

Smart Medical System based on 5G and IoT Technology

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Abstract: With the development of mobile technology, remote smart healthcare has become an important part of modern medical care. The emergence of smart healthcare has broken the confines of traditional healthcare. 5G networks are evolving into the latest standard that can support huge data volume transmission and low latency performance, and it can certainly drive remote smart healthcare as a truly viable development path. The implementation of IoT technologies will greatly enhance the centrality of the healthcare industry. In this paper, we will explore the feasibility of implementing smart healthcare through 5G networks, discuss its advantages and differences compared to traditional medical care, analyze the key technical support of IoT for smart healthcare, and list the applications of IoT technologies in smart healthcare, and finally provide an outlook on the future development of smart healthcare.

Keywords: Smart Healthcare; 5G Network; IoT; Data Acquisition; Data Fusion; Data Transmission.

1. Introduction

In recent years, scientists and technologists have continued to come up with new modes of thinking, and rapidly developing technologies have led to huge breakthroughs in medical technology. Currently, the next generation of mobile communication technology is very advanced, and the 5G era has enabled a great trend in smart healthcare. Medical image analysis, intelligent case processing, intelligent diagnosis, remote medical monitoring, and other technologies have become the core of intelligent medical applications, and a new generation of intelligent technologies will drive the medical field towards intelligent progress.

2. Advantages of Intelligent Medical Care Over Traditional Medical Care

Compared to traditional medical activities, remote intelligent medical care has many significant advantages. Firstly, smart healthcare can greatly improve the patient service experience, not only making it more convenient for patients to access services, but also reducing the health burden on them. Secondly, smart healthcare also contributes to improved hospital resource utilization, helping to reduce and optimize hospital input costs and utilization rates. Additionally, smart healthcare can achieve virtual participation as well as the dissemination of experts and their resources across distances, providing patients with safe, convenient, and effective healthcare services.

3. 5G Network: Supporting Remote Smart Healthcare

5G, the fifth-generation cell phone action communication standard, also known as the fifth-generation mobile communication technology [1], is a new mobile communication technology with ultra-high bandwidth, ultra-low latency, and ultra-high speed. Compared to 4G, 5G has a qualitative leap in speed, and its peak rate will increase by tens of times, from 100 Mb per second in 4G to tens of Gb per second. At the same time, end-to-end latency will also be reduced from tens of milliseconds in 4G to a few milliseconds

in 5G. This means that 5G dramatically increases the speed of our Internet access and communications, allowing faster and more stable data to be sent and received with lower power consumption. As a result, it will be the new technology that enables almost real-time transmission and drives the development of remote smart healthcare.

With the spread of 5G, high-capacity data streams can be run quickly, accurately, and securely without time, space, or policy barriers. As an example, tele-smart healthcare systems can already transmit through barriers from any location, allowing healthcare professionals to receive and transmit patient data in real time so that tests can be performed more efficiently to confirm diagnoses.

Network communication technologies and basic healthcare institutional settings and resource allocation provide a good material basis for an efficient response to remote services in the Internet of Medical Things [2]. In the medical field, the application of IoT and artificial intelligence technologies based on the advantages of 5G technology such as high bandwidth, low latency, and large connectivity can achieve an overall improvement in the level of intelligent medical services. The integration of 5G intelligent medical care can better and more quickly meet the new needs of patients for medical services, and provide strong technical support to promote the construction and development of intelligent medicine and health industries [3]. While integrating 5G technology into IoT, it can give rise to various medical scenarios such as medical image analysis, health management and disease prediction [4].

4. Technical Support of IoT for Smart Healthcare

Smart healthcare uses IoT technology to achieve a comprehensive upgrade of medical information by collecting, fusing, and transmitting data from patients, doctors, and medical devices to achieve fast, efficient, and accurate medical services, improve the efficiency of resource utilization, and enhance the quality of medical services and patients' experiences.

