

IoT Based Patient Health Monitoring System

Pratiksha Nade¹, R P Shelkikar²

¹Student, Department of Electronics and Telecommunications Engineering, TPCT's College of Engineering, Osmanabad, Maharashtra, India

²Department of Electronics and Telecommunications Engineering, TPCT's College of Engineering, Osmanabad, Maharashtra, India

Abstract— The healthcare monitoring systems has emerged as one of the most vital system and became technology oriented from the past decade. Humans are facing a problem of unexpected death due to various illness which is because of lack of medical care to the patients at right time. The primary goal was to develop a reliable patient monitoring system using IoT so that the healthcare professionals can monitor their patients, who are either hospitalized or at home using an IoT based integrated healthcare system with the view of ensuring patients are cared for better. A system is developed which can provide real time online information about physiological conditions of a patient mainly consists of sensors, the data acquisition unit, microcontroller, and programmed with a software. The patient's temperature, heartbeat rate, ECG data are monitored, displayed and stored by the system and sent to the doctor's mobile containing the application. Thus, IoT based patient monitoring system effectively monitor patient's health status and save life on time.

Keywords—Healthcare monitoring system; IoT; heartbeat rate; sensors; ECG

I. INTRODUCTION

The increased use of mobile technologies and smart devices in the area of health has caused great impact on the world. Health experts are increasingly taking advantage of the benefits these technologies bring, thus generating a significant improvement in health care in clinical settings. Likewise, countless ordinary users are being served from the advantages of the M-Health (Mobile Health) applications and E-Health (health care supported by ICT) to improve, help and assist their health.

According to the constitutions of World Health Organization (WHO) the highest attainable standard of health is a fundamental right for an individual. As we are truly inspired by this, we attempt to propose an innovative system that puts forward a smart patient health tracking system that uses sensors to track patient vital parameters and uses internet to update the doctors so that they can help in case of any issues at the earliest preventing death rates.

Patient Health monitoring using IoT is a technology to enable monitoring of patients outside of conventional clinical settings (e.g. in the home), which may increase access to care and decrease healthcare delivery costs. This can significantly improve an individual's quality of life. It allows patients to maintain independence, prevent complications, and minimize

personal costs. This system facilitates these goals by delivering care right to the home. In addition, patients and their family members feel comfort knowing that they are being monitored and will be supported if a problem arises.

II. LITERATURE SURVEY

S. J. Jung and W. Y. Chung studied the Flexible and scalable patient's health monitoring system in 6LoWPAN. The main advantage of this enabling factor is the combination of some technologies and communications solution. The results of Internet of Things are synergetic activities gathered in various fields of knowledge like telecommunications, informatics and electronics.

K. S. Shin and M. J. Mao Kaiver studied a cell phone based health monitoring system with self analysis which incorporates IoT [13] a new paradigm that uses smart objects which are not only capable of collecting the information from the environment and interacting the physical world, but also to be interconnected with each other through internet to exchange data as well as information.

Gennaro tartarisco and Tabilo Paniclo had studied a Maintaining sensing coverage and connectivity in large sensor networks mainly includes the information about how to build or develop a new computational technology based on clinical decision support systems, information processing, wireless communication and also data mining kept in new premises in the field of personal health care.

Cristina Elena Turcua studied Health care applications a solution based on the Internet of Things survey aims to present a detailed information about how radio frequency identification, multi-agent and Internet of Things technologies can be used to develop and improve people's access to quality and health care services and to optimize the health care process.

Gubbi, Jayavardhana, Buyya, Rajkumar, Marusic, Slaven, Palaniswami, Marimuth studied the Internet of Things (IoT): A vision, architectural elements, and future direction which proposes on demand positioning and tracking system. It is based on Global Positioning enabled devices and suitable for large environments. Smart phones between two terminals are used for making initial communication. The initial communication is performed by synchronization phase.

