IoT Based Healthcare System

Kirti Mishra[1], and Rashmi[2]

[1,2] SOP, Sanskriti University, Mathura, Uttar Pradesh, India
Correspondence should be addressed to Kirti Mishra; kirti.smas@sanskriti.edu.in

ABSTRACT- Health is a fundamental need. It is also a human right to have access to high-quality health care. Due to a lack of resources, India is now dealing with a slew of health problems. This review article discusses the concept of utilizing cutting-edge technology, such as the Internet of Things, to solve health problems. It provides an architectural assessment of a smart health care system based on the Internet of Things that aims to serve everyone with high-quality health care. Patients' bodily parameters may be measured in real time using this system design. Sensors gather patient body characteristics and send them to an Arduino Uno, which then sends the data to the cloud via a WiFI module.This information is saved in a MySql database server, which handles information and makes it accessible. The Android App may be used to see this information. Which may be installed on a smartphone, tablet, or computer? Authentication, privacy, security, and data management are all handled via cloud computing. If the data is abnormal, the patient and caretakers will be notified through email. Different decision-making algorithms may be used to make choices, and individuals can access the database based on them. The patient has access to their medical records. As a result, this system offers everyone with high-quality health care as well as error-free and seamless contact with patients.

KEYWORDS- Internet of Things, cloud server, Patient, Monitoring, Smart Health.

I. INTRODUCTION

In today's society, health monitoring is a significant issue. Patients suffer from   As a consequence of a dearth of effective health surveillance, major health issues have arisen. IoT devices come in a variety of shapes and sizes. Available these days to monitor a patient's health via the internet. Health professionals are also using these smart gadgets to keep tabs on their patients [1]. IOT is quickly changing the health care sector, thanks to a slew of new healthcare technology start-ups. In this project, we'll create an IoT-based health monitoring system that monitors the patient's heart rate and body temperature and sends an email/SMS warning when those readings exceed crucial thresholds. Thing view records pulse rate and body temperature data so that patient health may be tracked from anywhere in the world through the internet [2]. A buzzer is connected to the kit near the patient so

that the patient's families are aware of the patient's severe state. The suggested system is primarily designed for situations in which physicians and patients are separated by a significant distance, and it is critical to provide the doctor with complete information on the patient's heart rate and temperature. In terms of obtaining medical data, IoT technology offers both possibilities and difficulties. Because the data utilized is massive (Big Data), computer resources are a problem. As a result, the data must be dispersed. Furthermore, since the data is diverse in nature and is dispersed, the software method to dealing with it is via the cloud computing platform. These are made to work along with the hybrid data. To cope with the heterogeneous data, a cloud platform has been created. For industrial applications, an IoT for health care data is utilized. Sensors are used to gather information. Data is gathered using a hard wired in evaluating operational performance, and the data is linked with the technician's measurements, allowing the performance to be reviewed and determined on the basis of data[1].

The Internet of Things (IoT) is a network of interlinked data processing gadgets, pneumatic and virtual computers, cattle, or folks with tokens that joins any item to the Internet, exchanges information and correspondence, and enables object recognition, tracking, monitoring, and governance. It offers services based on informational technologies (IT) that are the usage of machines to store, retrieve, transport, and alter data without the necessity for sentient or human-to-computer contact. In this context, the Internet of Things is defined as "a dynamic worldwide connectivity architects with self-configuring capabilities set of well - defined and interoperable interaction procedures in which bodily and simulated artifacts have personalities, physical character traits, and virtual personalities." Combining a variety of promising technologies, the IoT concept might be put to life in the real world. Identifying, detecting, and interaction techniques are all possible components of the internet of things. In terms of identification, RFID tags that interact with the Internet of Things may be recognized by a distinct identification and affixed to products. RFID devices can track items in true moment, making RFID a viable alternative for a complex healthcare scheme. Wireless detector channels combined with IoT may allow for peer-to-peer communication, whereas other computing and interaction choices in an inactive system are asymmetric. The Internet of Things

may undoubtedly be utilized to identify and connect for a smarter health systems [3].

As a result, our study uses the Internet of Things (IoT) to use sensing technology to collect information and to communicate in order to create a smart healthcare system. Rather of applying IoT to a specific job with a limited scope, IoT may be approached with a broad scope. The Service Oriented Architecture (SOA) often necessitates the use of middleware to bridge the gap between the technical and application levels. IoT may be linked to the development of a particular application in middleware architecture [3]. Despite the fact that many academics are working on IoT middleware, there is no general middleware that can be used across all conceivable smart devices, such as smart homes, smart vehicles, smart hospitals, smart cities, and so on. Nonetheless, by expanding the scope of IoT, we want to offer a notion of a smart hospital in this research. The power of many kinds of systems. As a result, RFID sensor networks can support sensing, and this study uses machine learning is being used to evaluate huge information in clouds computer, and it is a paradigm for delivering a cheap, omnipresent, on-demand networking access to a shared pools of customizable computer science environments with low administration work [3]. IoT sensing devices must gather data, connect networks to store data, and evaluate data as experts to support a truly smart healthcare system. Machine learning is required to transform data into understanding. In the field of health, the application of computer learning algorithms for clinical sickness diagnosis assists medical workers in detecting illnesses depending on features apparent to the client. In the healthcare industry, machine learning may be used to convert human expertise knowledge and abilities acquired via clinical experience into application software. By using machine learning, software can make correct diagnostic and treatment choices, reducing the number of needless tasks for medical personnel. As a backdrop, we examine our past research in healthcare systems focuses on contemporary technology that may be used to improve the healthcare system in two ways: research and industry[4].