4.1. Data Acquisition

The core of the Internet of Things (IoT) is IoT sensing, which collects data through sensing technology. Smart healthcare data collection mainly includes medical devices, patient monitoring, and medical team collaboration. Medical equipment connected to the IoT can monitor and record equipment status in real-time, as well as transmit equipment data, such as the location of pharmaceutical delivery vehicles and the status of medical equipment. Patient monitoring mainly collects individual patient health data, including body temperature, blood pressure, and blood oxygen levels, which is transmitted to medical personnel through sensor collection devices to enable real-time monitoring of the patient monitoring system. Different data collection terminal devices can be developed through user-customized services, and these devices can be developed for the general population, high-risk population, and chronic disease management population to carry out targeted one-to-one telemedicine services. The services provided for different categories of users vary from person to person, thus maximizing the utilization of medical resources and avoiding waste, while effectively preventing diseases and achieving the goal of universal health management [5]. Medical team collaboration is the result of data collection in the medical process, including medical record data, medical advice, and other information, to facilitate collaboration between various links.

4.2. Data Fusion

After IoT data collection, data fusion is required to integrate the collected data for comprehensive analysis and decision-making by the healthcare team. Data fusion in smart healthcare is mainly for the integration of data from medical devices and individual patient health data. Through the integration of patient indicators, they can be combined with past cases, care records, and other information to achieve overall patient analysis and evaluation, and provide more accurate and personalized treatment plans.

In the field of smart medicine, information on human vital signs collected through multiple sensors can be integrated and transmitted to a data medical platform through a data fusion gateway [6]. Data fusion can effectively collect and model various information about patients, fuse data from different sources together according to standards, interconnect through multiple data sources, and also obtain timely and accurate information through big data analysis techniques in order to carry out perfect smart medical services.

In smart medicine, IoT data fusion is mainly applied to the following aspects: First, medical equipment monitoring. IoT technology can connect medical equipment to the network to achieve remote monitoring and diagnosis, thus improving the efficiency and quality of medical equipment use. Second, personal health monitoring. IoT devices can collect patient vital signs and health status data and transmit them to the cloud platform, which, combined with other relevant data, can be used for analysis in order to achieve a full range of monitoring and analysis of the patient's history and health status. If abnormal data is found, community doctors will be notified of the need to follow up with residents or take necessary steps to ensure their health status, and the advantages of remote centralized management of health data can be used to achieve a deep integration of diagnosis and prevention and provide quality services to residents [7]. This is of special significance for the chronically ill and the elderly. Third, in medical treatment, IoT technology can provide

doctors with more accurate and convenient medical treatment solutions. For example, the physiological parameters of patients can be collected through smart wearable devices, providing powerful data support for doctors to conduct remote diagnosis. Fourth, epidemic detection. At a time when the global new crown epidemic is of high concern, IoT technology can monitor public places where people enter and leave in real time through IoT sensors, and discover areas where people have been in time to provide data support for checking the spread of potential diseases.

In short, the application of IoT data fusion in smart medical can help medical institutions achieve more efficient and convenient medical services and better information management, which is increasingly important for people's health and wellbeing.

4.3. Data Transmission

It first provides a stable, reliable, and expandable Internet of Things (IoT) network that can ensure efficient transmission between IoT devices. Network deployment is the foundation of IoT services, and any IoT services, as well as smart medical services, require a stable and reliable network. This requires that the IoT transport layer not only have an efficient network structure, but also a reliable security mechanism that can ensure the security of the wireless connection of smart medical devices. In addition, the efficient data transmission capability of the IoT transmission layer should be able to transmit a large amount of smart medical data at high speed to meet the needs of smart medical care. At the same time, it should also have reliable load-balancing technology, which can ensure the stability of transmission, establish a reliable real-time data-sharing environment, and obtain high-quality transmission effects.

Data transfer enables the real-time transmission and exchange of data between different networks and systems, providing an efficient, reliable, and secure way to access and analyze medical data. Its potential applications range from monitoring and detecting health conditions to enabling telemedicine applications. Despite some issues and challenges, data transmission is expected to play an increasingly important role in the development of future smart healthcare systems.

In conclusion, smart healthcare offers new ideas and directions for healthcare delivery based on IoT data collection, fusion, and transmission technologies. IoT technology provides a new means for the comprehensive upgrade of medical services, and the overall solution of medical services can be built up more quickly, thus improving the quality of medical services and providing support for our health.

