A REVIEW ON: IoT BASED PORTABLE ECG MONITORING SYSTEM FOR SMART HEALTHCARE

Prof. Pravin M. Tambe[1],Mayur Balu Katkade[2], Megha Dhananjay Ahire[3,] Manjusha Appasaheb Vighne [4,] Rupesh Shivaji Pawase[5]

Assistant Professor[1],BE Student[2,3,4,5]

[1,2,3,4,5]Department of Computer Engineering Sir Visvesvaraya Institute of Technology Nashik, Maharashtra

---

Abstract - Emergency unit ICU is where the patients who are basically sick and conceded for therapy. For such basic circumstances the Specialists need to make some all-memories update patients wellbeing related boundaries like their circulatory strain, heartbeat ,temperature Asthma ,Environment and saline is full or not. Doing physically is too drawn-out an undertaking and furthermore for various patients it turns out to be near unthinkable. For this sort of circumstances this IoT based framework can achieve a robotization that can keep the specialists refreshed all time over the network. IoT Based ICU Observing Framework is an Arduino based framework which gathers patients data with the assistance of few sensors. The sensors which are organized, either worn on the patient's body or implanted in our living surroundings, change the get-together of information inductive of our physical and mental state. Internet of Things (IoT) based savvy wellbeing checking framework is a patient checking framework in which a patient can be observed 24 hours. In the present world, Health observing frameworks are one of the most remarkable uses of IoT. In ICU, patient observing is basic and most significant movement, as little postpone in choice connected with patients' treatment might cause super durable handicap or even demise. The majority of ICU gadgets are outfitted with different sensors to quantify wellbeing boundaries, however to screen it all the time is as yet testing position..

Keywords: *EMG sensor ,ECG sensor,LM35 Thermister sensor, Humidity sensor DHT-11,Load Cell,Arduino Uno, Android App, Load Cell,Buzze ,Button.*

1. INTRODUCTION

The rapid development of Internet of things (IoT) technology makes it possible for connecting various smart objects together through the Internet and providing more data interoperability methods for application purpose. Recent research shows more potential applications of IoT in information intensive industrial sectors such as healthcare services.IoT in healthcare is the key player in providing better medical facilities to the patients and facilitates the doctors and hospitals as well.Now, IoT is one of the buildings blocks that is considered to be use for developing smart system for Healthcare services. "Objects" connected to the internet are highlighted to cross 20 billion in the upcoming smart Technology. Over a billion "smart products" connected to the internet, recently IoT is about networking of physical objects and these physical objects are embedded to exchange data in between the IoT components and also sense surrounding environments in which they are operating. In environments like hospital and clean room, precise environment control is paramount in meeting your objectives of patient and product safety.

The data such as temperature and humidity arecollected and transmitted for data analysis. With the help of ECG and heart rate sensor, cardiac disease could be diagnosed with subject to body position. The uploaded data will be sent to the physicians / Care takers.Medical field is the backbone of any country. Medical field technology place a big role when it comes to patient care. Technology is big when it comes to giving the patient the best type of quality care when they are in the hospital. In the old days doctors or nurses would just communicate with patient manually which causes mistakes. Now with the electronic health systems those mistakes are drastically declining. Statistics have shown that using the electronic health systems has lowered nursing mistakes as well as improved patient care. Our society has progressed through the years and has been introduced with the electronic health care systems which have drastically improved our health care systems.

2. LITERATURE REVIEW

1.Tamanna Shaown,concluded Using the ECG analog ront-end and ARM Cortex-M3 processor to develop a portable ECG monitor. The STM32 as the core unit, the ADS1292 as the acquisition analog front-end, it also includes a touch screen display module, an SD card storage module and a voltage conversion module. Automatic ECG analysis algorithms including QRS complex detection, QRS width detection and ST segment detection. ECG can be divided into four kinds of heart beat and eight kinds of arrhythmia rhythm using the extracted ECG parameters[1]

2.The results have been evaluated on the MIT-BIH Arrhythmia Database, the sensitivity of QRS complex detection was 99% and the sensitivity of heart beat classification was above 95%. The monitor can display the real-time ECG waveform and the current heart rate, to make recommendations for the subjects, and it stored the abnormal ECG waveform that provided to physicians for further analysis and diagnosis.[2]

3)Ahn et al. implemented a system for measuring the physiological signals in sitting position such as ECG and BCG by using a smart chair that senses the non-constrained bio-signals and can be monitored using a

monitoring system such as the one they had developed providing a classic example of the application of iot in healthcare. [3]

4)Almotiri et al. proposed a system of m-health that uses mobile devices to collect real-time data from patients in and store it on network servers connected to internet enabling access only to a certain specific clients. This data can be used for the medical diagnosis of patients and is achieved by using a number of wearable devices and body sensor network. [4]

