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REAL TIME ECG MEASUREMENT AND VISUALIZATION ON MOBILE

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ABSTRACT

Mobile Cardiac Telemetry, or Real-Time ECG Monitoring on an Outpatient Basis, is a term used today (MCT or MCOT). A mobile cardiac telemetry system monitors the patient continuously for up to 30 days while performing an outpatient ECG (electrocardiogram). MCT is a relatively new type of ambulatory cardiac monitoring that has been shown to be a reliable and effective way to monitor the patient's ECG data while the patient is awake or asleep. Because there is no patient interaction during MCT monitoring, the system automatically identifies and transmits ECG rhythm to a distant diagnostic monitoring laboratory. With the execution of this automated capability in real time, MCT monitoring technology has advanced beyond other types of cardiac monitoring. By using processor we connect the AD8232 heart rate sensor and ESP8266 wifi module which helps to transfer the collected data to the cloud and by using the exists iot remote app we retrieve the data and the final output signal will be visualized in the patient mobile phone and also it can be shared.

Keywords: Ecg Signal, Mobile Cardiac Telemetry, AD8232, ESP8266

1. INTRODUCTION

The platform for tracking patients' bio-parameters aims to provide a service that will aid in increasing the effectiveness of total healthcare without regard to a particular nation. Instead of being obliged to perform tedious manual tasks like never-ending paperwork, doctors and other medical professionals will be free to concentrate on the patients and their issues. Using specialized programmes created for mobile devices, online browsers or desktop clients, all data will be almost always accessible from anywhere, and any modifications will be made immediately available to medical personnel based on the security clearance. Doctors will have instant access to the patient's most recent examination results. If an ambulance is required to respond to an accident, the rescue team can use portable devices to send information about the patient's health status directly to the hospital, giving the staff and doctors there the knowledge they need to carry out an immediate operation without delaying to prepare the necessary tools. Neuronal networks automatically store and interpret all biosignal data. The existence of crucial values, which could indicate a patient's worsening medical state, can be evaluated by the system.

The system will notify the appropriate medical professionals and provide all information that could help evaluate the reason and significance of any monitored bio-signals readings that cross the line that the doctor has set.

2. PROBLEM STATEMENT

To analyze submitted data and make clinical judgments regarding the patient, the diagnostic laboratory personnel need instant, round-the-clock access to a doctor. To help the patient in an emergency, the technician needs to be taught on how to summon emergency medical services. The main benefit of real-time continuous MCT monitoring over other types of ambulatory cardiac monitoring is the capacity to react quickly when clinically significant events occur. The issue we want to discuss has to do with processing ECG data in real time. In comparison to the other data types discussed above, ECG data is the most complicated.
In this case, IOT serves as a link between hardware and software to aid in data retrieval. The term "Internet of things" refers to actual physical things that have sensors, computing power, software, and other technologies and can link to other systems and devices via the Internet or other communications networks and exchange data with them.
A suggestion was made to the guide, and the work's future implementation was discussed. The architecture must be planned for easy application and connectivity without user extra work before the development process can begin, but users must be able to use the provided solution quickly and efficiently. Client apps, database servers, and network servers are all essential components of the overall architecture.

3. LITERATURE SURVEY

In this study, they suggested the Real-Time Mobile-Based Electrocardiogram System for Remote Monitoring of Patients with Heart Arrhythmias, an electrocardiogram (ECG) system for the concurrent and distant monitoring of many cardiac patients. Real Time Processing of ECG Signal on Mobile Embedded Monitoring Stations, a different paper, discusses the issue of mobile embedded monitoring stations processing patient ECG signals in real time. This article discusses the creation of a low-cost, low-power, portable, and time-saving ECG monitoring system utilizing an ECG electrode, an AD8232, an Arduino, and an Android app.

A bigger number of scientists have presented various Continuous ECG observation frameworks during the past few years. Using continuous programming, D Zazula, A SoStariE, D KoroSec, D Korie, M Vezjakt, M Spegelt, and P Reinhradtj [1994] show how to observe and manage electrocardiograms (ECG). The package includes projects for online research as well as for post-practice verification of the online results. On computers, the norms of operation under the MS-DOS operating system are revealed. Continuing performance is evaluated as the results of the investigation as obtained by the PC are compared to the manual readings.

