

# IOT BASED PATIENT MONITORING SYSTEM

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## Abstract

*Health is the most important factor for human being. Hence it is essential to monitor the health parameters. For continuous monitoring the patients, there are doctors and caretaker in hospitals. But when patient returns to home. There is no facility to look after them or check the patients. Hence to overcome this problem, there is a new solution i.e. patient monitoring using IOT. Hence patient's data such as heart rate, blood pressure, temperature, ECG, position, blood oxygen etc. can be measured and sent to the server. To measure this parameters different sensors are connected to the patient's body. Then this information will be uploaded to the webpage. Doctors can access this data by typing the log in details such as user name and password. Hence continuous monitoring can be accomplished. IOT plays the major role in this system. The system we have proposed will monitor heart rate, temperature and saline level. The data will be transmitted using Wi-Fi module. We are using IOT Gecko which is an opensource platform to design IOT system*

**Keyword:** Healthcare, Internet of Things, patient monitoring.

## 1. INTRODUCTION

Internet provides many services for education, business, shopping, industries, social networking, entertainment, finance etc. Internet of Things is the next popular system of Internet. Using Internet of Things, we can share, communicate data with the help of webpages over internet using different protocols. The objects are connected to collect the data, analyze, used to initiate required action which provides a network to analyze, plan and decision making.

IOT is about connecting devices to the Internet and using the connection for controlling and remote monitoring of their devices. IOT is making smart network which can be controlled and planned through internet. Systems are developed with embedded technology that allows them to exchange information among each other over the internet. It is assumed that around 8 to 50 billion devices would get connected and then they will communicate by the end of 2020.

The concept of internet of Things stands on wireless network, sensors and gateway, which enables user to share communicate and then access the data or information. The IOT technology has a huge data about human, objects, time and space. By combining the current Internet technology and IOT provides a large amount of space and smart service based on low cost sensors and wireless

communication. Hence if we use Internet of Things in the area of medical, then monitoring the patients will become very easy.

## 2. LITERATURE SURVEY

From given description, the IOT plays a very important role in healthcare with the help of various sensor.

### A. Architecture:

[1] Punit Gupta, Deepika Agrawal, Jasmeet Chhabra, Pulkit Kumar Dhir, have proposed a model. It shows the implementation of an "IoT based Smart Health Care Kit" for urgent medical cases which provide support to services. They have used an INTEL GALILEO second Generation Development Board. Doctors can help in urgent services in earlier state. Galileo Board collects data from sensors connected to patient and the data is transmitted to a webpage through ethernet for temperature calibration. They had used LM35 sensor and Xampp based data served used for patients timely record.

[2] Abhilasha Ingole, Shrikant Ambatkar, Sandeep Kakde have proposed a paper which describes "Implementation of Healthcare monitoring System using Raspberry Pi". This model is implemented to check the temperature of body and heartbeat of patients at runtime. It is focused on collecting the physical parameter and then that information is made available for multiple users. They have used Raspberry Pi B+ model. It is interacted with different parameters measuring unit. In this system, basic health parameter are considered and monitored. The operating temperature range of DS18B20 is  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  and it provides the accuracy about  $\pm 0.5^{\circ}\text{C}$  over the range of  $-10^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . Each DS18B20 is provided with a unique 64-bit serial code.

[3] Augustus E. Ibhaze, MNSE, Francis E. Idachaba, Ezimah C. Eleanor have designed a system called "E-health Monitoring System for the Aged". This system checks the heartbeat as well as temperature of patients simultaneously with the pulse sensors and the temperature sensors by populating a centralized database with its reading of defined intervals. If the readings get raised above threshold values set in program, then this device makes use of GSM, GPRS or GPS shield to transmit the readings. By using Arduino microcontroller sensors attached to the figure of the patient for measuring temperature and heart rate. Also it is designed to recognize the location of the patients. This device takes gv powered battery.

[4] Prosanta Gope and Tzonelih Hwang proposed a model, "BSN Care: A Secure IoT Based Modern Health Care System Using Body Sensor Network". This system represents a body sensors technology. It consist of wearable body sensors like EMG(Electromyography), ECG (Electrocardiogram), blood pressure etc. It uses wireless communication using 3G/GPRS/CDMA. To achieve security requirements, they proposed an authenticated protocol and to acquire data security requirements. Used OCB i.e offset codebook authenticated encryption mode.

[5] Kaleem Ullah, Munam Ali Shah, This presents the system called as 'k-Healthcare'. It uses four layers, sensor layer, network layer, internet layer and service layer. They have used sensors like smart phone sensors, RTX-4100, Arduino, Raspberry Pi, pulse oximetry. 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.

