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Advanced Electronic Stethoscope

Anamika Kumari[1], Pratiksha Mohite[1], Mohini Zoye[1], Bhushanmalkapurkar[2]
[1]Department of Electronics & Telecommunication, DY Patil School of Engineering & Technology, Pune, Maharashtra, India
[2]Professor. DY Patil School of Engineering & Technology, Pune, Maharashtra, India

ABSTRACT

There has been an exponential increase in health care costs in the last decade. Seniors have to make frequent visits to their doctor to get their vital signs measured. The objective of this paper is to design and implement a reliable, cheap, low powered, non-intrusive, and accurate system that can be worn on a regular basis and monitors the vital signs and displays the output. This data is also easily accessible by the physician through wireless network. This paper specifically deals with the signal conditioning and data acquisition of three vital signs: heart rate, blood pressure, and body temperature. The "ADVANCED ELECTRONIC STETHOSCOPE" is developing to measure the various body parameters using a single stethoscope. The stethoscope comprises of four different wires which perform different tasks. Out of them first is used to measure the heart beat rate, which includes microphone and to hear the beats we are using headphones. Other is used to measure blood pressure which includes the blood pressure sensor. We display the graphical view of blood pressure for measurement on the screen. One of them is made to measure the body temperature which is possible using the temperature sensor which is being displayed on the screen. And the last one, is used to measure the ECG(electrocardiograph). The graph of ECG is being displayed.

Keywords: Blood pressure sensor, temperature sensor, ECG.

I. INTRODUCTION

The stethoscope is used to measure the heart rate of the patient. It is a very vital transducer for many medical practitioners and used for end user like doctors, nurses and physicians detect the abnormalities of the heart and lung such as sounds of heart, lung rhythm, and vibration of the intestines and blood flow. Diaphragm of head stethoscope is the metal end that is placed on the chest to listen to the lungs and heart sound with the tubing to tapered inner bores [1]. This structure is able to provide a better sound transmission while listening is known as a vacuum tube.

The most type of stethoscope used these days is the acoustic stethoscope. However, the problem with this acoustic stethoscope is the sound level is very low make it hard to analyse and diagnose the heart sound by a medical doctor. This is why several forms of digital electronic stethoscope have been developed to replace the conventional acoustic stethoscope. Basically, the purpose of digital stethoscope is to improve the sound resolution, allow variable amplification, minimize interference noise and simplify the output signal[5]. The digital stethoscope can enhance the auscultation problem of acoustic stethoscope which is easily affected by the movement and noise surrounding. Several techniques with the functions like stethoscope have been widely used such as SPO2, Sphygmomanometer and Electrocardiogram (ECG).

State-of-the-art electronic stethoscope provides the choice of bell, diaphragm and wide mode to pick the right frequency for better body sound acquisition. Usually there are three main modules, namely data acquisition module, pre-processing module and signal processing module, in the computer based cardiac dysfunction detection system using electronic stethoscope[7].

The simplest method of sound detection is achieved by using acoustic stethoscope. The microphone mounted behind the stethoscope diaphragm, picks up the sound pressures created by the stethoscope diaphragm and converts it into electrical signal.

Sound detection of heart beat for the stethoscope is mainly problem as it introduces errors in stethoscope. This problem always occurs for medical doctors and physicians at hospital in listening to heart sounds through the stethoscope when the signal level of detections is very low and cause very difficult to be analysed [3]. That is why some form of digital electronic stethoscope needs to be developed to replace the existing acoustic stethoscope. The advanced stethoscope is mainly concerened to analysis of heart rate, ECG, body temperature and blood pressure measurement. And this will be done by advanced stethoscope only. As the diagnosis part can be done by anybody except by an experiences medical doctor or physician for details of analysis, by developing the Digital Stethoscope where it will save the measured heart beat signal from a patient and the data input signal in voltage can easily be read by patient when they used it. This stethoscope will monitor the data with wireless transmissions and the result will be saved in real time[4].

