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Research Article

Research on Traditional Chinese Food Medical Four Diagnostic Information Collection Platform Design Using Cloud Storage Architecture

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Abstract: A Traditional Chinese Food Medical (TCFM) four diagnostic information collection platform for dietary obesity is designed based on cloud storage architecture. The patient information recorded in the collection platform may comes from three different information collection devices: computer, image acquisition and cell phone. An application with friendly graphic user interface is implemented on computer devices to collect text-class food medical information; image acquisition is a closed collector box which can provide no natural light environment and acquire the face, tongue, hands and other image without natural light affection; a mobile application is designed for patients to record daily health information in their cell phone and transmitted to the information collection platform. In order to efficiently integrate patient information collected by different devices, information collection platform based on cloud storage architecture is designed, the architecture of cloud storage is layered and cooperative and the key technologies including deployment, storage scheme, data organization is considered.

Keywords: Cloud storage architecture, collection platform, four diagnostic information, TCFM

INTRODUCTION

Dietary obesity is an endocrine and metabolic disease (Gui *et al*., 1992). Dietary obesity prevention and treatment by Traditional Chinese Medicine (TCFM) has obvious advantages in less toxicity and better treatment, which makes TCFM, has received wide attention in the dietary obesity food medical community (Zhang *et al*., 2014). Dietary obesity is a chronic disease, therefore, comprehensive prevention in diet, exercise, medication, self-testing can achieve better efficacy. Simply specialist treatment based treatment model in hospital can not effectively follow-up and management the patients, so the treatment is not systematic and coherent. In addition, the images of patient's face, tongue and other parts of the skin of the body have important value on the diagnosis and treatment of traditional Chinese medicine. A collection platform with three sources of information including hospitals, community and patients need to be created.

Three different types of information collecting system are designed and partly implemented. The first one is installed on the computer platform used to collect patient symptoms and laboratory examination information at the hospital. For collecting TCFM face diagnosis images without natural light, a closed collecting boxes and photographed software are designed. The third one is installed on the smart cell phone for collecting patient health information in daily life. Each system can be installed on multiple devices.

Patient information collected by different devices has different forms and characteristics, making the original centralized management, centralized storage of food medical records organization and management model has been unable to meet the actual demand. Cloud storage as a new form of services can be a good solution to this issue. The cloud storage used to integrate patient information resources, not only can save investment costs, simplify complex setup and management tasks and put the resources into the cloud also facilitate access to resources from more places, to achieve sharing resource of food medical records.

MATERIALS AND METHODS

Structure of the TCFM collection platform: Traditional Chinese food medical Four Diagnostic Information Collection Platform includes three modules: food medical records collection, patient's skin picture collection and patient daily health information collection. Among them, food medical records collection module can be installed in computers in the

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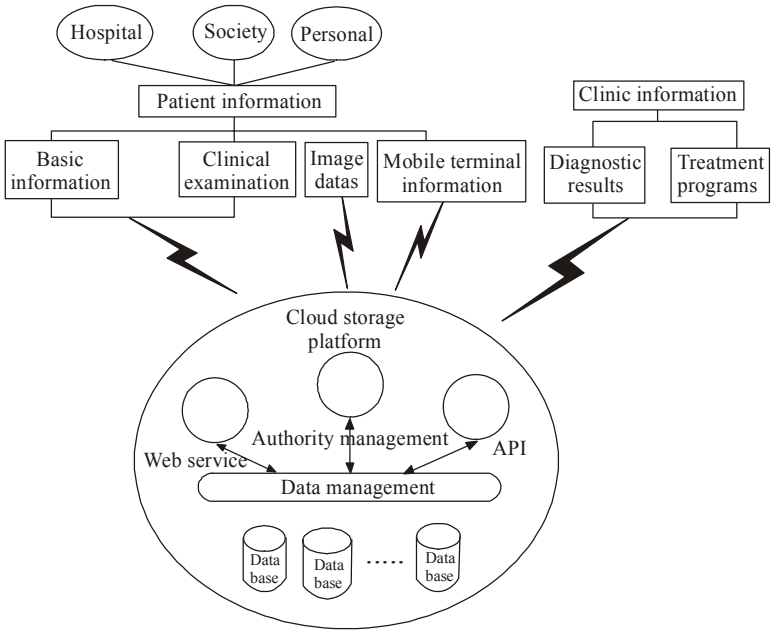

Fig. 1: Structure of the dietary obesity TCFM collection platform

Fig. 2: Screen-shots of mainly interfaces

Fig. 3: Inspection acquisition system

hospital, the patient's doctor entered basic information, pathological information and test results and so on through a fixed graphical interface; Image acquisition module is the composition of collection boxes and pictures taken program, the picture is usually captured by doctor's assistants; daily health information collection module is a mobile application installed on the patient's mobile phones, the usual diet, exercise, blood glucose, blood pressure and other information from patient records.

In this chapter, at first, the overall structure of the collection platform is illustrated, then, three modules is introduced respectively.

