Design and Implementation of Internet of Things Health Management System based on Cloud Service

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Abstract: With the aging of society, the number of empty nesters who can not take care of themselves is increasing gradually. Many families and empty nesters are eager to have a more perfect health service system. The Internet of Things health management system based on cloud service will provide an integrated health service platform with the concept of active service. The goal of this system is to realize the Internet of Things health management system based on cloud service, which provides intelligent active real-time perception of health status information of the elderly, safe storage and processing of health status information, active real-time alarm of the elderly for emergency help, the best route selection of the elderly for emergency assistance, real-time inquiry of health status information and other functions. In the design and implementation of the system, the new requirements of the functions and performance brought by the active service business model are considered, and the corresponding solutions are put forward.

Keywords: Cloud computing; Internet of things; Big data; Smart health

1. Introduction

In China, 70% of people are in a sub-health state, and a considerable number of people suffer from high-risk chronic diseases such as hypertension, diabetes, and cardiovascular and cerebrovascular diseases. With the development of China's aging trend, the health status of elderly people living at home and living alone has become a major social problem. How to achieve self-health management through fast and safe ways? How to dynamically collect and analyze the physiological and physical information of patients in time? Using Internet technology, through the wireless sensor device, the information collected from the patients is transmitted to the health management platform through the communication network. The hospital experts analyze and process all kinds of data through the management platform to determine the patients' health status, so as to achieve the goal of integration of home monitoring, disease prevention, emergency rescue and remote diagnosis, truly delivering health to every family.

2. The Historical Status and Significance of Research

The application of the computer, Internet and wireless communication technologies to the health field has greatly promoted the development of remote health monitoring technology. Common health monitoring instruments are connected to remote monitoring service centers via telephone lines or computer networks to monitor the pa-tients' basic health data remotely. These service centers provide some basic health monitoring services for patients[1]. On the network platform, you can maintain your own health record online as long as you apply for a personal health account online. In addition to the storage and exchange of personal health information, it is also possible to search for health information. By the cloud computing, cloud storage, cloud services, Internet of Things, mobile Internet and other technical means, through the joint, interaction, communication and cooperation of medical institutions, experts, medical research institutions, medical manufacturers and other relevant departments, we can provide medical patients and people who have health needs with online, real-time, up-to-date health management, disease treatment, disease diagnosis, human function data collection and other services[2].

With the aging of Chinese society, the number of empty nesters who can not take care of themselves is increasing. And with the improvement of living standards, many empty nesters are concerned about having better health services. The Internet of Things health management system based on cloud services has a new business plan with the concept of active service, which provides intelligent active real-time perception of health status information for elderly users. The Internet of Things health management system based on cloud service is a new business model with the concept of active service. For the elderly who need active health services urgently, especially for empty nesters, the system provides an integrated health service platform for them.

3. Requirement Analysis of Internet of Things Health Management System

In order to cope with the aging and realize the effective care and emergency treatment of children in the absence of the scene, the construction of the Internet of Things health management system based on cloud service makes it possible. The system provides a modern health management and service mode. And the system supports real-time perception, real-time push, safe storage, real-time query, and timely alarm of physical health status information of elderly users.

3.1. Intelligent alarm system

The function description of Intelligent alarm system: If an old man lies on the bed or in the toilet, the pressure sensor can collect data in real time and transmit it to the cloud server through the coordinator and the gateway. Under the control of the cloud, the alarm information can be sent back by the GPRS module to send the alarm information to the family members and 120 users. The cloud server receives the data packet, analyzes the sensor data by analyzing the storage sensor data, and obtains the alarm time pre-value stored by the user in the cloud database, and sends the alarm data packet to the gateway when the pressure sensor data duration exceeds the pre-value. The cloud obtains the sensor value and stores it, and the old user is in a healthy state; the cloud obtains the sensor value and stores it, and the elderly user is in a dangerous state, it will send an alarm message to the gateway communication module.

3.2. Voice alarm system

If the elderly is in discomfort and unable to move, the GPRS module can be started by voice instruction, and an alarm message can be sent to the family members and 120 users for assistance. The voice alarm system has a voice sensor node module, a coordinator node module, a gateway communication node module, a short message alarm module and a receiving warning module.