J.L. Kalju developed a system, which is capable of measuring different physiological parameters and are used to design a system for heart rate reconstruction for rate adaptive pacing.

Loren Schwiebert, Sandeep K.S. Gupta and Jennifer Weinmann studied the strength of smart sensors which are developed from the combination of sensing materials along with combined circuitry for other biomedical applications.

Gentili G.B proposed a simple microwave technique to monitor the cardiac activity. This technique is dependent on changes in modulation envelope of amplitude modulated waves passing through the body. It explained the use of wireless microsensors networks for medical monitoring and environmental sensing.

Reza S.Dilmaghani(2016) in their study found the design of Wi-Fi sensor network that is capable of monitoring patient’s chronic diseases at their home itself via a remote monitoring system. So immersing of wireless sensor technology individual test like only blood pressure, heart rate, temperature etc. can be measured but this research project enables all this parameter together to be measured under single system, and also thus all can be worn by patient and processed data send toward internet through internet of things(IOT).

III. PROPOSED WORK

Our project is comprised of both hardware and software. In hardware part, heartbeat and temperature sensors are used. Therefore, Nodemcu integrates with the GSM Module. When the heartbeat and temperature are measured, Nodemcu ESP8266 module helps to upload it on Web server and GSM is used for send text message if it’s critical.

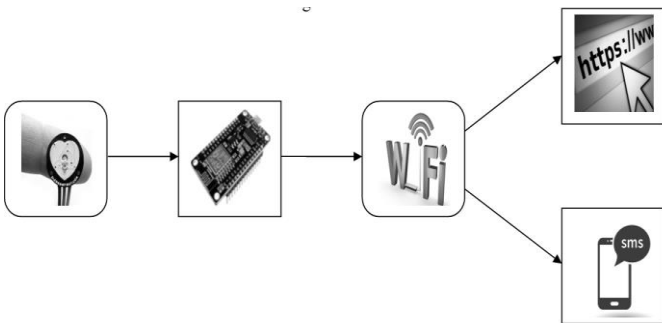


Figure 1: system model for heart beat sensor

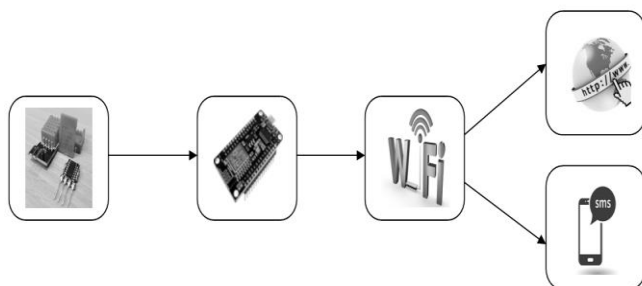


Figure 2: System model for temperature sensor

A. Block Diagram

As shown in below block diagram, our project is comprised of both hardware and software. In hardware part, heartbeat and temperature sensors , GSM Module ,power supply are used.