The authors of [2010]'s Ondrej Krejcar, Dalibor Janckulik, Leona Motalova, and Karel Musil discuss the issue of real-time processing of patient ECG signals by mobile embedded monitoring stations. In actual tests, two ECG measurement equipment were employed. A 12-channel Blue ECG gadget and a two-channel bipolar ECG core. Both gadgets are manufactured by Core Science Corporation. Owing to a problem with processing a 12-channel ECG sent via Bluetooth from an ECG equipment to a mobile station, two potential solutions to the packet parsing issue were presented. Visualization is a crucial component of the processing of biomedical data. We demonstrated and evaluated a Windows Presentation Foundation solution. The Microsoft Windows Mobile operating system is the foundation for mobile embedded monitoring stations.

A continuous on-chip ECG signal handling framework is proposed by Bhushan N. Patil in [2014]. A basic ECG acquisition front-end and a computerized QRS top location module are included in the proposed plan. The QRS top location plot relies on the calculation of the four-scale wavelet change, and it is possible to execute precise QRS top detection using a multi-scale wavelet-based denoising technique. The results demonstrate that the proposed ECG signal handling framework uses wavelet change to consume extremely low power and small silicon area, making it ideal for long-distance cardiovascular monitoring WBAN applications.

K. Tanveer Alam, R. Harini, B. Rama Murthy, and others, [2017], The goal of the current study is to use a handheld tele-electrocardiogram (ECG) to detect cardiac conditions in rural populations that are underserved and have limited access to medical treatment. The study's goal was to clinically validate the use of handheld ECGs as screening instruments for diagnosing heart conditions in rural populations. The suggested electrocardiogram (ECG) monitoring system is developed as an Android smartphone application and is controlled by the Arduino UNO microcontroller.

4. SYSTEM OVERVIEW

4.1 Surface Electrodes: A tiny gadget used to detect or stimulate electrical activity in the tissue beneath the skin. Using surface electrodes, one can examine the muscles and nerves for any issues. Surface electrodes are useful for their large pickup area, low cost, and lack of invasiveness. In order to collect bioelectric potentials from the surface, surface electrodes are those that are in direct touch with the subject's skin. ECG, EEG, EMG, and other signals can be sensed with electrodes.

4.2 Ecg Simulator: An electronic device called the ECG (electrocardiogram) Simulator feeds cardiac monitors an electrical wave resembling the signal from the human heart. It can be used to instruct medical staff on how to configure the input settings for ECG devices.An electronic device called the ECG (electrocardiogram) Simulator feeds cardiac monitors an electrical wave

resembling the signal from the human heart. It can be used to instruct medical staff on how to configure the input settings for ECG devices.

4.3 AD8232 Module: An integrated signal conditioning block called the AD8232 is used in applications for biopotential measurements like ECGs. It is made to extract, amplify, and filter weak biopotential signals in noisy environments like those brought on by movement or distant electrode placement. The sensitivity value is 97.63%, and the error value for determining a person's fitness level using Sensor Pulse and manual methods is 2.043%.

4.4 Microcontroller (ESP66) : With the use of Hayes-style commands, this tiny module enables microcontrollers to join a Wi-Fi network and establish straightforward TCP/IP connections. They need other parts to create a functional development system, particularly a serial TTL-to-USB adapter (also known as a USB-to-UART bridge) and an external 3.3 volt power source. Larger ESP8266 Wi-Fi development boards like the NodeMCU, which has the USB-to-UART bridge, a Micro-USB connector, and a 3.3 volt power regulator incorporated into the board, are recommended for inexperienced ESP8266 developers. These less expensive ESP-xx modules provide a lower power, smaller footprint choice for production runs once project development is through and certain components are no longer required.

4.5 CLOUD & API: The on-demand availability of computer system resources, in particular data storage and processing power, without direct active supervision by the user is known as cloud computing. Functions in large clouds are frequently dispersed over several sites, each of which is a data centre.Cloud computing is used for anything that involves storing and processing massive amounts of data quickly and needs more storage and computing power than the majority of businesses can or want to invest in and implement on-premises. To store data, including files, business data, videos, or photographs, cloud storage uses remote servers. Users use an internet connection to upload data to servers, where it is stored on a virtual machine on a physical server.

Application Programming Interface is referred to as API. Every software with a specific function is referred to as an application when discussing APIs. Interface can be compared to a service agreement between two programmes. This agreement specifies the requests and responses that the two parties will use to communicate. A software bridge called an API enables communication between two programmes. In other words, an API serves as the messenger who transmits your request to the service provider you are using and returns the result.

4.6 Patient Mobile: Due to simplified appointment scheduling, patient evaluation, and treatment, mobile healthcare apps save both patients and doctors time while also enhancing the quality of service. ScienceSoft is an IT business that has been providing medical mobile app development services since 2005. They have a staff of healthcare software developers.

