ISSN: 2278 – 909X
International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE)
Volume 8, Issue 5, May 2019

WIRELESS ECG MONITORING USING ANDROID SMART PHONE

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Abstract— **This paper presents the development of Low cost, low power, portable ECG monitoring device. ECG sensor based advanced wireless patient monitoring system concept is a new innovative idea. ECG monitoring is one of the main processes which are used to find the malfunctioning of the heart. Now a days many lives are affected by heart attacks .The main cause of heart attack is a lack of medical care at the right time. In some cases it might be required to monitor ECG frequently. But it is not possible due to the high cost of healthcare equipment .This is the limitations of existing system. This project targets financially-challenged people from rural areas who have heart problems and who wanted their ECGs checked regularly. So with the use of this portable device patient can monitor their ECG anytime, anywhere and send the report of ECG to the doctor and can effectively communicate with the doctor.**

Index Terms—: **Electrocardiogram (ECG), Arduino UNO, Android App**

I. INTRODUCTION

The Electrocardiogram is a measurement of the electrical activity of the heart over time. This system provides accurate performance of heart. The heart generates an electrochemical impulse that spreads out in the heart which causes the cells to contract and relax in a timely manner which gives the heart pumping characteristic. This sequence is initiated by a group of nerve cells called the sino atrial (SA) node, resulting in a polarization and depolarization of the cells of the heart. This technique is the best way to measure and diagnose abnormal rhythms of the heart.

Several groups have developed applications to monitor the ECG in mobile devices, where the samples have been obtained from standard data bases, or they have development the ECG module. In this work, we describe the implementation of an Android Application that can receive

ECG raw signal from acquisition module with wireless transmission capabilities (Bluetooth), process it, extract and display it for real time ECG visualization in mobile device.

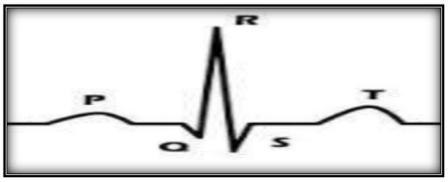

Fig.1:A Typical ECG Waveform

The electrocardiogram is the graphic record of electrocardiography.ECG curve contains waves P,Q,R,S,T and sometimes U. Here the "P" wave represents atrial contraction,the "QRS" complex wave represents contraction of ventricles.The "QRS" complex is much larger than the "P" wave due to the relative difference in muscle mass of the atria and ventricles, which masks the relaxation of atria. The relaxation of the ventricles can be seen in the form of "T" wave.

II. System Architecture

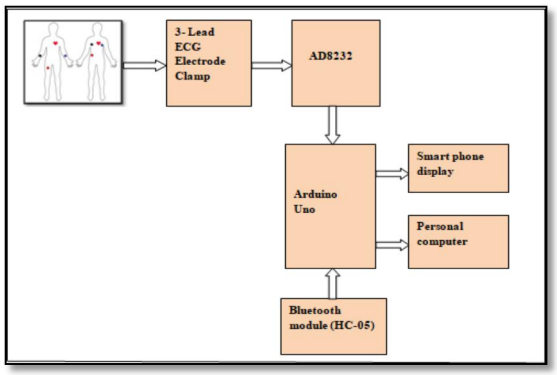

Fig.2:System Blockdiagram

Figure 2 represents the block diagram of the proposed system. It consists of four units ECG electrodes, ECG module(AD8232),Arduino Uno,Bluetooth module(HC-05). In this system electrodes are placed on the Left Arm, Right Arm and Right leg of the patient's body. The input from the human body is transmitted to ECG module(AD8232) through the electrodes. The ECG module processes the data and it produces the continuous analog signals according to the input given by the electrodes to the Arduino microcontroller. The Bluetooth module is connected to the Arduino microcontroller for transmission purpose. On the other side, we have Android Application on our mobile for the reception of ECG signal.

A. HARDWARE COMPONENTS:

Electrodes:

The original ECG devices used in medical practice in the art of cardiology use a combination of different electrodes. The 3 Lead electrodes are shown in figure2. In proposed system utilized 3-lead electrodes from e-health shield. This type of connection includes three electrodes - one on the right hand, the second one on the left hand and the third one on the left leg. Three electrodes cross the notional heart. The right foot is taken as connection to the ground.

Fig.3:ECG Electrodes

ECG Module (AD8232):
The AD8232 is an integrated signal conditioning block for ECG and other bio-metric measurement applications. It is designed to pull out, amplify, and filterless energy bio-potential signals in the presence of noisy conditions, such as those created by movement or remote electrodepositing. This design allows for an ultralow power analog-to-digital converter (ADC) or an embedded microcontroller to obtain the output signal. The AD8232 can execute a two-pole high-pass filter for eliminating motion artificial facts and the electrode half-cell potential. This filter is tightly coupled with the instrumentation amplifier design to allow both large gain and high-pass filtering in a first stage, thereby saving money and space.