we provide the blueprints for our Idea for an intelligent medical network. IoT healthcare's conceptual design Computers and data analytics may be crucial high sciences for enhanced medical services [5]. The Internet of Things (IoT) aspires to link a variety of activities and products in the surroundings so that they might interact and transact commerce "anytime, anyplace, with everything and anybody, ideally through any channel, system, or service." It is feasible to extend healthcare systems by introducing IoT into the system. The Internet of Things (IoT) is a network that integrates pervasive communication, connectivity, and computing with ambient intelligence to form the Internet of Things [6]. It's a malware framework in where all true elements may stay connected. The Internet of Things (IoT) enables individuals to arrange their everyday routines by combining real elements such as electrical devices, cell handsets, and laptops that can communicate both directly and wirelessly. The IoT makes it possible to handle almost any number of gadgets. It seeks to bring the advantages of the internet, such as remote access, data

sharing, and connection, to a variety of different application areas, including healthcare, transportation, parking, agriculture, and surveillance . Using sensors, Heart level, body temperatures, breathing rate, blood sugar rate, body position, ECG, and various parameters are all measured by remote patient monitoring equipment. Arduino, Raspberry Pi, and other microcontroller-based devices and others, are used to connect and operate the sensors. Sensors are used by the microcontroller to gather data. Typically, biological data is gathered and kept on servers. The gadget can determine if the patient's state is normal or abnormal based on the recorded data. This gadget gives physicians and medical assistants with real-time health care observation that they may access at any moment [7]. The device's primary benefit is its low power consumption, improved performance, great sensitivity, and ease of setup. By 2020, there are expected to be between 26 and 50 billion network-connected devices, with 100 billion by 2030. The Raspberry Pi is the most popular IoT platform. It's a low-cost Linux-based gadget. Raspberry Pi and the Internet of Things have ushered in a new age in healthcare systems. Utilizing a mix of devices like as a heart rhythm meter, temperature probe, gyroscope, and breathing detector, a Raspberry Pi may be transformed as a mini-clinic. In many areas of the globe, these systems are in use. The primary controller of the systems is a microcontroller unit (MCU), however it does not allow parallel data processing.
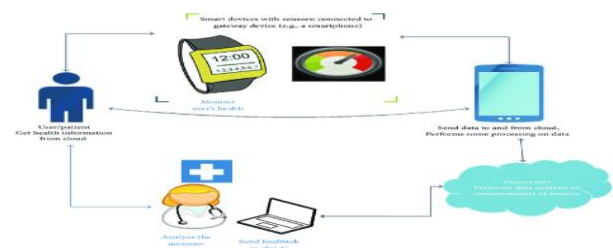

Figure 1: Diagrammatic Representation of Smart Health Care System [RESEARCHGATE]

The IoT is an important component of smart healthcare, since it provides significant advantages and characteristics such as identity, location, sensing, and connection. The Internet of Things (IoT) may be used to create a smart healthcare system in a variety of ways, from calibrating medical equipment to creating a customized monitoring system. The Internet of Things (IoT) plays a major role in healthcare applications, ranging from controlling chronic illnesses on one end of the spectrum to tracking daily physical activity that may aid in achieving fitness objectives on the other [1]. The Internet of Things may be used to track medical equipment deliveries and oversee the manufacturing process. Medical data may be collected from users via IoT-based systems. The Internet of Things serves as a link between the doctor and the patient by allowing remote access, which allows the doctor to keep an eye on the patient and provide remote consultations. The Internet of Things (IoT) combines sensors, actuators, microcontrollers, CPUs, and cloud computing to provide precise findings and make healthcare accessible to everyone. The use of the Internet of Things in healthcare has prompted researchers all around the globe to develop

potential frameworks and technologies that may offer everyone with convenient medical help. In addition to improving the user experience, the Internet of Things pushes the industry to automate, allowing for more research to be conducted across many platforms. A sensor/actuator, a local area network (or, in some cases, a body area network), the internet, and the cloud are all essential components of the IoT in smart healthcare. The specifications of each of these four essential components may vary greatly depending on the application and needs of the particular healthcare system. The term "smart health" refers to the use of various biometric sensors to collect human bodily data. And that sensor data may be utilized to offer smart health in a variety of ways.

- Smart health is a result of the internet of things, and the emphasis is on increasing operational efficiency and creating a cost-effective system while preserving quality, providing health records, and protecting data privacy. As a consequence, consumers get high-quality health care[8].

- One may access his or her medical data and get understanding of their physical fitness by using smart. In this area, several mobile apps and notifications are also utilized to provide alerts when data is aberrant[9].

