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Multi-Network Fusion Technology for Online Health Care

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Abstract: This research presents a multifunctional remote medical care structure based on multi-network fusion. The structure facilitates various processes, including entity registration, authentication, electronic medical record establishment, data acquisition, remote diagnosis, and information feedback. The user terminal consists of a smart phone and a medical sensor, while the structure server includes modules such as server communication, information management, safety, disease diagnosis, information feedback, and authentication center. The structure offers rapid response, timely detection of pathological changes, convenience, and rapidness. Additionally, it allows for easy functional expansion and significant upgrading capabilities.

Keywords: *Remote medical care, multi-network fusion, electronic medical record, data acquisition, remote diagnosis, information feedback, smart phone, medical sensor, authentication center.*

Introduction

Advancements in technology have revolutionized the healthcare industry, allowing for the development of innovative solutions to improve patient care and accessibility. Remote medical care structures have emerged as a promising approach, enabling healthcare professionals to provide diagnosis and treatment remotely, thereby overcoming geographical barriers and enhancing the efficiency of healthcare delivery. In this context, this research focuses on the development of a multifunctional remote medical care structure based on multi-network fusion. The proposed structure encompasses a comprehensive set of functionalities, including entity registration, authentication, establishment of electronic medical records, data acquisition, remote diagnosis, and information feedback. It aims to bridge the gap between patients and healthcare providers by leveraging the capabilities of modern communication networks and wearable medical sensors. The user terminal consists of a smart phone equipped with various modules for data processing, location tracking, information querying, safety measures, communication, storage, and user interface. Additionally, a medical sensor with wireless network connectivity is utilized to gather vital medical data from the user. At the server side, a robust infrastructure is employed to facilitate effective communication, information management, safety measures, disease diagnosis, information feedback, and an authentication center for secure access. This multi-network fusion approach enables seamless integration and transmission of data between the user terminal and the server, ensuring timely and accurate remote diagnosis. The multifunctional remote medical care structure offers several key advantages. Firstly, it provides a rapid response, allowing healthcare professionals to promptly attend to patients' needs, irrespective of their physical location. This feature proves invaluable in emergency situations where time plays a critical role. Secondly, the structure possesses the capability to detect pathological changes in a timely manner, enabling early intervention and preventive measures. By continuously monitoring vital signs and medical parameters, it can alert both patients and healthcare providers of any abnormalities or deviations from the expected norms. Furthermore, the structure enhances convenience and efficiency in healthcare delivery. Patients can receive medical consultation and diagnosis remotely, eliminating the need for frequent in-person visits. This is particularly beneficial for individuals residing in remote areas or with limited mobility. Moreover, the structure's ease of use and intuitive interface makes it accessible to a wide range of users, including the elderly and technologically inexperienced individuals. The figure (**Fig**.1) illustrates a Structure Architecture of Telemedicine.[3]

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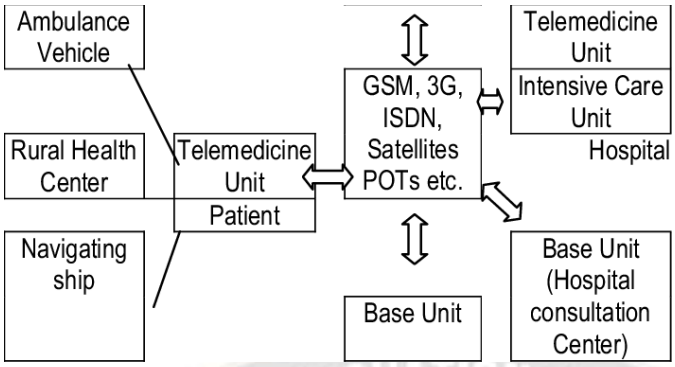

Fig. 1: Structure Architecture of Telemedicine Structure

Additionally, the proposed structure allows for functional expansion, providing a platform for incorporating new features and technologies as they emerge. This adaptability ensures that the structure remains up-to-date with the latest advancements, guaranteeing improved healthcare services and an enhanced user experience. In conclusion, this research aims to develop a multifunctional remote medical care structure based on multi-network fusion, leveraging the capabilities of smart phones, medical sensors, and a robust server-side infrastructure. The structure's features of rapid response, timely detection of pathological changes, convenience, and functional expandability hold immense potential in transforming the healthcare landscape. Through this research, we seek to contribute to the advancement of remote medical care structures and their widespread adoption for the benefit of patients and healthcare providers alike.