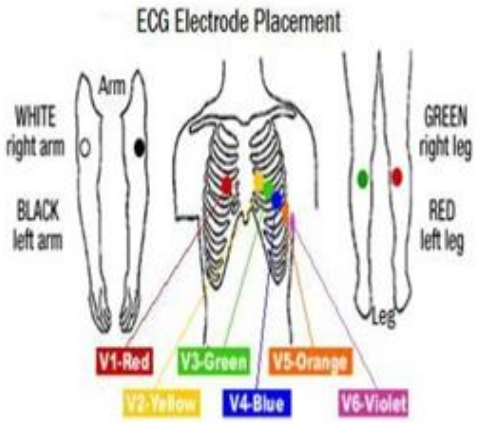

Figure 1.1 ECG Placement for 10 Electrodes

II. METHODS AND MATERIAL

BLOCK DIAGRAM

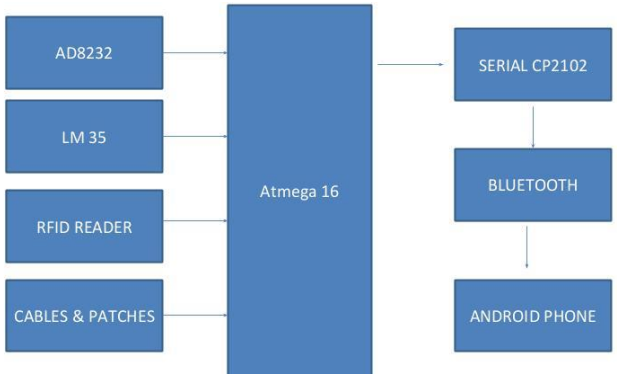

Figure 2. Block Diagram Explaination

AD8232: The AD8232 is an integrated signal conditioning block for ECG. and other biopotential measurement application. It is designed to extract, amplify and filter small biopotential signals in the presence of noisy conditions, such as those created by motion or remote electrode placement.

LM35: It is a precision IC temperature sensor with its output proportional to the temperature.

RFID READER: A radio frequency identification system uses tags and labels attached to the objects to be identified. Two-way radio transmitters receivers called interrogators or readers send a signal to the tag and read its response. RFID tags can be either passive, active or battery assisted passive.

BLUETOOTH: HC05 module is an easy to use bluetooth SPP module, designed for transparent wireless serial connection setup.

ATmega16: It is an 8bit microcontroller with 40 pins, in which 32 programmable input output lines are present.

Cables and Patches: Cables and patches are used to take input from the heart. Patch cables are generally defined as a specific length of a cable terminated at each end with a plug or socket. Patch cables or patch cords are normally short, but may come in length up to 100 feet or more.

ALGORITHM

- ✓ Start
- ✓ Check RFID tag
- ✓ For testing the person identification
- ✓ Go to step 1
- ✓ Place the electrodes on patient body
- ✓ Send data serially through bluetooth on patient body
- ✓ Check for temperature
- ✓ Send temperature data serially through bluetooth on android application.
- ✓ End

Flowchart:

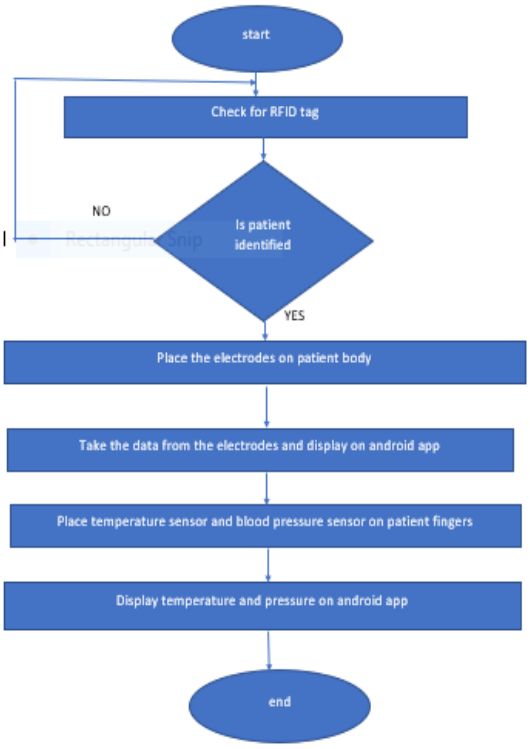

Figure 3

III. RESULT

Development of the Advanced electronic stethoscope is gaining an edge over traditional stethoscope mainly due to the advanced sensor technologies, digital signal processing techniques as well as the digital sound transmission capabilities of digital stethoscopes. Most stethoscope manufacturers are focusing on developing the devices with enhanced acoustics, better performance and innovative designs.

The "Advanced electronic stethoscope" will measure all body parameters digitally and also display the results on android phone using digital transmission techniques.

The result will display on android phone by using Bluetooth module.

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IV. FUTURE SCOPE

To design the circuit that will give a result for the heartbeats detection in digitalize stethoscope in number with the sensor circuit is to detect an input analog signal for heartbeats and convert into digital. Then continued by the development of Wireless Transmission using bluetooth it is to transmit and receive the data of signal from a communications system. The signal is sent directly to a personal computer that contains a data system to record important information about the patient to keep in the software system in real time wave to be analyzed received.

Then this wireless stethoscope will be verified and shown the data of heartbeats as a result for the counting of heart rate per minute Continue by create and design the Data Base of the heartbeat signal using Microsoft Excel for Data Logging information of patients and can be monitored in real time display with record for further analysis also to produce a portable device with a low cost wireless stethoscope

V. CONCLUSION

The purpose of this paper was to design and implement an electronic stethoscope to serve as a platform to diagnosis for the detection of heart rate the system uses a custom build sensor to capture heart sound at 8kHz and converts them to electrical signals to be processed by an ATmega644 microcontroller. Flash memory chip to record and playback audio waveforms.

This project is meant to provide a framework for developing useful embedded cad tools for cardiac murmur detection. Heart murmurs may go unnoticed during routine check-up since detection relies on the training of physicians, the quality of the equipment used, and the severity of the condition.

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