

# Review of IOT Based Health Monitoring System

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**Abstract**-The Internet of things has provided opportunity and applications for medical patients. The IOT applications are key enabling technologies in medical service. It is important way for taking care of patient's health. IOT is consisting of communication and sensors which are suitable tools for IOT based health care monitoring system. The aim of this review paper is to summarize various health parameters of human body using sensors proposed by different authors. In recent years more powerful IOT applications are developed as well wide range of opportunities are provided. Health monitoring system has been challenges for researchers. The important application of IOT system is it helps to decrease health related problems of patients.

**Index Terms**-Health care monitoring system, Temperature sensors, ECG sensors, Heart rate sensors, Blood pressure sensors.

## 1. INTRODUCTION

IOT application demand is very high these days. Basically, IOT is nothing but a network where all the physical objects are connected to the internet through various sensors, devices etc. Different objects are remotely controlled across an existing network. IOT is an intelligent technique which reduces human effort and data can be accessed easily through physical devices. No human interaction is required in this system as it contains autonomous feature through which devices are controlled.

Health problems are increasing at a high rate now a day. The introduction of a change in sensors technology is designed by a system that includes several sensors to collect information about human body parameters. It will be transmitted on an IoT platform that can be easily retrieved by the unprofessional people through the internet.

History about patients health can be monitored and analyzed using an accessible database which will be further used by the doctor. The data can be saved on the server permanently. The health monitoring system is capable of identifying various parameters of a human body are measured and further this information will be transmitted on an IoT through technologies. If any abnormal activity is recognized nearby the patient, the system automatically generates alerts and alert is sent to a personal doctor and family members in case of emergency.

Nowadays many devices are economically available for personal health care, activity awareness, and fitness. In hospitals the patients must be under continuous monitoring for a longer period so constant

monitoring is required. By using the internet of things we can observe various parameters of the patients continuously for longer duration. Hence we summarize IOT system which is helpful in producing useful internet applications for medical field.

## 2. MOTIVATION

The facilities in rural hospitals for health care are limited. Due to the lack of quality of health management enables issues in health care system. Everyone should be aware of their own health. Also, it should be beneficial for each. WHO defines the doctor-patient ratio will be 1:1000 which has been failed in India.

There is a lack of resources to reach out the problems of individuals in developing countries. It becomes very expensive for a common man to afford daily health check-up of his health. The IOT various system has been developed for this purpose to give assured services. These system reduces time with safely handled equipment.

## 3. LITERATURE SURVEY

In [1], author has presented "An IOT Based Health care monitoring system". Constant observation is required in hospitals where the patients are under medical care for a longer period of time. Although the patient is not in a critical situation, the doctors still need confirmation on their health parameters. Now a day, the expenses for hospitalization are high and expensive. So the health policies in various countries have shifted its focus from providing reactive, acute care to provide care outside the hospital. Hence author designs and build the sensing data that conditions the

system to display accurate body parameters of the patients.

The aim of this paper is to supervise the heart rate, blood pressure, temperature and ECG continuously through respective sensors. The recorded data is sent to the device and if the value exceeds, the alert message will be sent to the doctor.

In [2], author has presented "An IOT Based Smart Health care system using Raspberry Pi". They have used an exclusive sensor to monitor a patient's health parameters. Hence author has used platform Raspberry Pi for IoT. The Raspberry Pi is a platform which offers compact platform for a Linux server with a low cost. The combination of Raspberry Pi and IoT is a new changing technology in the healthcare system. Raspberry Pi collects various data from sensors and transfers to database. Cloud computing possess numerous advantages such as flexibility, highly automated, low cost etc. The Cloud's features enable customers to build and deploy their applications on virtual servers.

Here the author has concentrated over the idea of separating wireless sensor network and cloud computing. Once sensors are connected to patients' bodies, they start to receive and transmit data to the database sensors like temperature (DS18B20), heartbeat, blood pressure, ECG (AD8232) services available in the cloud are responsible for receiving, storing, and distributing patient's data.