Related Work

With the rapid advancement of computer technology and communication technology, there has been significant progress in the field of telemedicine. However, current research in this area primarily focuses on wired communication, which still lags behind in terms of practical application.[1] The increasing living standards of individuals have also led to a growing emphasis on personal health monitoring. To address these challenges, there is a pressing need to develop a multifunctional remote medical care structure that integrates medical diagnosis, healthcare, home care, monitoring, and emergency assistance. Traditional telemedicine care methods primarily rely on fixed medical monitors, which require complex apparatus and numerous connections.[2] This setup can impose significant mental pressure and strain on patients, potentially impacting the accuracy of diagnosis and resulting in delayed treatment. Moreover, existing telemedicine structures offer limited functionality and lack mobility, making it difficult to detect pathological changes in a timely manner, particularly for individuals in a subhealth state. This deficiency can lead to delayed intervention during emergencies.[3] To overcome these limitations, it is essential to leverage sophisticated wireless sensor network technology to develop a comprehensive remote medical care structure.[4] Such a structure would provide a seamless and user-friendly experience, allowing patients to transmit vital signals and medical data to healthcare facilities without the need for cumbersome equipment.[5] By integrating medical diagnosis, healthcare, home care, monitoring, and emergency assistance, this multifunctional structure aims to enhance patient care, improve the accuracy of diagnoses, and provide timely intervention when necessary. By addressing the current shortcomings of existing telemedicine structures, this research seeks to contribute to the advancement of remote medical care technology.[6] The development of a multifunctional remote medical care structure with enhanced mobility, real-time monitoring, and comprehensive functionality would greatly benefit patients and medical personnel, ensuring prompt and accurate diagnoses and timely medical interventions.

Research Objective

The objective of this research is to develop a multifunctional remote medical care structure based on multi-network fusion. The research aims to design and implement a structure that enables seamless registration, authentication, electronic medical record management, data acquisition, remote diagnosis, and information feedback. The structure utilizes a user terminal comprising a smartphone and a medical sensor, along with a server-side infrastructure for effective communication and management. The research further seeks to evaluate the structure's performance in terms of rapid

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response, timely detection of pathological changes, convenience, and capability for functional expansion and upgrading.

Multi-network fusion structure for remote medical care

The research focuses on the development of a multifunctional remote medical care structure that integrates various networks. The structure consists of two main components: the user terminal and the diagnostic center structure server terminal. The user terminal is responsible for collecting vital sign data from the user regularly or automatically, as well as obtaining positional information when required. The collected information is digitally signed based on user identity and timestamp and then sent to the diagnostic center structure server terminal. The user terminal also receives reputation information of medical institutions from the authentication center, which is regularly published. The diagnostic center structure server terminal serves as a unified management structure for electronic health records of users. It analyzes the data in electronic health records through data mining techniques to assess the user's health status. The structure receives information from the user terminal, transfers it to the disease diagnostician structure module for preliminary diagnosis, and provides diagnosis results and suggestions back to the user through various information-sending methods. In emergency situations, immediate care or warnings are provided.

The structure also facilitates communication between users and expert doctors, as well as among users, for discussions on healthcare and nursing knowledge. The user terminal comprises a smart mobile phone and a medical sensor. The smart mobile phone includes modules for data receiving processing, location information acquisition, information querying processing, terminal security, terminal communication, terminal storage, and terminal user interface. The medical sensor, equipped with threshold values, collects vital sign data according to the acquisition mode and transmits it to the smart mobile phone.

The structure server terminal includes a server communication module, an information management module, a server-side security module, a disease diagnostician structure module, an information feedback module, and an authentication center. The server communication module handles the communication between the user's smart mobile phone and the server terminal. The server-side security module verifies digital signatures and timestamps, extracts user identity information, and stores checking results and information in the user's electronic medical record. The disease diagnostician structure module utilizes expert diagnosis thinking to analyze electronic health records and provide preliminary diagnostic results. The information feedback module generates appropriate feedback based on the diagnostic results. Figure (**Fig**.2) below exhibits the New Remote Health-Care Structure Based on Moving Robot Intended for the Elderly.