5)Banerjee et al. proposed a pulse rate detection system based on a noninvasive technique. The proposed system used plethysmography process and correspondingly displayed the output digitally that made it a real-time monitoring device. The method has proved as reliable for the patient compared to other invasive techniques[5]

6)Gregoski et al. introduced a smartphone-based heart rate monitoring system. The system used a mobile light and camera to track finger blood flow and calculated blood flow-based cardiac output. The developed system described an integrated device that wirelessly transmitted a person's pulse to a computer, empowering people to test their heart rate by merely looking at their phones instead of using hands each time. This is an excellent design but it is not feasible if continuous heart monitoring is needed. [6]

7)Oresko et al. mentioned a fully functional cardiovascular disease sensing system for smartphones, identifying a tool that is developed to be the same given sufficient time and monetary resources. The developed prototype only tracked coronary rhythm in real-time, did not track heart rate over time, and could not detect any cardiovascular disease. [7]

3. PROBLEM STATEMENT

To develop a mobile based application to measure patient BP,ECG,Pulse .Hospital is associated with the lives of common people and their day-to-day routines so we decided to work on this project The manual handling of the record is time consuming and highly prone to error. The purpose of this project is to automate or make online, the process of day-to-day activities .Monitoring an individual's health is considered important because of the increasing health problems in today's world. A growing stressful life takes a heavy toll on public health. As the queue grows in hospitals and the number of patients is increasing, doctor's fees have skyrocketed, especially for those patients who are unable to pay or who are not in large patients but who only know that after paying the doctor's fees. Remote health monitoring can provide useful physical information at home. This precaution is helpful for elderly or chronically ill patients who may wish to avoid hospital stays. The system should collect the diagnosis of heart disease, blood pressure, temperature data and a few other parameters. This program provides better health care for self monitoring and consultation from a specialist. The customized app will be extremely useful for users of any age. Easy to present the app to the user will be the key to the success of this program.

4. OBJECTIVES

The objectives are as follows:

1. Provide solution with least hardware requirement.
2. To develop an application that is cost efficient.
3. To detect blood pressure and pulse rate of an Individual using wearable sensor.
4. To ensure data readability of the sensors where anybody can easily identify the status of the health without any prior technical knowledge.

5. EXISTING SYSTEM

In the Existing system, consulting any doctor is very tiresome task for the patient. There are many cases where the patient is unable to find out the required doctor for his disease, this become even worse if there is an emergency case especially when the patient is in an unknown area. This situation might harm the patient in the mean time. Even knowing the proper address, contact details of the doctor for required disease has become a very tough task. Also, sometimes doctor's schedule may get change during such cases patient's appointment might be cancelled. This might not be known by the patient due to lack of communication between the patients and the doctor. A doctor can have many patients in a day which becomes even more difficult for the doctor to intimate his schedule for each and every patient. Because of this time of patient get wasted and in the case of emergency it may cause harm to the patient. We have seen that a patient is not able to select an appropriate hospital for his/her emergency in unknown area. Again, if patient wants to take an appointment of specific doctor then patient has to go to the hospital and patient has to stand in a queue to take an appointment. This is very time consuming process. Also, sometime doctor schedule may get change then at that time patients appointment may get cancelled. Even though the appointment has got cancelled, patient may not get aware of that cancellation. Because of this the time of patient gets wasted and in this case of emergency it may cause harm to the patient. If doctor gives prescription to the patient sometimes patient may forget to take medicine. Every time patient has to in a hospital with combined test report. This increases the overload on the patient.

6. PROPOSED SYSTEM

The proposed system is to record various sensor information and present it to users in an easy-to-use interface. Recorded data that can be accessed through the app will show that the reading is within the normal range.

It will also inform the user and their contacts regarding medication requirements. The proposed system consists of sensors that monitor various health parameters, namely heart rate, blood pressure, electrocardiogram (ECG), body temperature and oxygen saturation (SpO2).

7. SYSTEM ARCHITECTURE

The proposed system on the architecture we design an ECG based heart rate monitoring system. The collected ECG data will be directly sent to the database server Using Wi-Fi module. Wi-Fi has been used here because it can provide larger cover areas and higher data rates.Wi-Fi is used here that it can send email to the doctorsor relatives in case of patient's emergency health Conditions.

