ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 6, June 2017

An IOT Based Health Care Monitoring System-A Review

Sneha N. Malokar [1], Samadhan D. Mali[2]

Department of Electronics and Telecommunication, Sinhagad College of Engineering, Vadgaon, BK, Pune, India

ABSTRACT: Generally in critical case patients are supposed to be monitored continuously for their Heart Rate, oxygen saturation level and temperature as well. In the previous methods, the doctors need to be present physically on sight or in several cases SMS will be sent using GSM. In the earlier case only current data is displayed, the history of the patient cannot be displayed. In the current paper, we are analyzing different methods and techniques used for health care monitoring system where doctor can continuously monitor the patient's condition on his smart phone and also the patient history will be stored on the web server and doctor can access the information whenever needed from anywhere.

I. INTRODUCTION

A recent healthcare system should provide better healthcare services to people at any time anywhere in an affordable and patient friendly manner. Currently, the healthcare system is going to change from a traditional approach to a modernized patient centered approach. In the traditional way the doctors play the major role. For necessary diagnosis and advising they need to visit the patients. There are two basic problems related to this approach. Firstly, the healthcare professionals must be at place of the patient all the time and second, the patient remains admitted in the hospital, wired to bedside biomedical instruments, for a long period of time. In order to solve these two problems the patient oriented approach has been received. In this theme, the patients are aware with knowledge and information to play a more active role in disease diagnosis, and prevention. The important element of this second approach is a reliable and readily available patient monitoring system (PMS). Health is one of the global challenges for humanity [6]. According to the constitutions of World Health Organization (WHO) the highest attainable standard of health is a fundamental right for an individual. Healthy persons can secure their lifetime income and hence to increase in gross domestic product and in tax revenues. Healthy persons can also reduce pressure on the already overwhelmed hospitals, clinics, and medical professionals and reduce workload on the public safety charities, networks, and governmental or non-governmental centers. To keep people effective and healthy, a readily accessible modern healthcare system is a prerequisite [6].

II. MOTIVATION

By 2050 India will become home to one out of six older persons. The elderly population is growing at a fast rate in India and in the world, only China having larger number of older people, estimates United Nations Population Fund. A report given by this organization says that about 90 million elderly persons lived in India in 2015 and is expected to grow upto 173 million till 2026. In such scenario there is going to be huge increase in the medical assistance and healthcare needs for this elderly population. A comprehensive and separate health care to senior citizens would be in much demand sooner. Hence it is very necessary that the health care system in India must reach a level to provide accessible and affordable health care to elderly particularly to offer treatment and diagnostic services for the management of chronic diseases.

III. OBJECTIVES

Wearable IoT devices have more demand in the market, due to the availability of Internet for a decent price and well accessibility. Following are some important objectives of healthcare monitoring system[10].

a) To get the information about human health in real time via IoT wearable device.

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b) Analysis and Prediction of chronic disorders in primary stage through the data mining techniques which gives the methodology useful for decision making.

c) Preprocessing of data acquisitioned about human (if necessary).

d) To bring IoT-based healthcare monitoring solutions, anywhere, anytime.

IV.LITERATURESURVEY

The reviews from different papers are taken and studied. A some of them are given below.

