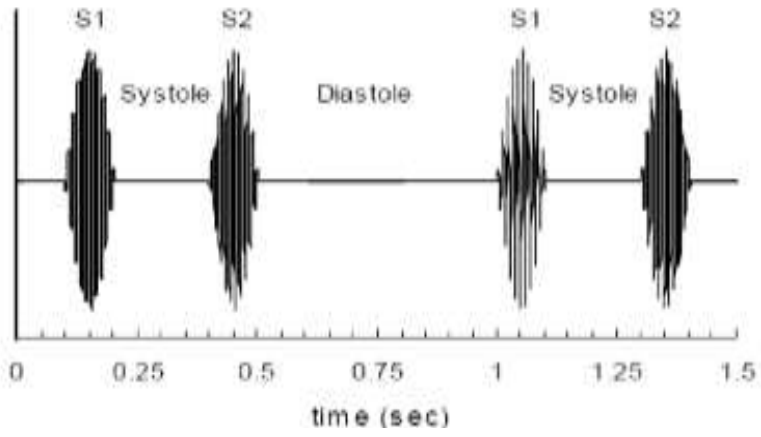

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Fig 1: The sound of a normal heart beat

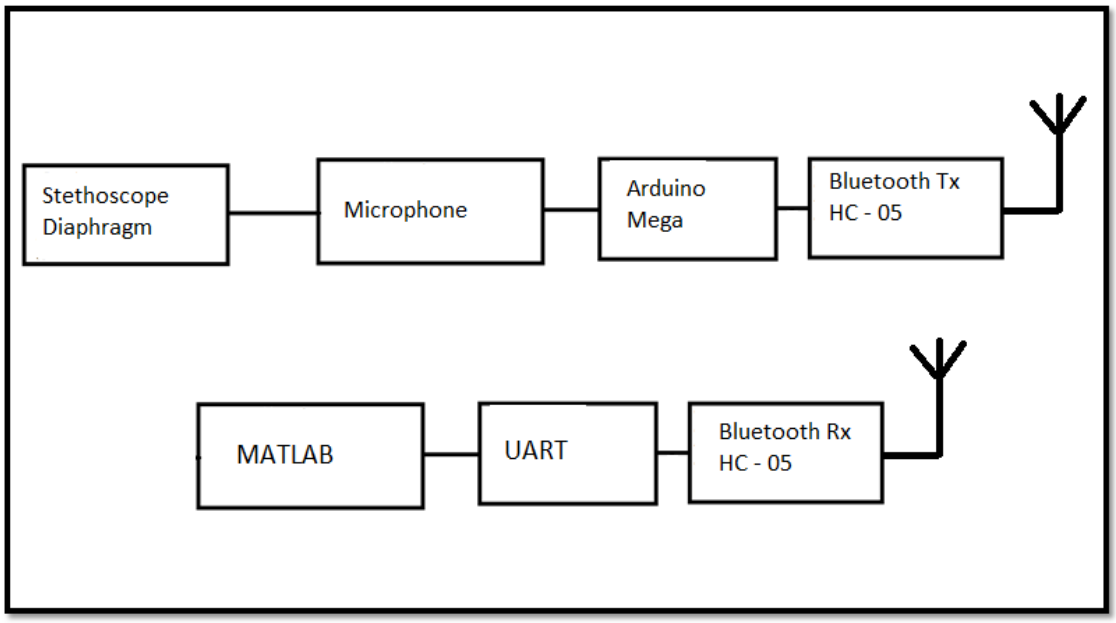

Fig 2: Wireless electronic stethoscope block diagram

The above shown is the block diagram of an electronic stethoscope. From Fig.1 and Fig.2 it has a diaphragm of the stethoscope and we will be taking the head of the stethoscope and we are removing all the excess part. That is connected to the medical grade tube at the one end and at the other end of the medical grade tube we are connecting a microphone. The microphone is used to record the heart pulses which are taken by the diaphragm of the stethoscope. The microphone sends the heart pulses to the Arduino mega which has to be transmitted. The Bluetooth Tx is connected to the Arduino mega board where the signal is transmitted wirelessly. And at the other end we have a Bluetooth Rx which receives the heart pulses and is connected to UART serial port which is connected to a system/computer. We are using MATLAB to demonstrate the Heart pulses in the form of waveform.