In [3] author has presented "SInternet of Things as Key Enabler for Sustainable Healthcare Delivery". Here the author considers IOT as a global network infrastructure, linking physical and virtual objects. This architecture consists of existing and evolving internet and network developments. Exclusive object-identification, sensor and connection capability are offered. Hence sensors will be characterized by a high degree of data capture.

This paper aims to show how radio frequencies are identified and Internet of Things technologies allow patients to access healthcare services.

In [4], author has presented "Simulation of Health care Monitoring System in Internet of Things by Using RFID". Author has designed the effective healthcare monitoring system using the IoT. The health monitoring system plays a vital role with IOT; the RFID tag is used to initialize the bed system as a key. The sensors are used to observe the patient's condition frequently. The information report of patient is transmitted to the website through IOT system so that the doctor can know about the condition of the patient. The movable bed mechanism is used to adjust the bed according to the patient's condition. The

buzzer is to indicate the nearby persons that the patient is in critical situations.

In this paper, there is a discussion over the security requirements of authentication. Particularly they have represented a ECC-based RFID authentication in terms of implementation and authentication. Even though most of these cannot satisfy the security requirements and implementation.

In [5], author has presented "A Literature Survey in ECG Feature Extraction". Patient's health has been observed in this paper. There is a well organized health monitoring system developed and designed by author. The system enables the doctors to monitor patient's health parameters (temp, heartbeat, ECG, position). The parameters of the patient are measured continuously (temp, heartbeat, ECG) and wirelessly transmitted using zigbee.

It provides a solution for improving the performance and power management of the patient health monitoring system. The presented system is used to continuously observe and analyze the data in microcontroller. If a particular patient's health parameter falls below the particular range, SMS is sent to the doctor's mobile number using a standard GSM module.

They have used Zigbee for wireless networking. The doctor can collect a record of a particular patient's data by accessing the database of the patient on their respective PC which is persistently updated through Zigbee.

In [6], author presented "IOT Based Patient Monitoring System". It is a mobile physiological monitoring system that is capable of continuously monitoring the patient's heart rate using ECG. Using replaceable electrodes ECG sensor can be attached to the patient's chest. Signals produced during muscle contraction is sensed by the system and recorded. The signals collected from the body are converted to an electrical signal. This paper shows the use of smart healthcare system. This new technology is capable of offering a large range of benefits to patients through early detection of abnormal conditions.

In [7], author presented "Health Monitoring Systems using IoT and Raspberry Pi". IOT Raspberry Pi based health care monitoring system has been analyzed by author in this paper. Any unusuality in condition of patient health can be detected and informed to the related person of patient. The elemental component of ECG is Instrumentation Amplifier, which is responsible for taking the differences in the voltage. The exhibited system is efficient and easy to understand. It is a connection between patient and doctor.

In [8], author presented a "Review on-IOT Based smart healthcare system". Here architecture of Smart Health Care Monitoring and IOT is demonstrated by author. New technologies help in minimizing the better quality as well security concept. ECG signals are obtained by electrodes that are placed on the chest. Later wires are connected to ECG sensor (AD8232). The sensor is used in measuring the electrical activity of the heart. Problems and challenges that could be faced in future are presented by this system. Applications of IOT can be improved using new methodologies and technologies. Sensors like Blood pressure, Temperature, Heart rate, ECG are used in IOT along with Raspberry Pi kit and Wi-Fi module.

In [9], author has presented "An Overview on Heart rate Monitoring and Pulse Oximeter System". In this paper a low-cost device is described that measures the heart rate of the patient by placing sensors on the fingers, later the result will be displayed on LCD. The designed system can be used by unprofessional people. The change in heart rate can be displayed by graph using graphical LCD. Over a period of time, maximum and minimum heart rate can be displayed using the designed system. Abnormalities are displayed on LCD indicated by buzzer. In order to send heart rate to PC output should be attached.

In [10], author has presented "Heart rate Measurement from the Finger Using a Low Cost Microcontroller". IOT has a wide range of application. IoT has been developed for Wireless sensor network (WSN). Using IOT, health monitoring designs are presented. There are some problems that are related to health monitoring and IOT. New technologies help to minimize better quality as well as security concept. New technologies and methodologies are used. Arduino board, Wi-Fi modules, temperature, pulse oximeter, blood pressure, heartbeat rate sensors are used in IoT.