[6] A.Divya, K.Keerthana, N.Kiruthikanjali, G.Nandhini and G.Yuvaraj, This paper show "Secured Smart Healthcare Monitoring System based on IOT". In this paper, Microcontroller PIC16F877A is used, to collect sensor data. Then it is sent through Internet of Thing. The data is protected. It can be accessed by the doctors at any time in any browser at Laptop, Tablet, Mobile phone. Then it is possible to check the health status of the patient. LCD is connected to PIC16F877A. It displays the healthcare data. HTML webpage is automatically refreshed in each 15 seconds, hence the status of health can be regularly sent to the caretaker.

[7] Meria M George, Nimmy Mary Cyriac, Sobin, Mathew,Tess Antony, This system proposes a patient health monitoring system using IoT and android. It consists of temperature sensor ECG sensor, Heartbeat sensor and accelerometer. These sensors are attached to Arduino board. The readings from microcontroller are given to web with the help of Ethernet shield. The parameters can be seen by android app which will be installed in doctor's smartphone. The health parameter value are saved and uploaded online.

[8] Duddela Dileep Kumar & Pratti Venkateswarlu, This model proposes a "Secured Smart Healthcare Monitoring System Based on IOT" .In this system ATMEGA8 Microcontroller gathers sensor data and transmits it to web server. This data can be viewed by doctors by typing the URL in internet browser.

[9] Aruna Devi.S,Godfrey Winster.S, Sasikumar.S, In this paper they have proposed a "PatientHealth Monitoring System (PHMS) Using IoT Devices".Body Area Network is used to gather the health parameter values from patients. The parameters used to recognize the disease can change from one disease to another. Hence every parameter can be sensed by different sensors which are attached to the

patient. The devices attached to the body of the patient are known as BAN in the phase of data collection. The sensors used in this model are Blood pressure module (for checking blood pressure), Heart rate module (for pulse rate) and temperature sensor (to collect temperature data) of the patient. The transmission device used in the transmission phases is Wi-Fi or Bluetooth. A mobile application design for the doctor to check health status of the patient. Data is updated in every 60 seconds. Only the data collected in last three can be viewed.

### 3. COMPARISON AND CONTRAST ANALYSIS

By studying the reference papers, we found that some authors have proposed new systems and designs which are implemented to deploy IoT in the area of medical applications and healthcare. Some of the researchers follow IEEE papers to design their Internet of Things system to provide remote monitoring and emergency aid while some of the authors used other standard papers for their models. Some have just simply explained the applications of IoT in healthcare.

We present a performances, comparison and analysis of different systems in Table 1. We evaluate the proposed IoT architectures based on some parameters such as emergency aid, technology used, standards followed, and support for multi devices.

- Emergency Aid: Using IoT in the area of healthcare, the focus should be on the provision of the support in emergencies. The system must generate alarms to inform in the critical situations of patients to the doctors and their beloved ones.
- Technology: IoT supports various technologies like RFID, 3G, 4G networks GPS, GSM, GPRS, Bluetooth, zigbee, wi-fi etc. By using these technologies, one can obtain data related to person's medical status and send it

**Table1.** Comparison and Contrast Analysis

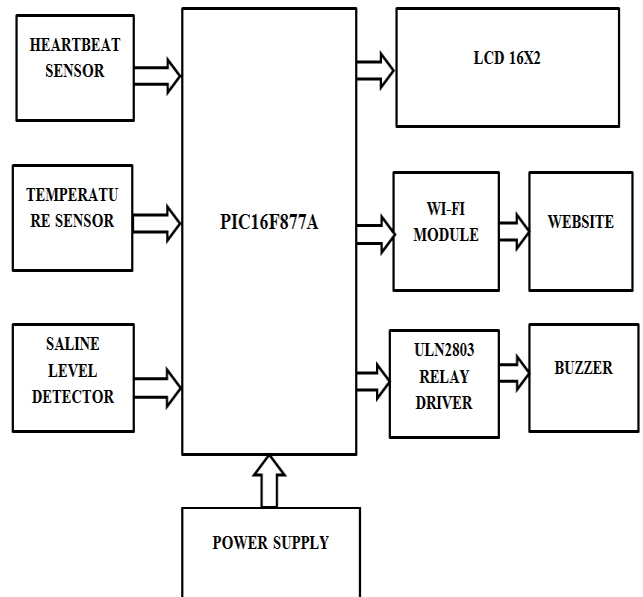
Authors	New Architecture/ Model	Technology	Emergency Aid	Multi - device	Application
Punit Gupta, Deepika Agrawal	No	Wi-fi, 3G, GPRS	Yes	Yes	System proposed to give proper and efficient medical services by collecting and connecting data through health status.
Abhilasha Ingole, Shrikant Ambatkar	No	Raspberry Pi, Wi-fi	No	Yes	The given system is designed for the medical data, access and store data.
Augustus E. Ibhaze, MNSE, Francis E. Idachaba	Yes	GSM, GPRS, GPS	Yes	Yes	The proposed system provides heart rate, temperature, location of patient at any time.
Prosanta Gope and Tzonelih Hwang	Yes	GPRS	Yes	Yes	Model proposed to interpret and get IOT data emergency data handling and data sharing with doctors.
Kaleem Ullah, Munam Ali Shah	Yes	RFID	No	Yes	Model proposed to provide a platform for accessing patient's health data by using smartphones and body sensors.
A.Divya, K.Keerthana, N.Kiruthikanjali, G.Nandhini and G.Yuvaraj	Yes	GSM Modem	Yes	Yes	This system is proposed to transmit the data on the webpage for regular monitoring of the patient over internet.
Meria M George, Nimmy Mary Cyriac, Sobin, Mathew, Tess Antony	Yes	Arduino, Ethernet shield	No	Yes	This model can be used for continuously monitoring using different sensors. It gives alerts using alarms in case of critical situation.
Duddela Dileep Kumar & Pratti Venkateswarlu	Yes	GSM Module	Yes	Yes	This model proposed to interpret data and to provide real time monitoring of the healthcare parameter.
Aruna Devi.S, Godfrey Winster.S, Sasikumar.S	Yes	Wi-fi, Bluetooth	No	Yes	This system is presented to monitor real time status of the patient irrespective of the presence of doctor.