Stethoscope:

Electronic Stethoscope is an acoustic device that can listen to the acoustic sounds of the heart in the body. Acoustic stethoscope consists of a bell chest piece which is made up of diaphragm. The sound captured is not heard clearly due to external noise. These disturbances are removed and analysis is carried out electronically in the proposed method.

Arduino:

Arduino Mega is a major part in our work, through which we are sending heart signal to host system which present in front of the doctor for the better analysis.

Bluetooth:

The recorded heart signal is sent through the Bluetooth (HC05-10m). In this work we used two HC-05 devices one is interfaced with Arduino for transmitting purpose and one is connected to PC to receive the signal.

IV. RESULTS AND DISCUSSION

In all following figures each point on y-axis shows heart beatings per count for male and female respectively with different sample range.

The following Fig.3 represent Data normalization signal of female for 0 to 400 samples and for 0 to 1 samples in Fig.4 are respectively.

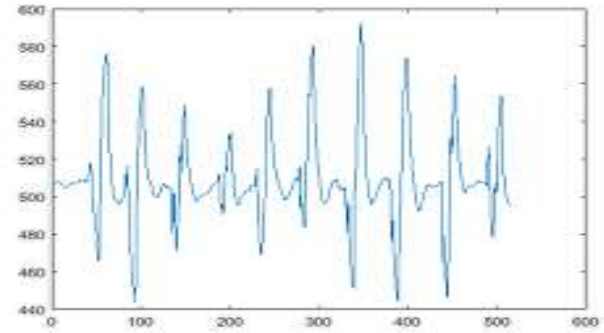

Fig 3: Data Normalisation signal of Female

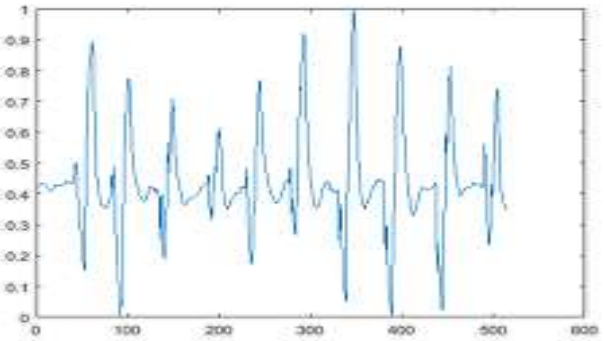

Fig 4: Data samples of Female

The Data normalization of male for 0 to 400 samples and for 0 to 1 sample in Fig.5 and Fig.6 respectively.