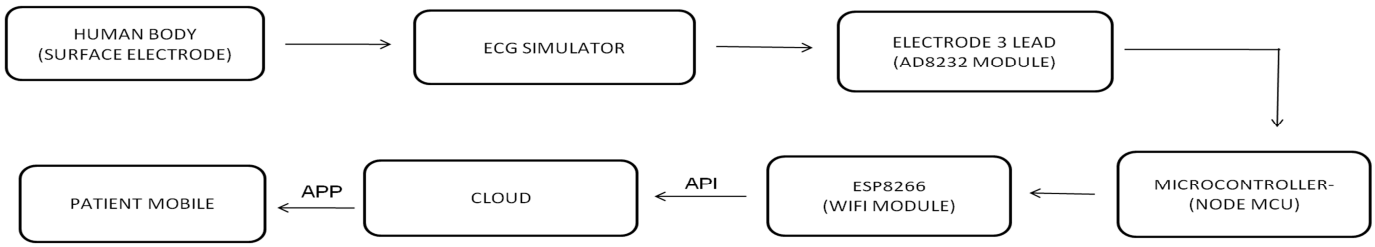
5. METHODOLOGY

This effort contributes to the creation of a portable ECG monitor that continually tracks the ECG. It'll let the user know. A patient will be able to roam around freely while also being continuously watched thanks to this project. In various circumstances, including the care of older persons, particularly those with cardiovascular problems, and of athletes or fitness fanatics, a long-term continuous ECG monitoring has proved highly important. An ECG is a non-invasive monitor that can be used to assess the electrical activity of the heart, measure the frequency and regularity of heartbeats, determine the location of the chambers, spot any damage to the heart, and look into the impact of medications and heart-controlling devices.

The platform for tracking patients' bio-parameters aims to provide services that will aid those in need. Doctors and other medical personnel will no longer be forced to complete tiresome manual activities like never-ending paperwork, giving them more time to focus on the patients and their problems. All data will be practically always accessible from anywhere via specialized software designed for mobile devices, web browsers, or desktop clients, and any adjustments will be made immediately available to medical staff based on the security clearance. The most recent test findings for the patient will be instantly available to doctors.

Finalized the components list for the hardware part, we discussed about using AD8232 as a heart rate sensor to measure the electrical activity of the heart and ecg measurements with linkage of electrode channels, Esp8266 it has the characteristics of inbuilt wifi module which helps to transfer the collecting data from the microcontroller, node mcu is used as the microcontroller that communicates between the sensor and data acquisition. Jumper wires and breadboard will be used for the circuit connection. Data cable connection is also used to retrieve the data. The MCU unit processes all needed operations with parsing to provide a real ECG record to the database or directly to visualizing application. Here IOT acts as the bridge between hardware and software which helps for data retrieval. The Internet of things describes physical objects with sensors, processing ability, software and other technologies that connect and exchange data with other devices and systems over the Internet or other communications networks.

6. BLOCK DIAGRAM



7. RESULT

Real time ecg signal will be successfully measured by using the device, where we are able to retrieve the data from the cloud by using an android app which is installed in patients phone and also here we can share the data to the respected Physicians to acknowledge the result by report.