to a remote server for further processing and storage. We can compare different systems and models on the basis of these technologies.

- **Protocols:**IoT supports various protocols like WBAN, ZigBee, Bluetooth, Wi-Fi, HTTP, IP, CoAP
- **Multi device support:** Different models and architectures can be compared based on multi device support. The efficient systems support many devices.

#### 4. PROPOSED SYSTEM

- In this system, we have proposed an “IoT based patient monitoring system”. Now a day for the patients, who stays in home after operational days, their checking is done by medical caretaker. But sometimes if the caretaker is not with them and if sudden change occurs in wellbeing parameter, then it results in harm. Situation can become worst so, the new technology “IOT-Internet of Thing” is used. We are proposing a system with which patient can be monitor from anywhere and at any time, their family can know their health status without being with them every time. Doctor can check their status from hospital.
- In this system, the main components are microcontroller PIC16F877A, Wi-Fi module (ESP8266) and IOT Gecko.
- PIC16F877A collects the health parameter values such as heartbeats, temperature and saline level using sensors which are connected to the body of patients. Then this data is uploaded using Wi-fi module ESP8266 to the IOTGecko where we have created our own webpage for our system. Doctors will have to type the username and password and then the data can be accessed.
- IOT Gecko is a development platform where we can design IOT based system easily. We can build our own system to handle or monitor IOT system on the web. We can process sensor obtained values and display online (Webpage). IOT Gecko easily debugs IOT system and integrates it easily with desirable language with API support for all platforms.
- **BLOCK DIAGRAM:**



#### 5. CONCLUSION

This Internet of Things technology may be used to establish an architecture which can communicate over internet for the better health monitoring. IoT would be used in various fields. The more benefits can be attempted in the field of healthcare. Hence this work is done to design health care system. From the literature survey, we can conclude that the patient monitoring system using IoT can provide better accuracy and ability to continuously measure the health status in real time. Hence an improvement in the area of healthcare. With these system doctors can examine the patients from anywhere and anytime.

#### REFERENCES

- [1]. Punit Gupta, Deepika Agrawal, Jasmeet Chhabra, Pulkrit Kumar Dhir-“ IoT based Smart HealthCare Kit” Jaypee University of Information Technology .Himachal Pradesh, 3.
- [2]. Abhilasha Ingole, Shrikant Ambatkar, Sandeep Kakde, “Implementation of Health-care Monitoring System using Raspberry Pi”, IEEE ICCSP 2015 conference., 978-1-4799-8081-9/15/\$31.00 © 2015 IEEE.
- [3]. Augustus E. Ibhaze, MNSE, Francis E. Idachaba, “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.
- [4]. 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.
- [5]. 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.

- [6]. A.Divya, K.Keerthana, N.Kiruthikanjali, G.Nandhini and G.Yuvaraj,"Secured Smart Healthcare Monitoring System Based On IOT, Asian Journal of Applied Science and Technology(AJAST) volume 1,Issue 2,Pages 53-56,March 2017
- [7]. Meria M George, Nimmy Mary Cyriac, Sobin Mathew, Tess Antony, "Patient Health Monitoring System using IoT and Android", Journal for research| Volume 02|Issue 01| March 2016,ISSN :2395-7549.
- [8]. Duddela Dileep Kumar& Pratti Venkateswarlu,"Secured Smart Healthcare Monitoring System Based on IOT", Imperial Journal of Interdisciplinary Research (IJIR), Vol-2, Issue- 10, 2016 ISSN: 2454-1362.
- [9]. Aruna Devi.S ,Godfrey Winster.S, Sasikumar.S," PatientHealth Monitoring System(PHMS) Using IoT Devices", International Journal of Compuetr science and Engineering Technology (IJCSET), Vol-7, March 2016, ISSN:2229-3345.