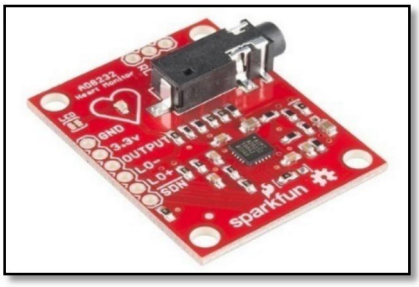

Fig.4:ECG module(AD8232)

Arduino Microcontroller Uno:
The Arduino Uno is an 8-bit microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a power jack, an ICSP header a USB connection and a reset button. It has everything required to hold up the Arduino; basically, connect it to a Laptop with the help of USB cable or power it with an adapter or battery to get initiated. The Uno differs from all previous boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega8U2 programmed as a USB-to-serial converter. "Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward.

Fig.5:Arduino Uno

Bluetooth module (HC-05):
Bluetooth is a technology for wireless communication. It is designed to replace cable connections. It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART). Usually, it connects small devices like mobile phones, PDAs and TVs using a short-range wireless connection to exchange documents. It uses the 2.45GHz frequency band. HC-05 Bluetooth module provides switching mode between master and slave .

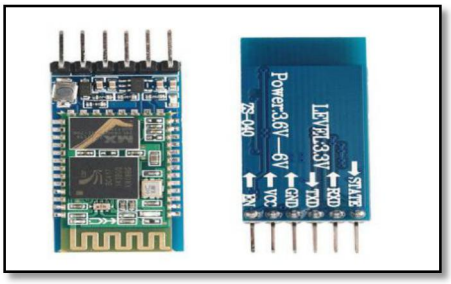

Fig.6:Bluetooth module(HC-05)

B. SOFTWARE COMPONENTS:
Arduino Software:
Arduino is an open-source electronics platform based on easyto-use hardware and software. Arduino boards are able to read inputs-light on a sensor, a finger on button, or a twitter message-and turn It into an output activating a motor, turningon an LED, publishing something online.yoy can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on wiring), and the Arduino software (IDE), based on processing.

Android application:
An Android app is a software application running on android platform because the Android platform is built for mobile devices, typical Android app is designed for a smart phone or a tablet PC running on Android OS. The developed Android smart phone application displays the ECG waveforms and is categorized as high level software for the application in the mobile phone. This application basically is a user interface (UI) which allows us to monitor the patient's ECG in real time.

III.RESULT
Results are obtained using Arduino and smartphone. The output of the ECG sensor is processed in Arduino Atmega328 controller and send to serial output in PC as shown in Figure7

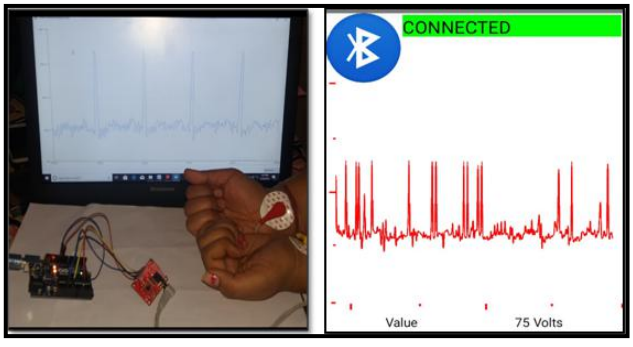

Fig.7: ECG graph in Smart Phone and Serial plotter

Practical tests have been conducted to evaluate the real time performance of the wireless Medical Diagnosis platform. The main aim and objective of this work is to develop an Android based Patient Care Monitoring system with ECG measurement. Here the process handle the communication between the server and Android mobile device to display the biomedical signals graphically on a mobile screen in real time. The ECG signal obtained from ECG acquisition circuit is plotted and displayed on android mobile phone. The ECG waveform displayed on android smartphone app is shown in figure7.

IV.CONCLUSION

Finally by using the above proposed method we can easily monitor electrical activity of heart. In this work, an android application was proposed which can continuously receive ECG signals from acquisition device wirelessly, detect QRS complex and plot the real time ECG signal on mobile phone for displaying. Also, it can send this information to concerned physician via server for medical decision.

V. REFERENCE

[1] R.Harini1, B. Rama Murthy2 , K.Tanveer Alam3, ***" Development Of ECG Monitoring System Using Android App",*** *Vol.No.9,Issue No.01,January-June 2017*

[2] K.Lakshmi Bhanu Prakash Reddy 1,M.Komalaakshi2, T.Bhargavi3, ***"Arduino Based ECG Monitoring System",*** *National Conference on Emerging Trends in Information, Management and Engineering Sciences (NC'e-TIMES#1.0) – 2018*

*[3] P.Kalaivani1, T.Thamaraiselvi2, P.Sindhuja3 and G.Vegha4, "****Real Time ECG and Saline Level Monitoring System Using Arduino UNO Processor",*** *Asian Journal of Applied Science and Technology (AJAST) Volume 1, Issue 2, March 2017*

[4] 1L.S. Kalkonde, 2Mrunali S. Salve, 3Ankita S. Bhatiya, ***"ECG Monitoring on Android Smart Phone",*** *Dept. of Electronic & Telecommunication, PRMCEAM, Maharashtra, India, Vol. 8, Issue 2, April - June 2017*

[5]Ayaz Akram, Raheel Javed, 2Awais Ahmad, ***"Android Based ECG Monitoring System",*** *LJSR, Volume 2 Issue 11,November 2013*