Internet of Medical Things (Iomt) based smart health systems and implementation of 5G technologies

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Abstract
How to monitor our health and take preventive measures in our daily life using iomt devices has been investigated. Iomt has been shown to play an important role in increasing the accuracy, reliability and productivity of electronic devices in the healthcare industry. An analysis of the iomt architecture is presented. The application and possibilities of 5g networks in healthcare are shown.

The internet of things (english - internet of things (iot)) is a network structure in which devices or machines collect data and make decisions by exchanging information with each other, without the need for human intervention and manual input of any data.iot ecosystem uses processors, sensors and smart devices to collect, transmit and process data. Sensors and devices collect data. Then wi-fi, satellite, bluetooth, etc. The data collected through the channels is transferred to the cloud. The system processes this information and decides to apply. All these processes are performed automatically (without the need for any user). The user can access information and give instructions at any time. Iot is already applied and used in many areas of our life.iot has two broad categories based on application areas:

-Iıot (Industrial Internet Of Things);
-Iomt (Internet Of Medical Things).

Iot applications in healthcare are the most demanding research areas. Internet-connected medicine is an infrastructure of smart devices, systems, software, and hardware. The internet of medical things (iomt) plays an important role in the healthcare industry to increase the accuracy, consistency and throughput of the electronic devices it provides [1]. Due to the current pandemic situation, it is very risky for a person to consult a doctor for every minor problem. So, using iomt devices, we can easily track our daily health records and thereby take preventive measures ourselves. Iomt plays an important role in improving the accuracy, reliability and productivity of electronic devices in the healthcare industry.

Iomt-based smart healthcare system (ass - shs-smart healthcare systems) is a set of various smart medical devices connected within the network via the internet (fig. 2). Smart healthcare based on the iomt framework consists of different phases. It collects medical data from the patient's body through smart sensors integrated into smart wearable or implanted devices that are interconnected through a body sensor network (bsn). In case of serious problems, doctors or other medical personnel can be consulted with the help of smart artificial intelligence-based applications on smartphones. This will lead to obtaining accurate information about the disease, minimizing medical errors, increasing efficiency and also reducing costs in the medical.
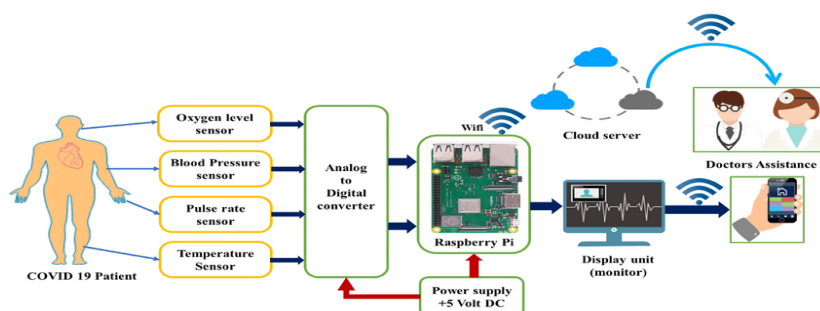

Figure 1.Diagram of a smart healthcare system

With an improved user experience, real-time disease management and prevention of certain problems is done using artificial intelligence. Ass deals with the medical information of the person under surveillance. Thus, providing security measures in iomt-based ass is a very important task. Artificial intelligence can also be used to ensure security in iomt systems by detecting network intrusion [2] and man-in-the-middle security attacks [3]. A web-based security assessment can be performed using the iomt security assessment framework (iomt-saf) [4]. In an emergency, an automatic alert can be sent to the right places using artificial intelligence. Blockchain can also be used to ensure security in the iomt network. It is a distributed database that stores secure and decentralized data electronically, in a digital format, ensuring data security and reliability.

In ASS, doctors can monitor patients' health parameters, make diagnoses and give appropriate prescriptions from anywhere [5]. In modern ass, we monitor blood pressure, body temperature, pulse, insulin levels, etc. We can measure and record specific health parameters such as at the same time, we can send reminders to patients to take their medicines.

Iomt Architecture. The iomt architecture mainly consists of 3 layers, which are as follows: application layer, perceptual layer and network layer (fig. 2).
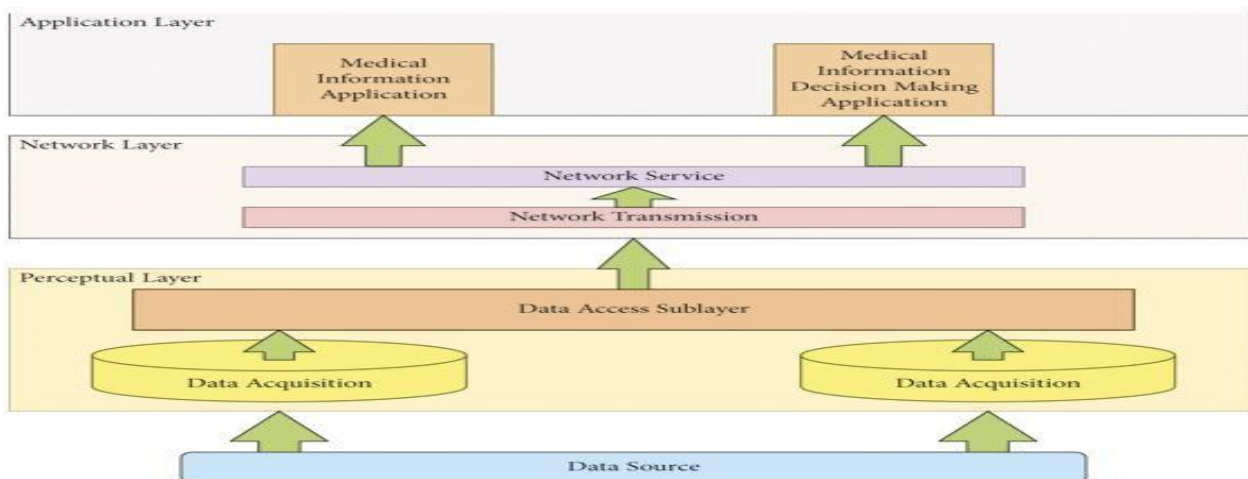