Kaleem Ullah,MunamAli Shah [1] This presents the model named as 'k-Healthcare' makes use of four layers, sensor layer, network layer, internet layer and service layer. There are different sensor used like RTX-4100,Aurduino, Raspberry Pi, pulse oximetry and smart phone sensors. Communication between layers is done through IEEE 802.15.4, 802.15.6, IEEE 802.11/b/g/n, Zigbee etc. For data storage management the system used cloud storage. The proposed system support different protocols and like HTTP, HTTPs, RESTful and Javascript web services. Punit Gupta,Deepika Agrawal [2] The proposed system is enough intellegent to monitore the health parameters of patient. In the hardware they used 2nd generation Intel Galileo, a 32-bit Intel Pentium processor system on chip. It is considered as the brain of the given model. As it provides Linux platform with high processing and computer power, it prefers over Arduino. This collects the data from all the sensors which are connected to the patient and upload this data on the web page through Ethernet. Here they used XD-58C pulse sensor for measuring heart beats, it takes +3.5v to +5v at VCC, 50Hz to 60Hz frequency. For temperature calibration they have used LM-35 temperature sensor and Xampp based data base server used for patient's timely record.
Prosanta Gope and Tzonelih Hwang [3] This paper presents a BSN i.e body sensor technology. It consists of wearable and implementable biosensors like EMG (Electromyography), ECG (Electrocardiogram), Blood pressure etc. BSN care server used wireless communication using 3G/GPRS/CDMA. Here they mentioned key security requirements like data integrity, data privacy, data freshness etc. To achieve security requirements here they proposed a lightweight anonymous authentication protocol and to get data security requirements, used OCB i.e. offset codebook (OCB) authenticated encryption mode.
Abhilasha Ingole, Shrikant Ambatkar [4] this paper based on basic health parameter monitoring without using heavy or bulky system. The credit card size minicomputer placed beside the patient's bed with power and results can see on the screen of computer which is in the same area network. It provides readings of body temperature and heart beat. For temperature monitoring system used DS18B20 sensor and for heart beat, it works on the principle of light modulation by blood flow through finger at each pulse. The detected values uploaded on the webpage. This web page created by written the code in HTML. As the Python is user friendly, used to interface different measurement parameters with Raspberry Pi. One can see the actual status of the system on LX Terminal.

Augustus E. Ibhaze, MNSE, Francis E. Idachaba [5] it is important to measure basic health parameters for aged people often to reduce the risk of ill of falling and dying. So the microcontroller based system is designed to monitor the both heart rate and temperature. This system sends the text message to the mobile phone. When the readings are not normal or increased beyond the threshold level, the device makes used of the sim808 GPRS/GSM/GPS to send the reports of patient's health and the location to a doctor's and caretaker mobile phone. By using Aurduino microcontroller sensors attached to the finger of patient for measuring temperature and heart rate. Also it is designed to recognize the location of the patient. This device takes 9v powered battery. Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour [6]
Here authors used Arduino shield to connect different sensors like temperature LM-35 sensor, blood glucose sensor and blood pressure sensor. By using LabVIEW software one can take reading of different parameters from the patient's body. The updated data displayed on LabVIEW front panel using Data Dashboard application. This collected biometric information sent wirelessly via ZigBee. NgoManh Khoi, Saguna Saguna [7] this paper proposed as well as evaluated an architecture called as IReHMo. It is capable to operate many types of home automation sensors and health care IOT devices from the sensing layer. For IOT communication protocols such as HTTP, MQTT, CoAP used. CoAP reduced the bandwidth requirements and volume of generated data. It reduces nearly 56% of the required bandwidth for a

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remote health monitoring system. The author gave qualitative analysis by comparing IOT protocols like HTTP, MQTT, CoaP, AMQP according to architecture, security mechanism, QoS schemes and communication pattern. Won-JaeYi, Oishee Sarkar,Thomas Gonnot [8] This paper presents an architecture of fall detection system paired with the Wireless Intelligent Personal Communication Node(W-iPCN) and Android smartphone is presented. Data received from accelerometer and gyroscopes for falls detection through the W-iPCN. Bluetooth consumes more battery power. To overcome this problem, W-iPCN is introduced. 6LoWPAN is based on IEEE 802.15.4 MAC layer which gives flexibility with another packet switched network like internet. In the process they used one accelerometer on the patient's thigh i.e ADXL345 and a combination of one LSM303 accelerometer and one L3GD20H gyroscope on his chest. These sensors data can access by W-iPCN to check whether the patient is fallen , lying down, sitting down or upright.