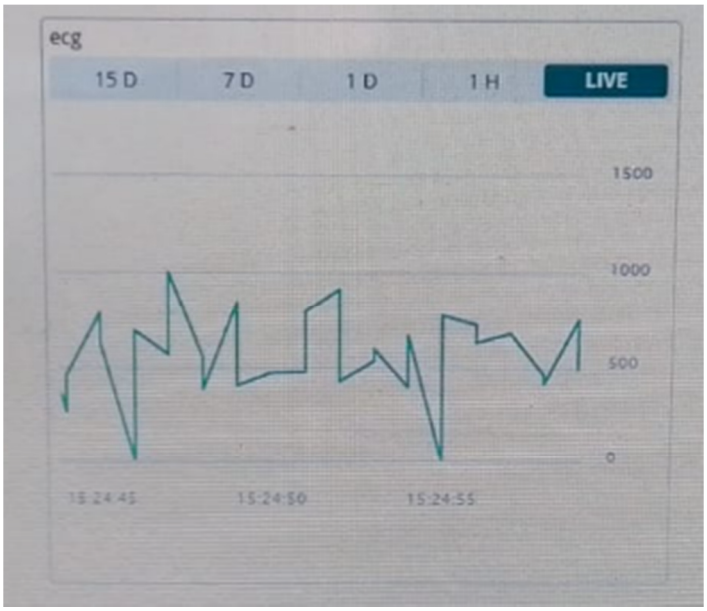


FIG.1 Ecg Signal

FIG.2 Output Ecg Signal

8. CONCLUSION

In this study, a technique for efficiently detecting heart attacks is provided. Given that inadequate treatment is the primary cause of heart attack deaths, it aids in lowering their number. Since the system will alert the doctor with an ECG report, this can be prevented. An Android application that can wirelessly constantly collect ECG signals from acquisition devices, recognise QRS complexes, compute heart rates, and plot real-time ECG signals on mobile devices for display was proposed in this work. Additionally, it can transmit this data through a server to the relevant doctor for a medical judgment. The proposed technology is unobtrusive and may be utilized by the user comfortably while performing daily tasks, according to experiments.

9. FUTURE SCOPE

The addition of biometric authentication utilizing ECG can be added to this concept. It is possible to get around the password memory issue. It is possible to modify the circuit such that it can be placed on the body. The algorithm can be improved to find more cardiac conditions. The research lays the groundwork for upcoming innovations that could enhance the planned use of wireless health solutions. Detecting abnormal cardiac rhythms, monitoring and analyzing ECG signals at home, and simultaneously automatically alerting the doctor to any emergencies are

some of the capabilities that can be added. Also, it is crucial to add extra features, such zooming capabilities, to the app, which will enhance its usefulness.

10. REFERENCE

[1] Jeevan Vijay, Sathisha M.S., Shivakumar K.M.,"ANDROID BASED PORTABLE ECG MONITOR", IJECS, Vol. 2, Issue 5, 2013.

[2] D. Wood, RN,"Wireless ECGs Make for Flexibility, Freedom." Nurse Spectrum, 2004.

[3] "A mobile phone-based ECG monitoring system", [Online] Available: http://www.ncbi.nlm.nih.gov/pubmed/16817611

[4] Xiaoqiang Guo, Xiaohui Duan, Hongqiao Gao, Anpeng Huang, Bingli Jiao,"An ECG Monitoring and Alarming System Based on Android Smart Phone", International Journal Of Engineering and Computer Science, Vol. 2, Issue 5, 2013, pp. 1560-1567.

[5] Swati Vijaykumar Chandankere, S.D.Markand,"Smart Phone Based ECG Monitoring", Proceedings of 44th IRF International Conference, 29th November 2015, Pune, India.

[6] Jeevan vijay, Sathisha M.S., Shivakumar K.M.,"Android Based Portable Ecg Monitor", IJECS, Vol. 2, Issue 5, 2013.

[7] D. Wood, RN,"Wireless ECGs Make for Flexibility, Freedom." Nurse Spectrum, 2004.

[8] "A mobile phone-based ECG monitoring system" [Online] Available: http://www.ncbi.nlm.nih.gov/pubmed/16817611

[9] Swati Vijaykumar Chandankere, S.D.Markand,"Smart Phone Based ECG Monitoring", Proceedings of 44th IRF International Conference, Pune, India, 2015

[10] Udit Satija, Student Member, IEEE, Barathram.Ramkumar, and M. Sabarimalai Manikandan, Member, IEEE "Real-Time Signal Quality-Aware ECG Telemetry System for IoTBased Health Care Monitoring" IEEE Internet of Things Journal , DOI 10.1109/JIOT.2017.

[11] R.Harini1, B. Rama Murthy2 , K.Tanveer Alam, "DEVELOPMENT OF ECG MONITORING SYSTEM USING ANDROID APP ", March 2017.

[12] Sudip Deb, Sheikh Md. Rabiul Islam, Jannatul RobaiatMou,Md. Tariqul Islam," Design and Implementation of Low Cost ECG Monitoring System for the Patient using Smart Device", , February 16-18, 2017 Feb 2017.

[13] Masudul Haider Imtiaz & Md. Adnan Kiber, “Design and Implementation of a Real-Time Automated ECG Diagnosis (AED) System”, 2013.

[14] Abhilasha M. Patel, Pankaj K. Gakare, A. N. Cheeran, “Real Time ECG Feature Extraction and Arrhythmia Detection on a Mobile Platform”, International Journal of Computer Applications (0975 – 8887) Volume 44– No.23, April 2012.

[15] Brian A. Walker#, Ahsan H. Khandoker#, and Jim Black, “Low Cost ECG Monitor for Developing Countries” , 2009