Fig.2. Iomt Architecture

The Perception Layer Deals with gathering data from the source and creating meaningful insights from the collected data. The perception layer consists of 2 layers: the data access (data acquisition) layer and the data access (data access sub layer) layer. The network layer deals with the provision of various platform and interface-related services and provides various data transfer methods. It consists of two levels at the network level: network service (network service) and network transmission (network transmission) levels. The network transmission layer is used to accurately, consistently, real-time, and seamlessly transmit data from the perception layer through cellular networks, wireless sensor networks, the internet, etc. Uses. The network service layer integrates different networks, data formats, and data stores. For such integrations, it provides an open interface and various platform-related services.

The application layer uses data collected from the network layer to manage medical records through various applications. This level consists of 2 sub-levels: medical information decision making application and medical information application. The application level of medical information includes various health equipment and inpatient, outpatient, medical treatment, etc. Includes other data-related materials, records for storing patient data, the level of application of medical data in decision-making deals with the analysis

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of various data.

Application Of 5G Technologies In Healthcare. Currently, Mobile Data Transmission is mainlybased on 4g/lte or wi-fi. the new 5g telecommunication standard offers a higher frequency compared to the current mobile transmission standard 4g/lte: 5g 100 times higher data transfer speed (up to 10 gb/s) and at the same time, with extremely low latency (<1ms)1000 times higher quality.

Generation	Frequency	Speed	Delay
Current 4G	5-200 Mhz	10-50 Megabits Per Second	50-60 Ms
2020–2030 5	1–23 Ghz	10–200 Gigabits Per Second	1–10 Ms
2030–2040 6	1–7 Thz	1–7 Terabits Per Second	1–10 Ms

5G technology has the potential to revolutionize healthcare with its high speed and massive connectivity. In addition to its many key advantages, it also powers medical innovation through artificial intelligence, remote medical learning, patient care and monitoring. The critical and time-sensitive nature of healthcare fields today makes it even more important to have continuous access to real-time data to support and gain full use of advanced technologies. The high speed in 5g technologies increases the ability for healthcare technologies to connect to multiple devices remotely at the same time. 5g in healthcare technologies means it paves the way for innovations in almost all technologies.

The integration of 5g technology into the healthcare industry will drive progress to improve patient care, enable remote diagnostics, improve telemedicine and increase the efficiency of healthcare operations. 5g's low latency and high speed make telemedicine more reliable and accessible. 5g technology can support the transmission of high-quality medical images and real-time data from medical devices. This enables remote diagnosis and continuous monitoring of patients, potentially leading to faster treatment decisions and better outcomes. When we think of remote patient monitoring devices, the first thing that comes to mind is the devices used to monitor patients at home. However, devices designed for nursing homes and out-of-home use are also playing an important role as remote monitoring systems.

5G technologies enable the collection and analysis of real-time data from the elderly and patients who have to continue living with constant treatment through specialized medical devices, wearable devices and the internet of medical objects. It allows healthcare professionals (doctors, nurses, etc.) To monitor patients, make decisions and offer personalized care.

Robotic surgery is one of the most important technologies awaiting the arrival of 5g. The low latency and high speed of 5g may allow surgeons to perform telesurgery or remote surgery using remotely controlled robotic systems. Thus, in every center with robotic surgery, operations that require expertise will be performed by specialist surgeons from all over the world. This can help to overcome the shortage of specialist surgeons in certain fields.

The high-speed data transmission provided by 5g can support the integration of artificial intelligence and big data analytics in healthcare.

5g technologies can also be applied in the following areas of healthcare:

- 5g supports high-quality real-time data processing, enabling realistic, continuous learning experiences for medical students and professionals;

- 5g's high bandwidth and low latency can enable better control and coordination of drones to deliver medical supplies to remote areas or during emergencies;

- 5g can support large-scale data collection, transmission and analysis. This also facilitates medical research and clinical trials;

- 5g's high-speed data transmission capabilities can facilitate the collection and analysis of large genetic data sets, enabling the development of personalized treatment plans based on patients' genetic profiles.

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Conclusion

The application of iot in every sphere of our life is increasing and taking an important place nowadays. Iomt technologies have created the foundation for the formation of an innovative model capable of fundamentally changing the system of providing medical assistance and disease prevention. From the point of view of health, the development of iomt-based ass helps in timely detection of diseases, preventing the spread of infectious diseases, eliminating time loss, etc. Will cause

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