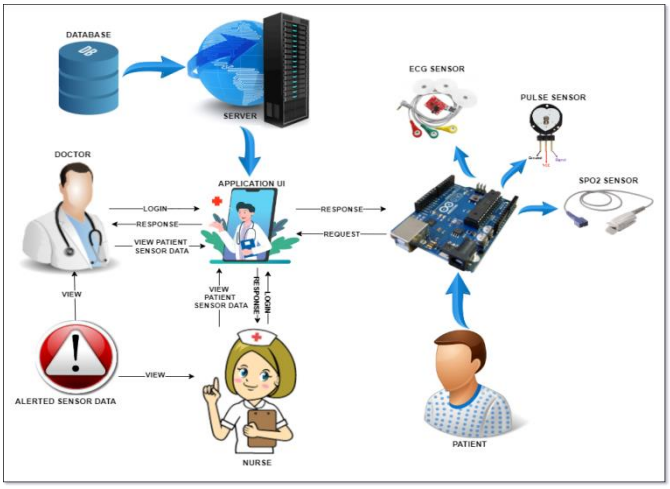

Fig:Block Diagram

The architecture of the IoT-based ECG monitoring system is illustrated in "Fig.1", which mainly consists of three parts, i.e., the ECG sensing network, IoT cloud, and GUI. The components used in ECG Sensing network are: ECG AD8232 Sensor, Raspberry Pi Model ECG Sensing Network: ECG sensing network is set for assembling physiological data from the body surface and pass on these data to IoT cloud through a wireless channel. In our equipment wearable ECG sensor has used to gather data from patient's body over long hours. Then the ECG signals are processed through amplification and filtering etc. to improve the signal quality. The ECG data gathered from sensors are transmitted to the IoT cloud via a specific wireless protocol such as Bluetooth, Wi-Fi, ZigBee etc. [7].With satisfying energy consumption all these three protocols can transfer enough data rates for transmitting ECG signals. Moreover, due to limited communication ranges of Bluetooth and ZigBee, Wi-Fi is used in our proposed system. Comparisons among various types of ECG sensing networksIoT Cloud: With the help of IoT cloud in ECG monitoring system we can store data, modify data and all the patient's information's are saved here. It can also send disease warning and protecting patients from getting injured. C. GUI: Graphical User Interface (GUI) is used for data imagination management. It contributes easy entry of the data in the IoT cloud. Users can log onto the cloud to acquire visualized ECG data in real time. Generally mobile applications and web pages are the two kinds of GUI's are available for users to visualize ECG data. Although mobile app can ensure immediate response but web pages are the best options in terms of protection and up-gradation.

CONCLUSION

Smart ICU system based on android technology, low cost, portable, energy efficient has given satisfactory results. The system makes the use of sensors along with EMG sensor ,ECG sensor,LM35 Thermister sensor, Humidity sensor DHT-11,Load Cell.The body parameters of a person sensed by the sensors are sent to the cloud with the help of Wi-Fi shield and the sensor details are displayed for doctors on the mobile application preinstalled on the android phone. For such critical conditions the doctors need to have an all time update patient's health related parameters like their blood pressure, heart pulse and temperature. In this way IOT Based ICU Patient Monitoring System that helps in monitoring ICU Patients without any manual intervention.

REFERENCES

[1] Tamanna Shaown,ImamHasan,Dr.MdShohrab Hossain, "IoT-based Portable ECG Monitoring System for Smart Healthcare".1st International Conferenceon Advances in Science,2019(ICASERT 2019)

[2] M. Surya Deekshith Gupta, VamsikrishnaPatchava, Virginia Menezes. "Healthcare based on IoT Using Raspberry Pi", 2015 International Conference on Green Computing and Internet of Things ((ICGCIoT), 2019

[3] Tatiana Huertas, Diego Mendez."Biomedical IoT Device for Self – Monitoring Applications", Springer, 2016

[4] B. G. Ahn, Y. H. Noh, and D. U. Jeong. Smart chair based on multi heart rate detection system. In 2015 IEEE SENSORS, pages 1–4, Nov 2015.

[5] S. H. Almotiri, M. A. Khan, and M. A. Alghamdi. Mobile health (m-health) system in the context of iot. In 2016 IEEE 4th International Conference on Future Internet of Things and Cloud Workshops (FiCloudW), pages 39–42, Aug 2016

[6] Banerjee S, Roy S. Design of a photo plethysmography based pulse rate detector. Int J Rec Trends Eng Res. 2016;2:302–6.

[7] Gregoski MJ, Mueller M, Vertegel A, Shaporev A, Jackson BB,Frenzel RM, Sprehn SM, Treiber FA. Development and validation of a smartphone heart rate acquisition application for health promotion and wellness telehealth applications. Int J Telemed Appl. 2012

[8] Oresko JJ, JinZhanpeng, Cheng Jun, Huang Shimeng, Sun Yuwen, Duschl H, Cheng AC. A wearable smartphone-based platform for real-time cardiovascular disease detection via

electrocardiogram processing. IEEE Trans Inf Technol Biomed. 2010.

[9]Trivedi S, Cheeran AN. Android based health parameter monitoring. In: 2017 International conference on intelligent computing and control systems (ICICCS). IEEE; 2017. p. 1145–9.

[10]I. Chiuchisan, H. N. Costin, and O. Geman. Adopting the internet of things technologies in health care systems. In 2014 International Conference and Exposition on Electrical and Power Engineering (EPE), pages 532– 535, Oct 2014.