The sender is used to send alarm information through voice of elderly users. If an old man correctly says the voice instruction: the user is uncomfortable. An alarm will be issued, the voice sensor will acquire an alarm instruction, and it will perform A/D conversion on the collected data, and the voice sensor can be successfully networked, then the coordinator module can be connected, and the voice sensor can be sent to the coordinator module through the radio frequency technology[3] .

The receiver is used to obtain the alarm message sent by the short message alarm module, notify the family members, and dispatch 120 ambulances. The receiving alarm module can obtain an alarm message from the short message alarm module, and the family users and the 120 users can make timely response actions.

3.3. Manual alarm node system

If an old man is in discomfort, the GPRS module can be started through the button within the reachable range, and it can timely send an alarm message to family members and 120 users for assistance. Manual alarm node system includes a button node module, a gateway communication node module, a short message alarm module and a receiving alarm module. If an old user issues the alarm instruction, the data can be transmitted to the gateway through the I/O port. At the same time, warning messages can be sent to family members and 120 users. The short massage alarm module can obtain the alarm information from the gateway and send the alarm message to the family members and 120 users.

3.4. Cloud health management system network platform

Users can query the real-time status of the elderly through the WEB browser, modify relevant information, and set personalized alarm parameters to achieve the optimal effect of using the system, and realize the family users to query the elderly basic information through the cloud health management system network platform. After logging in to the cloud health management system network platform, the users can query the basic information of the elderly users. When family users need to inquire about the basic information of elderly users, the basic data of the corresponding elderly users can be queried from the cloud database, the query result can be returned to the health management system based on cloud service, and the UI can display the query structure.

3.4.1. Alarm parameter settings of cloud health management system network platform

Setting the alarm initiation time, the alarm message sending interval and the trigger value of pressure sensor. The purpose of this module is to set relevant alarm parameters for family users. When family users set alarm parameters, they need to log in successfully, make sure the session is valid, the Internet of Things health management system based on cloud service communicates with the cloud database normally, and the Internet of Things health management system based on cloud service operates normally.

3.4.2. Family information modification of cloud health management system network platform

Family users can modify the basic information of relatives. Users select relatives information, click the edit button, input modification information, write the update data to the cloud database, return the write results, and return to see the updated information.

3.4.3. Hospital route query of cloud health management system network platform

Family members can check the route between the two places through the map. The purpose of this module is to query the route to the hospital through the visualization map for the family members. Family members click the "hospital route query" button, input the starting location and the target location, click the "confirm" button, and query the target location and the starting coordinate by using the Baidu map server, then the Baidu map server returns the query results, calculates the optimal path the by the optimal path algorithm , and displays the optimal route map[3].

3.5. Family client and 120 client

The family client realizes the function that the family users login family member client system, which can view the elderly users' timely information, suggestions and the historical data graph. Family members can inquire the health status information of elderly users through the family client system. The 120 client realizes that the 120 users can monitor the short message at any time, and through the judgment of the short message number, the Baidu map is used to calculate the optimal route and generate it at the same time, so that the elderly users can get timely rescue.

4. The Business of Internet of Things Health Management System

The business of voice alarm system. The voice sensor can acquire voice instruction from the elderly, send data to the coordinator, and transmit data to the gateway. After the gateway acquires alarm instruction, it can use GPRS module to send alarm messages to family members and 120 users.

The business of manual alarm system. The button sensor can acquire the alarm instruction pressed by the elderly and send the data to the coordinator. The data is sent to the gateway. After the gateway acquires the alarm instruction, the GPRS module enabled by the gateway will send the alarm message to the family members and 120 users.

The business of intelligent alarm system. The pressure sensor can obtain the bed and toilet conditions of elderly users in real time, send data to the coordinator. Then the data is transmitted to the gateway, and sent to the cloud server. After data storage, the cloud alarm time threshold can be obtained. After data processing, the alarm information is sent back to the coordinator, and the GPRS module is started to send alarm messages to family members and 120 users.

The business of family client system. In order to query the current health status of the ward and the historical health data of the elderly, the family members can log in through the mobile client software. Through the registration function, family members can keep abreast of the health status information of the elderly. The family

members can conduct inquiry operations to understand the health status information of the elderly.

The business of 120 client system. 120 users can carry out monitor by mobile phone short messages to determine whether there are elderly users who need first aid, and automatically open the map with the best route for first aid. In order to accurately locate the specific location of the elderly, the optimal route map is drawn and timely rescue can be carried out[4].