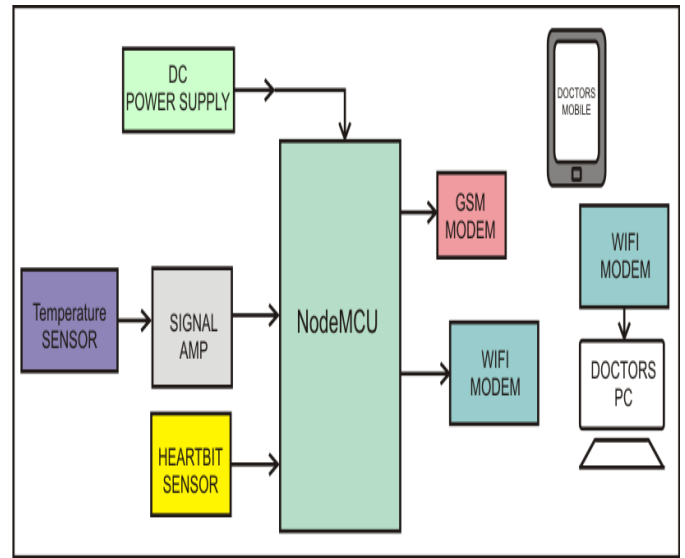


Figure 3: Block Diagram

- **Node Mcu:** Nodemcu is main control unit of our system. The input part i.e heartbeat and temperature sensor connected to Nodemcu. Nodemcu integrates with the GSM Module. When the heartbeat and temperature are measured Nodemcu ESP8266 module helps to upload it on Web server and GSM is used for send text message if it’s critical.
- **Heartbeat sensor:** Heart beat sensor is designed to give digital output of heart beat when a finger is placed inside it. This digital output can be connected to Nodemcu directly measure the Beats per Minute (BPM) rate.
- **Temperature sensor :** Temperature sensor is used for measuring body temperature of patient and it gives values in digital form.
- **GSM module :** GSM module integrated with Nodemcu. GSM is used for send text message if patient’s health is critical.

B. Hardware Implementation

To run the system first we need to connect nodemcu with the power supply as nodemcu is the main control unit. In input side, we have heartbeat sensor, temperature sensor . On the other hand, output is shown on web page. Moreover, ESP8266 WiFi Module helps to send data in the cloud and when the data gets uploaded, we can check the output by using Laptop or Computer by log in to the server. First of all, a finger is placed in the heartbeat sensor and push button is also pressed so that the system can read data. It can upload the output on webpage and send text message through GSM module, Similar process is done with the temperature sensor. For ECG curve

plotter is used, and the curve is obtained by using heartbeat values. This is all about the block diagram which shows the entire process of hardware.

IV. RESULTS

After connecting and programming all the components with each other, we have performed the experiment. According to the proposed system, we have designed prototype Iot based Patient monitoring System. Nodemcu, GSM module and all the sensors are connected with wires.

A. Heartbeat Result

Heartbeat sensor is designed to give digital output of heart beat when a finger is placed inside it. This digital output can be connected to Nodemcu directly measure the Beats per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger each pulse.

B. Temperature Sensor Result

Body temperature is one of the important signs to provide insight into the physiological state of person. The normal core body temperature is approximately 37C. An abnormal body temperature may be considered as an important indicator that the person is suffering from an infection, fever, or low blood flow due to circulatory shock. The body temperature of a healthy person may also vary marginally depending on the time of measurement during the day and the location of measurement on the body.

We have checked the data which is taken from 30 various people having specific age limit.

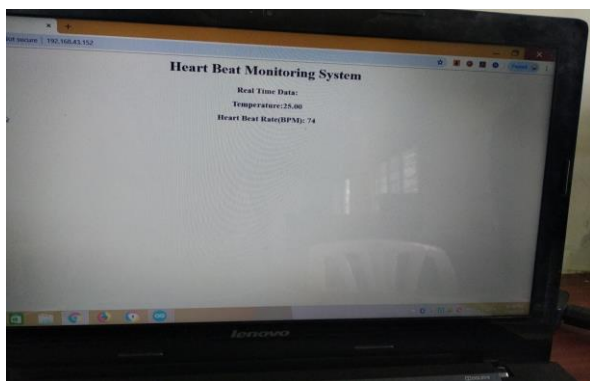


Figure 4: Heartbeat and Temperature sensor result in webpage

V. CONCLUSION

Thus, the proposed system could gather, reading of various important indications of the patient and after that evaluate at cloud then caution the doctor or concerned individuals about the health condition. It monitors the vital signs and sense abnormalities. These abnormalities alert the medical staff, it reduces the manual monitoring. The system is based on IoT and sends the data to cloud platform. This message protocol transmits the readings of important patient's vital sense and helps a web interface to give a pictorial representation of

information. Also, if doctor is not present in campus, he will receive a SMS on his mobile phone in case any of the parameter goes beyond the normal range.

