



**IJIRCCCE**

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 5, May 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 8.379**



9940 572 462



6381 907 438



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www.ijircce.com

# Internet of Things (IoT) in Healthcare

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**ABSTRACT:** In this modern era, we have seen increased number of Heart disease Asthma, Diabetes and Mental health patients. So, in these conditions, IOT play a crucial role in this type of disease. Through the integration of sensors, software, and actuators for tracking and monitoring purposes into patients and their medications, smart healthcare plays a vital part in healthcare applications. Through the use of sensors, clinical care uses the Internet of Things to monitor patients' physiological status. Data is collected, evaluated, and sent remotely to processing centers so that appropriate actions can be taken. People's lifestyles are being significantly impacted by IOT devices. This growth is mostly being driven by interest in health and wellbeing. This approach has the potential to expedite the transformation of hospitals into smart ones and help physicians identify and recommend appropriate wearable IOT devices. This is not only for patients, it also useful for normal people to check own health status by using wearable IOT devices. The design and development of dependable and reasonably priced wireless sensing device based on the Node MCU microcontroller for the real-time collection of health vital signs including heart rate and body temperature. their engagement in healthcare benefit conveyance.

**KEYWORDS:** Wearable Sensors, Body Sensor Networks, IOT, Security, Healthcare, Node-MCU, AI & ML Cloud.

## I. INTRODUCTION

The Internet of things refers to a vast network of physical devices such as sensors, software and other technologies, that connect and exchange data with each other over the Internet. A new era of remote, continuous monitoring of vital health metrics, such as blood pressure, body temperature, heart rate, and blood glucose levels, is ushered in by the advent of IoT into the healthcare industry. These data points are gathered via wearable and implantable IoT devices, giving healthcare providers real-time insights into patients' well-being. This can totally change the way that medical services are provided because it provides tailored treatment plans in addition to proactive action. The IoT healthcare system offers effective tracking and monitoring that enhances the management of human-resources. Healthcare data is handled by cloud computing, which also offers resource sharing capabilities including flexibility, early detection of security issues, parallel processing, data service integration with scalable data storage, and adaptability.

Furthermore, one of the most significant advantages of utilizing wearables and the Internet of Things is the continuous |digital evaluation of human health in real time which is fueling wearables' rising popularity and extending the convergence of the physical and the digital realms into the Internet of Things. For each patient, which wearable gadget is the most appropriate? The industry is seeing a notable increase in the number of healthcare based wearables with functions that are tailored to certain body parts. Patients must be aware of which measurement instruments are necessary for their particular situation and what lifestyle choices like exercising or eating differently they should make to improve their health. This concept is known as Quantified self. When faced with a plethora of healthcare based wearable IoT device options and functionalities, one challenge for physicians, patients, and other healthcare professionals is figuring out which device is best for them or their patients at each diagnostic or quantified self-stage. IoT devices have the ability to analyze, transmit, and store physiological states and medical data in real-time on both public and private clouds. They can also make data available for additional study.

IoT gadgets can be useful in detecting health-related problems well in advance through seamless interaction with gateways and cloud storage, real-time information sharing. For example, thanks to sensors and sensor smartphone integration, unusual changes such as faster heartbeat, rise in blood pressure or blood sugar can be tracked and recorded, notifying persons about this unusual health condition. It is not just confined to notify, this IoT-based system can also suggest safety actions including personnel advice, informing your doctors, your family and friends. A smart shirt is another example of an IoT-enabled medical gadget. Numerous sensors that track the patient's movements, blood pressure, body temperature, and heart rate are all included in this shirt. This shirt with a sensor allows you to acquire an ECG. Additionally, this smart shirt can notify medical professionals of the patient's location via GPS in the event of

an emergency, such as a heart attack or stroke. The Internet of Things is a novel paradigm that enables everything that you wear, drive, read, see, and interact with to be connected, addressed, and controlled remotely. This includes people and locations you visit.

## II. LITERATURE REVIEW

According to the World Health Organization, the "health-care system consists of all organizations, people, and actions whose primary intent is to promote, restore, and maintain health." Though nearly every nation on the earth has a unique healthcare system, different experts have categorized them based on broad trends. The Beveridge model emphasizes on health care provided with public funds; most clinics and hospitals are government owned, and the majority of healthcare professionals receive government compensation; patients do not receive bills, and government control over costs is maintained. "Using Raspberry Pi to implement a healthcare monitoring system." The purpose of this model's implementation is to runtime check patients' heart rates and temperatures.

The primary goal is to gather the physical parameter, after which the data is made accessible to numerous consumers. The Raspberry Pi B+ model was utilized by them. It interacts with several parameter measurement units. Basic health metrics are taken into account and tracked in this system. In 2016, Ibhaze and colleagues created the "Ehealth monitoring system for the aged." This device measures the patients' body temperature and heart rate. concurrently with the temperature and pulse sensors by entering the readings of predetermined intervals into a centralized database.