In [11], author has presented, "Heart Attack Detection and Heart Rate Monitoring Using IOT". In this paper with the help of observed heart rate through IOT device, heart attack can be detected. Here the methods used by author includes Arduino board, Wi-Fi module and pulse sensor. Pulse sensor will start sensing the heart rate readings once the system is set and heart rate of the patient will be displayed on LCD screen. Data can be transmitted over internet with the use of Wi-Fi module. By checking a patient's heart rate it can be determined if the patient is healthy or not based on heart rate displayed on the LCD screen. Limits are set to the system, heart rate of the patient is monitored and immediately alert message will be sent by the system if the heart rate goes below or above threshold value. They have implemented an application that will track and monitor heart rate of patient

correctly and message will be sent in case of possibilities of heart attack.

In [12], author has presented "Heart rate Monitoring System". This paper explains a unique contribution in identifying all components of an IOT healthcare system. A generic model is proposed that can be applied to IOT based healthcare monitor. It is important and no known end-to-end system is found for remote monitoring of health issues.

Here concentration is given more on the sensors to observe the various parameters of the patient body. The contribution is done by concentrating on LPWANs (Wide Area Network), by focusing on their unique suitability for use of IoT systems.

In [13], author has presented "Survey of IOT Based Patient Health Monitoring System". Here author proposes a smart health care system that includes smart identification tag, server and internet. Physiological conditions are provided by smart identification tag on the basis of medical report of the patient which is diagnosed by doctor via WLAN. The objective of this paper is to monitor the patient often. New technology proposed here is capable of providing a large range of benefits to patients. The author has proposed a mobile physiological monitoring system, which is capable of monitoring the patient's body parameters in the hospital. Sensing, and controlling are the functions of smart system and decision made is based on available data.

In [14], author has proposed "Survey Paper for Health Recommender System". Here various parameters of the human body are detected by the designed health monitoring system. Later this data is made available to doctors via internet. In case of emergency when the person is not in a state of conscious, the alerts will be generated automatically and sent to the doctor. Here records of health parameters can be instantly used. People pay attention towards prevention and early identification of disease, Author has examined arduino based health monitoring system. Disability can be detected in the health through sensors through internet and informed to the particular person. The proposed architecture is efficient and easy to understand. It plays as a connection between doctor and patient.

In [15], author has presented "Remote Health care Monitoring System using Arduino Board over Distributed Ubiquitous Environment". Here author concentrates on IoT based Smart Healthcare System. The major objective of this designed system is to transfer the patient's health parameters.

This paper proposes the efficient system for observing patient pulse rate and temperature. The system uses pulse sensor to keep track of heart rate of

the patient. With the use of sensors we can access the various parameters of body. These input data are transmitted to the computer for family and doctor's for reference. Thus in the modern health care system, the usage of IoT technologies have brought many benefits for patients,

In [16], author has presented "Zigbee and GSM Based Patient Health Monitoring System". Here a system is presented with a technique that will upgrade the health monitoring systems in the hospitals by providing monitoring capability. The system is wireless based. As it's a wireless device, the cost of cables is affordable. Unless unusual condition of patient is not captured there will be persisting observation of important signs of patient over long duration. Critical situation of patient can be overcome. The major objective of this paper is to design a patient health monitoring system that alerts the staff in the hospitals so that instant care is made available to the patients. With the help of proposed system, staff work can be reduced persistent monitoring capability is provided. In upcoming days work may include a number of sensors in a single system.

#### 4. CONCLUSION

A summary of Health Monitoring system is discussed in this paper. This paper includes various technologies and applications for IOT based Health Monitoring system. It also explains and analyzes various applications, implementation and methods for the process of IOT based Health Monitoring system. Every technology has got their own applications and restrictions. The summary of this paper shows that which technique and applications should be adopted to improve the quality of IOT based Health Monitoring system.

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