Sufian Kaki Aslam and Jaffar Umar Thalib Saniie [9] This paper discusses the design flow and an architecture of a Tele-Health observation (THM). It uses effective usage of the computation and different inbuilt peripherals of STM32 microcontroller. This design is classified in three stages namely Biometric Data Acquisition; Data Processing and communication; Notification Panel and User Interface. Here they are using STM32F746NGH6 microcontroller, the discovery board gives Ethernet, 4.3 inch LCD-TFT, MicroSD card, MEMS digital microphone, USB host etc. TFT-LCD display has 480x272 pixel size with capacitive touchscreen capability. STN32 platform makes really easy to upload the program.

V. PROPOSED SYSTEM DESIGN

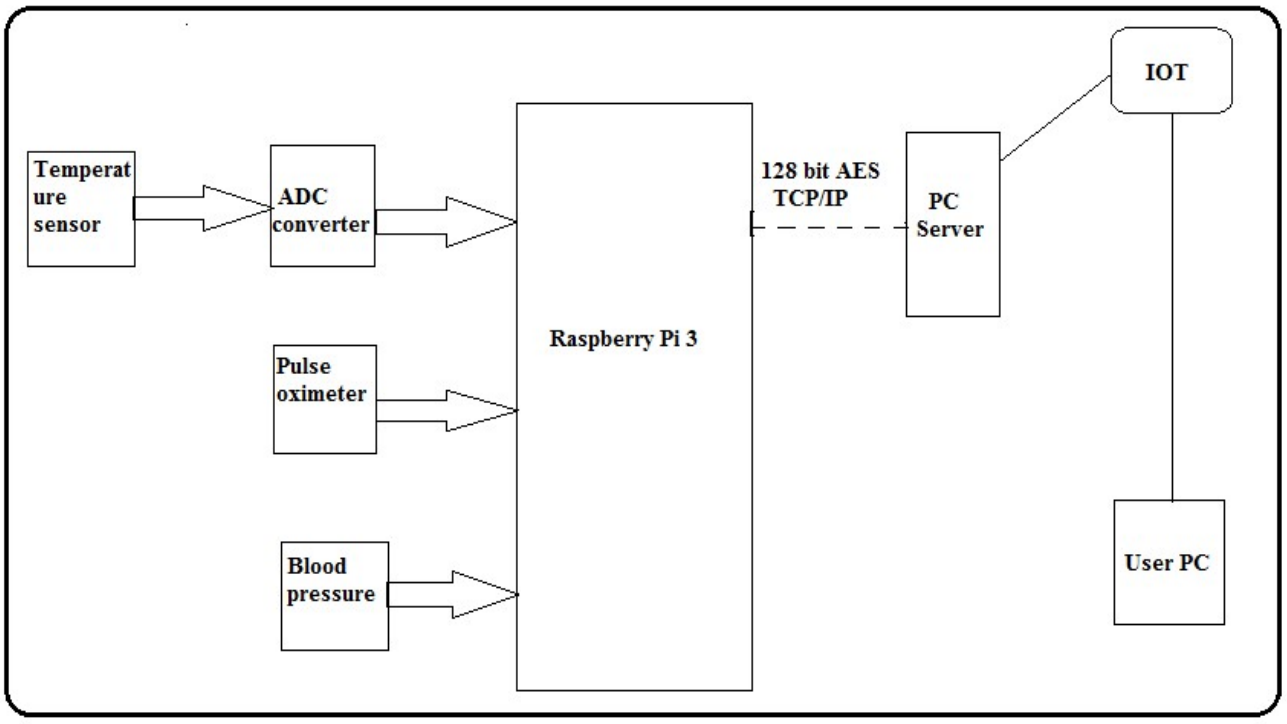

Fig1: Diagram of planned design

We are proposing the system according to the study of literature survey. Temperature detector converts the analog readings into digital by using analog to digital converter. By using python based pulse oxymetery detector count pulses as well as oxygen saturation level in the blood. Blood pressure detector detects blood pressure level i.e. systolic and diastolic blood pressure ranges of the patient's body. Python sends all information to the computer through the TCP/IP

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protocol. This data is encrypted with the help of AES 128-bit algorithm. Computer then decrypted the information and store at data base. All the information brows by PHP and HTML and show on web page.