- The pathway for smart health care is shown in the diagram below. The cloud is utilized to send data from the sensor to the patient, health care practitioner, or caretaker, who can then access the data and check on the patient's health condition[10]. Smart health care enables two-way communication between the patient and the caregiver or provider of health care.

Figure 2: Diagrammatic Representation of Pathway of Smart Health Care System [RESEARCHGATE]

A. *Component of Smart Health Care System*

- *Intelligent Network:* As component of the information collection function, IoT-driven sensors collect real-time surveillance data from smart sensors. The management of records in bio optical devices has progressed thanks to developments in sensor technology. Just a few of the functions include EEG biotelemetry, an ECG sensor, a heart bit rates detector, monitoring, hypoglycemia tracking, virus

tracking, and a healthcare watch. The IoT Health services smart show's Wlan Sensors Networks (WSN) is a vital component. IP-based WSN solutions may be a realistic choice for ordinary products. Detectors, pcs, RFID tags, and smart devices would all be able to join the networks periodically, communicate, and cooperate effectively to accomplish various tasks when given a unique address. To be effectively controlled and maintained, the data gathered from the sensors should be accessible in cloud computing systems. As a result, data from sensors that are remotely dispersed is manipulated by a single point of software. Furthermore, industrial operations need the use of wireless communication systems to send signals obtained by distant sensors monitoring the control loop. This is why the study, design, and development of a remote wireless system for an industrial process have already been completed28. A personal area network is defined as the connectivity of smartphones inside the area of a private area, generally within a radius of around 10 meters (PAN). PAN is a helpful tool for tracking the movements of elderly individuals. To create an intelligent network for IOT HEALTHCARE, WSN, PAN, and a generic network are sufficient.

- *Cloud Computing:* On-demand technology, often referred as cloud computer science, is a type of Web computing. environment that allows computers and other computing resources to access shared processing devices and data on-demand through virtualization, dynamic data integration, and integrating data from many, the cloud computing paradigm offers flexible, dependable, and powerful storage and computing resources that enable high scale computation. Cloud computing's main aim is to provide scalable and easy-to-use computer resources and IT services. It is difficult to exchange patient data in a specific hospital since the data format is incompatible with others. Exams must be repeated if a patient has to be transferred to another hospital. It's a waste of time and money. As a result, hospitals must exchange patient information in a secure manner. Furthermore, each hospital is not required to retain all raw data gathered in order to evaluate a patient's condition. As a result, cloud computing is the best solution for a storage system in IOT HEALTHCARE.

- *Data Analysis:* Machine learning is used by the data analysis module. The science of teaching computers to behave without being explicitly programmed is known as machine learning. Machine learning has given us clever cars, practical speech recognition, efficient online search, and a far better knowledge of how to maximize a performance criteria using example data or previous experience30. Machine learning must be used to summarize relevant results from stored data; otherwise, computers would spend processing time dealing with insignificant data. Machine learning is accelerated by improved data collecting, networking, and faster computers, while human specialists struggle to extract information from vast amounts of data. The degree of

dependability in the analysis results is improved by using an algorithm approach. Figure 5 depicts the algorithm's approach. Because the definition of "enough data" is unclear, it is considered a condition of enough data if it has been recognized as a successful practice for more than three times. The study' findings help the system offer real-time advise and warnings to medical personnel and assistants about changes in vital signs or patient transitions, as well as significant changes in environmental factors, so that preventive treatment may be provided.

II. DISCUSSION

A patient surveillance systems centered on the Internet of Things (IoT) that can track a person 24 hours daily for at least, 7 times a week is known as an intelligent healthcare surveillance systems. The Internet of Things (IoT) is altering the technical infrastructure of today's society. By allowing simple connection among diverse modules, the Internet of Things has enabled us to implement many intricate systems such as intelligent house devices, intelligent traffic management systems, smart office structures, smart surroundings, smart automobiles, and smart temperature control structures in a very small space. Health monitoring is another of the most well-known IoT applications. Many various concepts and patterns for using IoT to monitor a patient's health have already been established. This article provides an overview of IoT-based intelligent devices are available. The latest revolutionary technologies established for IoT-based intelligent healthcare monitoring systems, as well as their advantages and limitations, have been discussed. The purpose of this research is to uncover common architecture and execution patterns for smart IoT-based intelligent health tracking gadgets for consumers.

III. CONCLUSION

It has been outlined how IoT is being used in health monitoring systems. Considering the reality that IoT is becoming used in every field of medicine, there is always room for improvement and research. Early discovery of any health problem may let the patient take the necessary emergency measures, perhaps saving his or her lives. The Internet of Things (IoT) might help in this situation. IoT-based healthcare surveillance gadgets may track clients in real time and inform them to any irregularities. However, technologies that ensure the security of sensitive data must be included in the IoT architecture. Furthermore, the sensors used should be tiny enough being easily incorporated into a wide range of devices. Finally, the use of various machine learning and deeper training approaches may increase the systems' accuracy and resilience. The notion of a smart heath surveillance systems related to Iot architecture is a novel contribution to healthcare study that will aid in the reduction of health issues and the avoidance of avoidable deaths.

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