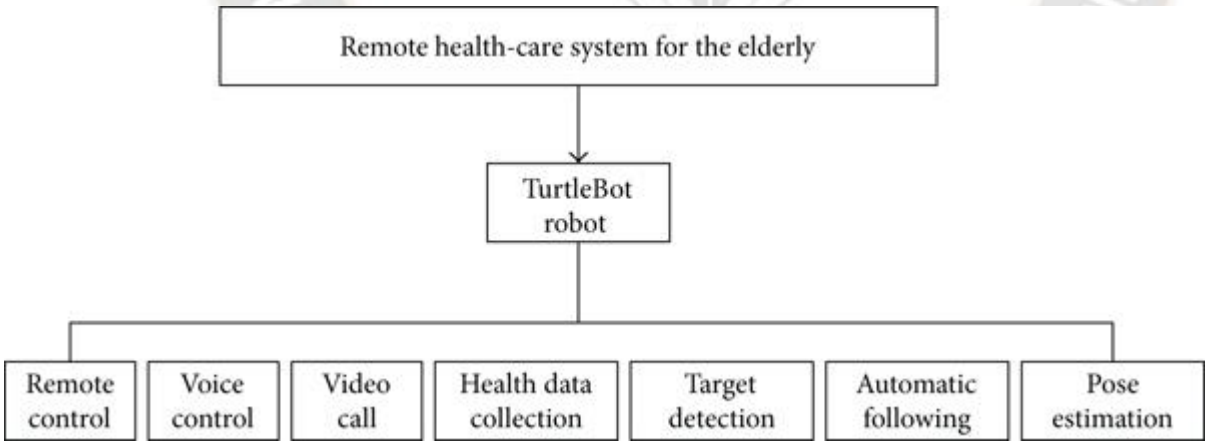

Fig. 2: A New Remote Health-Care Structure Based on Moving Robot

The authentication center stores user, doctor, and medical institution information, issue's identity digital certificates, and publishes reputation information. In conclusion, the proposed multifunctional remote medical care structure merges multiple networks to enable efficient remote healthcare. It incorporates user terminals for data collection and communication, a server terminal for unified management and analysis, and an authentication center for

verifying user information. By integrating these components, the structure aims to improve healthcare accessibility, enhance diagnosis accuracy, and facilitate timely medical interventions.

Conclusion

In conclusion, this research focuses on the development of a multifunctional remote medical care structure that merges multiple networks to revolutionize healthcare delivery. The structure comprises a user terminal and a diagnostic center structure server terminal, each serving distinct purposes to provide comprehensive remote medical care. The user terminal plays a crucial role in collecting vital sign data and positional information from the user. It ensures the integrity and authenticity of the data through digital signatures based on user identity and timestamps. Additionally, the user terminal receives reputation information of medical institutions from the authentication center, enhancing the user's ability to make informed healthcare decisions. The diagnostic center structure server terminal acts as a central hub for managing electronic health records and analyzing user data. It employs data mining techniques to extract valuable insights and assess the user's health status. The structure enables seamless communication between the user and medical professionals, facilitating remote diagnosis, feedback, and advice.

In emergency situations, the structure promptly provides necessary care or warnings, ensuring the user's safety. The proposed structure leverages wireless sensor network technology, enabling real-time monitoring and convenience for users. By integrating various functionalities such as medical diagnosis, healthcare, home care, and emergency assistance, it offers a comprehensive solution that enhances patient care and diagnosis accuracy. The structure's multifunctionality, rapid response capabilities, and timely detection of pathological changes address the limitations of existing telemedicine structures.

Moreover, its user-friendly interface and expandability make it highly adaptable to evolving healthcare needs. The integration of various networks ensures efficient and secure communication between the user terminal, diagnostic center, and authentication center. In summary, the multifunctional remote medical care structure presented in this research demonstrates significant potential to improve the accessibility and quality of remote healthcare services. By merging multiple networks and incorporating advanced technologies, this structure offers convenience, real-time monitoring, and comprehensive functionality. It holds promise for enabling remote medical care that is prompt, accurate, and accessible, ultimately benefiting both patients and medical professionals.

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