VI. VISIONS OF SOME WELLKNOWN TECHNOLOGY FIRMS ABOUT IOT HEALTHCARE STATUS

This section provides the scope of the usage of IoT in government sector and industry side:
Microsoft and Google: Microsoft has concentrated on usage of an intelligent system to expose the power of IoT-based health care solutions. Google has uncovered its code for an open source physical web standard for an IoT, which can be taken as an try to arrange an easier approach to communicate with connected medical equipment [10] and powerful systems gives the backbone of technologies that permit for capturing the health data from devices to ensure required connectivity.

IBM and Intel: IBM shows success and value in health care through the notion of smarter health care systems. It has developed a set of IoT devices via partnerships of other well known firms in the world. IBM focuses on a numerous of healthcare solutions such as data governance for health care, connected home health and health analytics for healthcare servicers [10]. Intel mainly focuses on health data streaming and real-time synchronous communication systems, which helps to reduce the cycle time and improve the first-time quality of many existing medical workflow environments. Intel's aims are to bring the IoT-based healthcare solutions anywhere, anytime.

Qualcomm and CISCO: CISCO is working with leading healthcare organizations to develop medical-grade network architecture. CISCO is ready to give converged systems based on unrelated networks and can introduce effective algorithm for handling cumulative traffic loads originating from massively deployed IoT healthcare devices with advanced data analytics. The 2net Platform of Qualcomm Life offers a set of wireless health solutions that can deliver health device data to databases and an integrated portals from nearly all wireless medical equipment of users. Qualcomm is demanding to advance intuitive, intelligent and innovate IoT healthcare solutions.

Apple: The apple watch can be named as a smart watch, heart monitor or a fitness tracker. Apple has openly claimed in the world as the IoT as an ultimate technology. The Memorial Hermann healthcare system relies a completely on Apple's Solutions to provide efficient and connected healthcare services focusing on better care, secure access, physician gains [10].

Government Sector: Many countries like U.S, Germany, Japan, Korea, France, china, Australia taking initiatives to conduct the use of IoT in the healthcare region. Moreover the Indian government took lot of initiatives to encourage the IoT in healthcare. These efforts are foreseen for advancement for the use of IoT in India's Healthcare sector.

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TABLE I. COMPARISON AND ANALYSYS OF DIFFERENT IOT HEALTHCARE SYSTEMS

Authors	New Arch/ Model/Fra-mework	Technology (RFID/Wireless/3G/4G)	Emergency Aid	Standard	Multi Device	Application
Punit Gupta,Deepika Agrawal [2]	N	Wifi,3G,GPRS	Y	N/A	Y	System proposed to give proper and efficient medical services by collecting and connecting data through health status monitors.
Prosanta Gope and Tzonelih Hwang [3]	Y	BSN Technology 3G/ CDMA/GPRS	Y	N/A	Y	Model proposed to interpret and acquire IOT data emergency data handling and data sharing across hospitals.
Abhilasha Ingole, Shrikant Ambatkar [4]	N	Body sensor	N/A	N/A	Y	The proposed model standardize the medical data, access and store data store data, access and store in unified formal.
Augustus E. Ibhaze, MNSE, Francis E. Idachaba [5]	Y	GSM/GPRS/GPS	Y	N/A	Y	Proposed model provide heart rate, temperature, location of the patient at any given instant.

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Abdulla, Asma Ismael, Aisha Rashid, Ali Abou-ElNour [6]	Y	Zigbee,Wifi,3G,GPRS,Bluetooth	Y	802.15.4	Y	Proposed model gives the information about SPO2, GSR-sweating ECG, EMG.
Won-JaeYi, Oishee Sarkar,Thomas Gonnot [8]	6LOWPAN	Wifi, Buletooth	Y	802.15.4	Y	Proposed system gives the platform for fall detection.
Darshan K R, Anandkumar K R [10]	N	RFID, Wireless 3G	N/A	N/A	Y	Gives_basic requirements of health monitoring system, challenges, system, gets symptoms & resources automatically using machine learning algorithm.