The business of cloud health management system network platform. The cloud health management system network platform allows family members to inquire the health status of the elderly, modify the personal information of the elderly users and family members, and modify the early warning data of the elderly according to the actual situation. The family members with the user names and corresponding passwords can access the cloud health management system platform through the browsers to implement modification and query.

5. The Technical Route and Design Scheme of Internet of Things Health Management System

5.1. The framework of the system

The system has good robustness. The system can obtain multiple health data information in a short time, and then immediately push three alarm information, and can ensure that the system can still operate normally when the packet is lost or delayed.

The system has a faster response speed. It is required that the information from each sensor node can be processed quickly through the cloud service platform, and that multi-users can access the cloud server concurrently during the peak period of access.

The system has high reliability. All data in the system are related to the health and privacy of the elderly users, which are not allowed to be lost or erroneous in the process of cloud processing.

The system has high security. The purpose of the system is to manage the information and health of the elderly users. It is necessary to strictly protect the user's privacy information and the security of user's rights at all levels.

The system has good expansibility. The system is based on cloud service platform, which can effectively solve the problem of the rapid increase of access caused by the expansion of enterprise scale and the integration of third parties. When users add or delete sensor nodes, the system can ensure that the new Internet of Things has good access to the system.

The system can be customized. According to the health status of different elderly users, the system provides personalized settings. The family user can set the alarm pressure threshold, the alarm time, and the interval be-

tween the sending time of the alarm SMS according to the actual situation.

5.2. The technical architecture of the system

The functions of the Internet of Things health management system based on cloud services include real-time monitoring of the physical health status of the elderly, real-time push of the physical health status of the elderly, safe storage of the physical health status of the elderly, real-time inquiry of the physical health status of the elderly, timely warning of the physical health status of the elderly and timely assistance to the elderly, which constitute a set of health services for the elderly. When designing and implementing the system, it is necessary to consider the new requirements in terms of functions and performance brought by the active service business model, and propose corresponding solutions[5].

5.3. The business architecture of the system

The hardware of the system includes strain gauge pressure sensors, trigger pressure sensors, voice sensors, coordinators, gateway and cloud servers. Software includes the voice alarm system, the manual alarm system, the intelligent alarm system, the family client query system, the health management system based on cloud service, the 120 emergency route generation system.

6. Implementation and Testing of the Internet of Things Health Management System

6.1. Implementation of web service in cloud service

The cloud system uses SaaS software with low investment, on-demand ordering, rapid development, and wide application. The system's servers are deployed in the cloud, and software services are provided through the Internet. According to their actual needs, customers can order the required application services through the Internet, and pay the fees according to the number of services ordered and service time, and obtain the services provided by the company through the Internet. The cloud server not only realizes the real-time monitoring of the health of the elderly users, but also provides a call to the gateway GPRS module. When the elderly user is in a dangerous situation, the GPRS module is called remotely to notify the family user and the 120 emergency center in time[6].

The system uses cloud computing to process and analyze a large amount of data, and to provide users with efficient services. Meanwhile, data management technology can efficiently manage a large number of data sets, and achieve the large-scale data to find the data users need. After querying and reading massive data, the system makes a lot of analysis. In this case, the frequency of data reading operation is much greater than the frequency of data updating. Data management in cloud service platform is a kind of data management that reads data optimally. Data management based on cloud system adopts data management mode of column storage in database discipline.

6.2. Implementation of the 120 client system

After receiving the specified short message, the system can promptly call the API of Baidu map to initialize the map, set the map focus (longitude, latitude), display the driving route, and accurately locate the location of the elderly user, which can ensure timely rescue.

6.3. Testing of the internet of things health management system

The system is tested by manual test and automated test, and its regression test is realized by automated testing technology. The results show that the system has achieved basic functions and can meet the needs of health management and assistance of elderly users. The deficiency is that the function of the system is not perfect. The results indicate that from the joint test of the whole system function, the functions of the system can be carried out consistently, and the system runs well as a whole.

7. Conclusion

Combining cloud computing technology, big data analysis technology, Internet of Things integration technology and active real-time push technology of streaming data, starting with engineering design such as demand analysis, business workflow analysis, technical route and design scheme, this paper designs and implements a Internet of Things health management system based on cloud service, including the voice alarm system, the manual alarm system, the intelligent alarm system, the family client system, the 120 client system and the cloud health management system network platform, which can further enhance the comprehensive perception of the health for the elderly, and achieve all-round interconnection of treatment, medicine and health care.

8. Found Project

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