REFERENCES

- [1] S. J. Jung and W. Y. Chung, "Flexible and scalable patient's health monitoring system in 6LoWPAN," *Sensor Lett.*, vol. 9, no. 2, pp. 778–785, Apr. 2011.
- [2] W. Y. Chung, C. Yau, K. S. Shin, and R. Myllylä, "A cell phone based health monitoring system with selfanalysis processor using wireless sensor network technology," in *Proc. 29th Annu. Int. Conf. Eng. Med. Biol. Soc.*, Lyon, France, 2007, pp.
- [3] G. Lawton, "Machine-to-machine technology gears up for growth," *Computer*, vol. 37, no. 9, pp. 12–15, Sep. 2004.
- [4] C. Kim, A. Soong, M. Tseng, and X. Zhixian, "Global wireless machineto- machine standardization," *IEEE Internet Comput.*, vol. 15, no. 2, pp. 64–69, Mar.–Apr. 2011.
- [5] Real time wireless health monitoring application using mobile devices, *International Journal of Computer Networks & Communications (IJCNC)* Vol.7, No.3, May 2015, Amna Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour, and Mohammed Tarique.
- [6] Secured Smart Healthcare Monitoring System Based on Iot, *International Journal on Recent and Innovation Trends in Computing and Communication* Volume: 3 Issue: 7, Bhoomika.B.K, Dr. K N Muralidhara.
- [7] Real time wireless health monitoring application using mobile devices, *International Journal of Computer Networks & Communications (IJCNC)* Vol.7, No.3, May 2015, Amna Abdullah, Asma Ismael, Aisha Rashid, Ali Abou-ElNour, and Mohammed ,Tarique.
- [8] Secured Smart Healthcare Monitoring System Based on Iot, *International Journal on Recent and Innovation Trends in Computing and Communication* Volume: 3 Issue: 7, Bhoomika.B.K, Dr. K N Muralidhara.
- [9] Goutam Motika, Abinash Prusty," Wireless FetalHeartbeat Monitoring System Using ZigBee & IEEE 802.15.4 Standard", 2011 Second International Conference on Emerging Applications of Information Technology, 978-0- 7695-4329-1/11, 2011 IEEE DOI 10.1109/EAIT.2011.89 .
- [10] S. M. Mahalle, P. V. Ingole, "Design and Implementation of Wireless Body Area Sensor Network Based Health Monitoring System", *International Journal of Engineering Research & Technology*, Vol. 2 Issue 6, pp. 105- 113, June 2013.
- [11] M.Prakash, CJ Kavitha Priya, "An Analysis of Types of Protocol Implemented in Internet of Things Based on Packet Loss Ratio", *Proceedings of International Journal of Information and Communication Technology for Competitive Strategies*, ISBN: 978-1-4503-3962-9, DOI: <https://doi.org/10.1145/2905055.2905085>, 4th – 5 th Mar 2016
- [12] M. Prakash, U. Gowshika, T. Ravichandran, "A Smart Device Integrated with an Android for Alerting a Person's Health Condition: Internet of Things" *Indian Journal of Science and Technology*, Vol 9 (6), February 2016. DOI: <https://doi.org/10.17485/ijst/2016/v9i6/69545>
- [13] Dr.A.Sabanayagam, G.Anish Giriya," DESIGN AND MODELING OF MOBILE HEALTH MONITORING SYSTEM", *International Journal of Innovations in Scientific and Engineering Research (IJISER)*,vol4,no 2,pp.63- 65,2017.
- [14] "Healthcare Monitoring System Using Wireless Sensor Network", D. Mahesh Kumar, Department of Electronics, PSG College of Arts and Science, Coimbatore - 641 014. Volume 04, Issue 01 Pages:1497-1500 (2012), ISSN:0975-0290.
- [15] <https://www.ibm.com/blogs/internet-of-things/6-benefits-of-iot-for-healthcare/>