VI. CONCLUSION

The health monitoring system proposed in this paper is developed to provide much needed patient health history in the real time to the doctors. The primary need of our paper is to monitor the system using wireless sensor system with high accuracy and security. Based on the survey, we have been able to use mobile devices and can be implemented in a global network with the help of the Raspberry-Pi.

REFERENCES

[1] Kaleem Ullah, MunamAli,"Effective Ways to Use Internet of Things in the Field of Medical and Smart Health Care", 2015 International Conference on Identification, Information, and Knowledge in the Internet of Things, 978-1-4673-8753-8/16/$31.00 ©2016 IEEE.
[2] Punit Gupta1, Deepika Agrawal2, Jasmeet Chhabra3, Pulkit Kumar Dhir4-" IoT based Smart HealthCare Kit" Jaypee University of Information Technology .Himachal Pradesh, India©2016 IEEE.
[3] Prosanta Gope and Tzonelih Hwang, "BSN-Care: A Secure IoT-Based Modern Healthcare System Using Body Sensor Network" IEEE Sensors Journal, Vol. 16, no. 5, March 1, 2016,IEEE 1558-1748 © 2015 IEEE.

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International Journal of Innovative Research in Computer and Communication Engineering

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Website: www.ijircce.com

Vol. 5, Issue 6, June 2017

[4] Abhilasha Ingole, Shrikant Ambatkar, Sandeep Kakde,"Implementation of Health-care Monitoring System using Raspberry Pi" This full-text paper was peer-reviewed and accepted to be presented at the IEEE ICCSP 2015 conference., 978-1-4799-8081-9/15/$31.00 © 2015 IEEE.
[5] Augustus E. Ibhaze, MNSE, Francis E. Idachaba, "E-Health Monitoring System for the Aged" 2016 IEEE International Conference on Emerging Technologies and Innovative Business Practices for the Transformation of Societies (EmergiTech), 978-1-5090-0706-6/16/$31.00 ©2016 IEEE.
[6] Amna Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour, and Mohammed, "Real time wireless health monitoring application using mobile devices" International Journal of Computer Networks & Communications (IJCNC) Vol.7, No.3, May 2015, DOI : 10.5121/ijcnc.2015.7302.
[7] Ngo Manh Khoi, Saguna Saguna, "IReHMo: An Efficient IoT-Based Remote Health Monitoring System for Smart Regions" 2015 17th International Conference on E-health Networking, Application & Services (HealthCom), 978-1-4673-8325-7/15/$31.00 ©2015 IEEE.
[8] Won-Jae Yi, Oishee Sarkar, Thomas Gonnot, Ehsan Monsef and Jafar Saniie ,"6LoWPAN-enabled Fall Detection and Health Monitoring System with Android Smartphone", 978-1-4673-9985-2/16/$31.00 ©2016 IEEE.
[9] Sufian Kaki Aslam and Jafar Saniie,"Architecture and Design Flow of Tele-Health Monitoring System using STM32 Platform", 978-1-4673-9985-2/16/$31.00 ©2016 IEEE.
[10] Darshan K R, Anandakumar K R "A Comprehensive Review on Usage of Internet of Things (IoT) in Healthcare System", International Conference on Emerging Research in Electronics, Computer Science and Technology – 2015, 978-1-4673-9563-2/15/$31.00 ©2015 IEEE.
[11]http://electriciantraining.tpub.com/14179/css/Figure-4-1B-Block-Diagram-Of-A-Basic-Power-Supply-172.htm
[12]https://www.google.co.in/search?q=block+diagram+of+aes+algorithm&rlz=1C1CHZL_enIN715IN715&espv=2&biw=1366&bih=662&tbm=isch&tbo=u&source=univ&sa=X&ved=0/Figure-2-1B-Block-Diagram-Of-AES.htm.