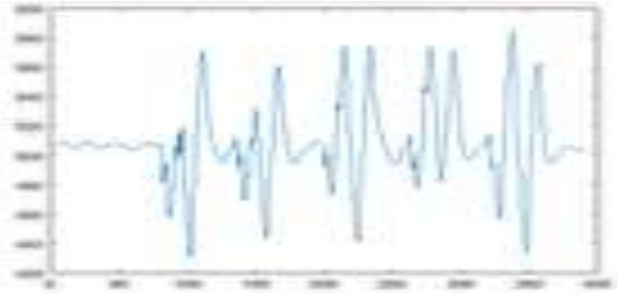

Fig 5: Data Normalization of a Male

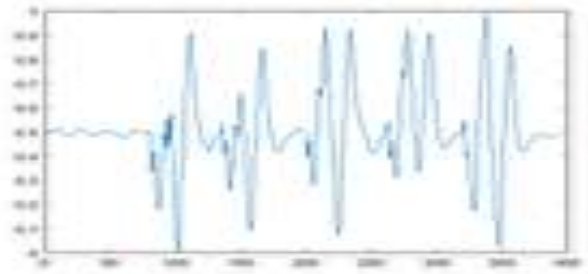

Fig 6: Data samples of a Male

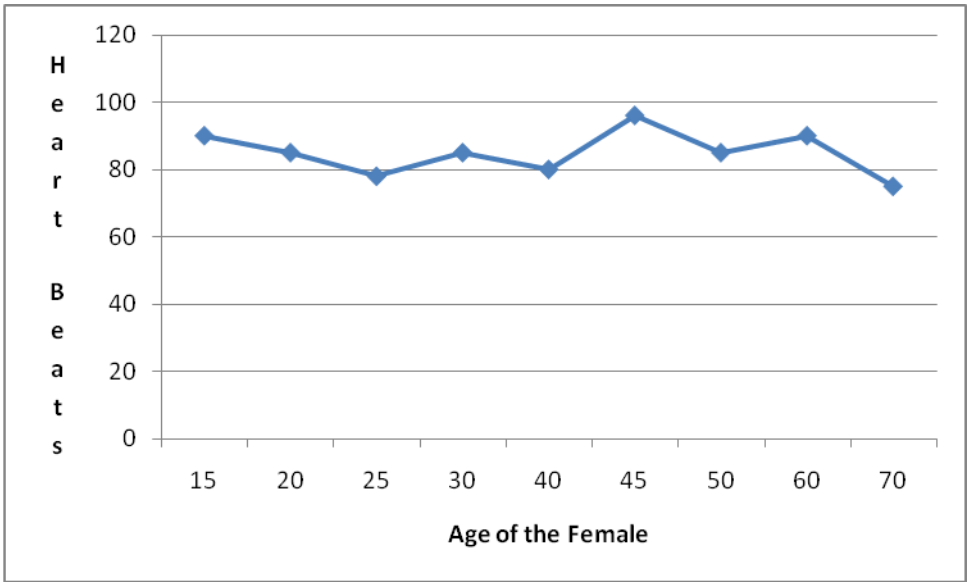

Fig 7: Analysis of heart beat of females of different age.

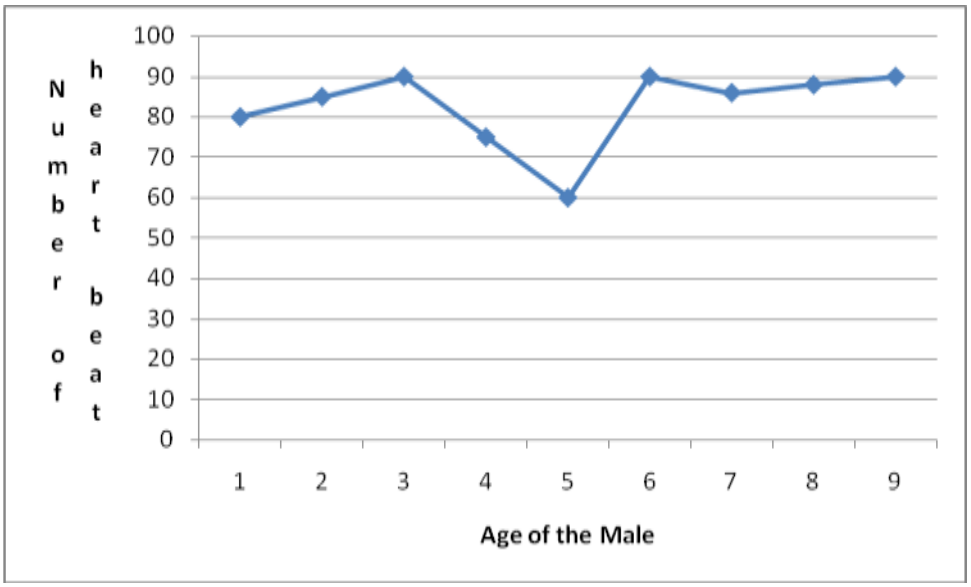

Fig 8: Analysis of heart beat of males of different age.

The aforementioned figures represent the analysis of heart beat of female and male of different ages in Fig.7 and Fig.8 respectively.

V. CONCLUSION

The use of wireless electronic stethoscope reduces time taken by the cardiologist for the analysis of heart beat even in the absence of him near to patient. This work can be further extended for the analysis of lungs sound for the better analysis of pulmonary diseases.

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