Patients' body temperatures and heart rates can be monitored via an Arduino microcontroller and connected sensors. It is also intended to identify the patients' locations. "BSN care: A secure IoT based modern health care system using body sensor network" is the model that Gope and Hwang (2015) presented. This technology simulates bodily sensors. technology. It is made up of wearable body sensors, such as blood pressure, electromyography (EMG), and electrocardiograms (ECG). It employs 3G/GPRS/CDMA wireless connectivity. Ullah et al. introduced the "k-Healthcare system. The sensor layer, network layer, internet system. The sensor layer, network layer, internet layer, and service layer are the four layers that it uses. They have employed sensors such as those found in smartphones, RTX-4100, Arduino, Raspberry Pi, and pulse oxygen meters. The system made advantage of cloud storage for managing data storage. The suggested solution is compatible with several protocols, including Java script web services, HTTP, HTTPs, and RESTful. The amount of data being generated by devices, sensors, and systems in this era of digitalization and connected smart devices makes it imperative to rely on cutting-edge technologies that can support clients in analyzing the available data and aiding in their decision-making. As a result, recommender systems have the potential to revolutionize both IoT vendors and users. Mala singhe et al. (2019) studied remote healthcare and monitoring in both with-contact and contact less methods. It mainly includes technology varies from sensors attached to body to ambient sensors attached to the environment and new breakthroughs show contact less monitoring, which requires only the patient to be present within a few meters from the sensor with wireless communication.

Shahidul Islam et al. (2019) actualize supporting sensors integrated with IoT health care, which can effectively analyze and gather the patients' physical health data, making based healthcare ubiquitously acceptable. The communication with the hyper-terminal program using LoRa has been implemented and an IoT based healthcare system is being developed on signals platform with the expected results getting from the sensors. Monica et al. (2020) talked about patient's body temperature, breathe rate, heart beat and body improvement. These sensors are associated with Arduino UNO and Linux server. By gathering information from sensors the information will be physical. Ismail et al.(2018) found the design of a software system, written in C-Language (C) which is capable of monitoring patient's temperature, pulse, heart-beat rate. TP-HBR is capable of receiving the data from the remote device and storing the data to a central database. With this technologies and intelligent systems, patients are able to monitor their own vital health signs at home and communicate the results to their health providers wirelessly. This will increase the ability to address a problem before a patient requires acute care.

## III. PROPOSED SYSTEM

Main purpose of IoT based system is to help healthcare system in case of emergencies. The system can self monitor and inform critical situations of patients to the doctors and it can help monitor the room ambience form remote location. Through connections, sensor signals are sent to the Node MCU. Here, appropriate sensors are used to assess the patient's body temperature, humidity, and pulse rate. can be watched from anywhere in the globe via an internet connection, as well as from the screen of a mobile app that uses a Node MCU connected to a cloud database system. "Node- MCU" is a portmanteau of "node" and "MCU" (micro-controller unit). Through a mobile application, the doctor



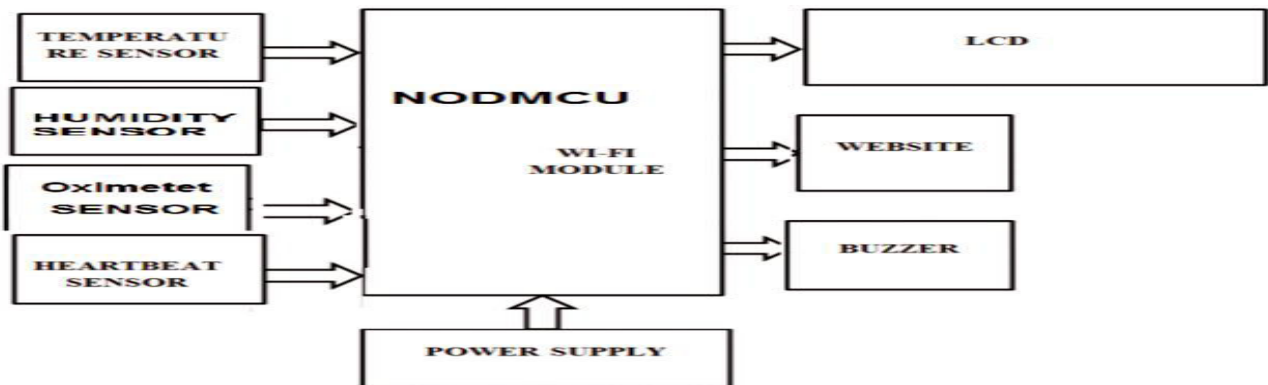


Fig.3. Block Diagram

## VI. CONCLUSIONS

The role of IOT technology is very important in the field of healthcare sector. IOT can provide better accuracy and status in real time. Established a relationship linking IOT wearable device adoption and care service engagement. This paper offers a concise overview of the various systems utilized for patient health monitoring, including an analysis of their benefits and employed methodologies. ECG monitoring and an Internet of Things voice support system are possible future additions. Within the healthcare industry, the Internet of Things plays a critical role. According to Deppak et al. (2018), IoT can offer improved accuracy and status in real time. We've come to the conclusion that a patient health monitoring system should be easy to set up and reasonably priced based on the previous review. For the purpose of tying up with patients and monitoring parameters via mobile applications and internet connectivity, the system or gadget needs to be portable.

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