5. Application of IoT Technology in Intelligent Medical Care in the 5G Era

5.1. Intelligent Case Processing

IoT technology can transmit and collect patients' health data in real time through wireless sensor communication, which can help doctors understand patients' conditions more comprehensively and accurately, medical reducing decision thus errors and saving medical resources.

5.2. Intelligent Diagnosis and Analysis

IoT technology can also be applied to intelligent diagnosis and analysis. By aggregating medical care and many data

points, new case information models can be constructed, which can help analyze the cause of disease and make accurate diagnoses and judgments.

5.3. Medical Imaging Diagnosis

Image processing medical images (e.g., tomography, magnetic resonance imaging, radiography, etc.) are an important source of data extensively used for diagnosis, therapy assessment and treatment planning [8]. Medical imaging is very important lesions diagnosing for in a large number of patients, and IoT and big data technology can collect huge image images and convert huge data into accurate results through deep neural networks.

5.4. Intelligent Pharmacy

Using IoT technology, information sharing can be realized, drug traceability can be achieved, an intelligent pharmacy system can be established, drug circulation can be promoted, drug safety and quality traceability can be improved, labor costs can be reduced, and safe and efficient drug dosage management can be facilitated.

6. Outlook for the Future Development of Intelligent Medical Care

With the rapid development of 5G technology and the Internet of Things, smart medical care will also present a broader development prospect. In the future, intelligent medical care will achieve the following developments. First, the development of biological sensing technology. As people pay more attention to physical health and disease management, sensing technology will play a more important role in the field of intelligent medicine. In the future, biosensing technology will become more and more intelligent, and can collect more accurate physiological data, quickly feeding back to medical personnel and patients, so as to achieve a more personalized and accurate diagnosis and treatment plan. The second is the realization of telemedicine. With the popularization of 5G networks, telemedicine will be greatly developed. Telemedicine will not only provide convenience to residents in remote areas, but will also enable remote diagnosis between doctors and patients through technologies such as video and voice, effectively reducing the pressure on medical resources and improving the efficiency of medical services. Third, intelligent diagnosis and personalized treatment. With the accumulation and analysis of medical data, artificial intelligence technology will be increasingly applied to the field of intelligent medical care. In the future, intelligent medicine will not only be able to quickly diagnose diseases, but also play an important role in the development of medical programs and treatment processes. At the same time, intelligent medicine can also help doctors to make personalized treatment plans, so that patients can get a better and more accurate treatment experience. In short, the future of intelligent medicine will be technology-driven, people-oriented medical model, artificial intelligence, 5G and the Internet of Things and other technologies for in-depth integration, so that traditional medical care to further upgrade and change. This will bring more convenient medical services to people and improve their quality of life.

7. Conclusion

The main purpose of this paper is to analyze the technical support of 5G network and IoT technology for smart healthcare and its application in smart healthcare. Data collection is achieved through sensing technology, data fusion is used to achieve data integration, sharing, and exchange, and data transmission is used to achieve safe and reliable transmission of data and information. This paper illustrates that with the convergence of 5G and IoT technologies in healthcare, the future healthcare industry will become more digital and intelligent and is expected to achieve more efficient services.

The findings of this study suggest that, with the rapid development of IoT technology, smart healthcare has become a new hot spot. In smart healthcare, IoT technology plays an important role. It can be said that IoT is the foundation for the development of smart healthcare, and there is no smart healthcare without IoT. However, it does not mean that there are no limitations for the application of IoT in the field of healthcare. In fact, there are many limitations to the application of IoT technology in healthcare, such as lack of standards, privacy and data protection issues, technical standards, and security issues. Therefore, there is a need for governments and industry organizations to strengthen management and regulation to ensure the healthy development of smart healthcare systems.

The smart healthcare system based on 5G and IoT technologies will have a profound impact on the entire healthcare sector. It will bring new opportunities and challenges to the development of the healthcare industry, improving the efficiency and precision of healthcare, and providing better services and experiences to patients and healthcare professionals.

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