The overall structure of the platform: Establishment of clinical research for the purpose of dietary obesity pathology data acquisition platform that seamlessly outpatient hospital information systems, clinical examination, imaging, mobile terminal information platform systems to share data. The overall structure of the collection platform is shown in Fig.1.

Four TCFM diagnostic methods collection system: According to dietary obesity diagnosis symptoms needed for TCFM differentiation of information to design the collection system's interface, acquisition interface can input patient basic information and four TCFM diagnostic information like inspection, listening and smelling, inquiry and pulse taking. In order to ensure the standardization of the collection information, interface provides check-box and text input controls to record illnesses information. Doctors only have right to check and increase patients food medical records and cannot modify and delete the records (out of consideration for the protection of patients' rights), but provide confirm operation to ensure that input information is correct. The main interface screen-shots are shown in Fig. 2.

Natural light removed images acquisition system: Inspection is an important basis for Chinese medicine diagnosis and treatment, including the face figures, tongue figures, hands figures and skin pictures of other body parts have plaque. Ordinary image acquisition devices, such as cameras, cameras, etc. can not filter the natural light, resulting in a great image color difference

exists in same parts of the same person at the different time, which can not be used as a basis for evaluating the treatment efficacy. In addition, the use of a simple camera device to capture images requires a lot of time to sort pictures. Therefore, we designed and implemented a natural light removed inspection images acquisition system, just like Fig. 3.

System is consisted of two parts: inspection images capture box and graphical user interface. The collection box is a cube with one semi-closed side and five closed sides. Installed Inside the box reserved locations for the three high-definition cameras, you can shoot frontal face, tongue, both sides of the side-faces respectively. the patient will face on the semi-closed side of the box and open the curtain, then begin to capture the pictures. The graphical user interface can be installed on any computer, which is connected with the collection box and data can be exchanged via a network cable. Inspection images capture steps are very easy: At first, click the capture buttons on the interface to call cameras shoot certain parts of the human body photos respectively, then, press site and acquisition time as the images name and recorded in the database. All these images can be transmitted to the cloud storage database of the collection platform.

Health information collection system in mobile terminate: Developing mobile application to record the patient's daily health information, including daily meals, water intake, sugar intake, fat intake and physical activity and even the number of steps, the movement of users, number of heartbeats, blood pressure data and etc. The system can aid mobile terminals and PDA-style wrist-mounted monitors and wearable monitors and other monitoring equipment to collect data and transmit to the cloud storage. Developing tool is Appcelerator (Titanium) and database of mobile terminals will use be SQLite.

Mobile terminal application's foreground design: The main features of the application are as follows:

- **User management:** user registration, cancellation, password service and other services, such as users rights management, etc.
- **Dietary management:** patients input their dietary variety and quantity through graphical user interface.
- **Campaign management:** patients input their sports and exercise duration.
- **Other data management:** using a variety of tools such as monitors to capture the user's motion steps, beats, blood pressure and so on.
- **Health data transmission:** Health data can be uploaded via a wireless network to a comprehensive database of biological information and can also download their own health records, which enable the cloud storage feature.

Mobile terminal application's background design: The main features of the application are as follows:

- System settings: databases setting, network setting and etc.
- On mobile devices, we use the open source and platform-independent database- SQLite. Users can save data locally and when the mobile devices collect the network the application can exchange data with the cloud storage database of the collection platform.

RESULTS AND DISCUSSION

Construction of the private cloud storage platform: We need to build a cloud storage environment, records from hospital, pictures captured by the collection boxes

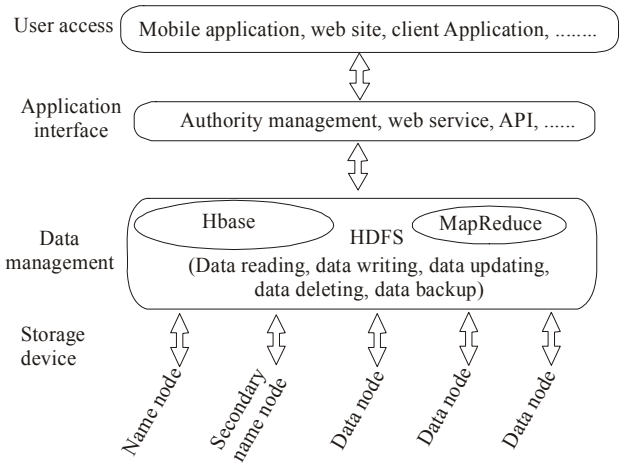

Fig. 4: Cloud storage platform architecture

Table 1: Server configuration information

Server	CPU	RAM (GB)	Hard Disk(GB)
NameNode	Core i5-4570	4	500
SecondaryName Node	Core i5-2310	4	500
DataNode1	Core i5-2410M	2	500
DataNode2	Pentium (R)-E6600	2	300
DataNode3	Pentium (R)-E6600	2	300

and healthy information records in the personal cell phone are transmitted over the network. After data preprocessing, information is integrated into a unified comprehensive database of biological information. Resource storage virtualization enables data storage can be dynamically extended to achieve information synchronization and sharing. What more, information security is one of the most important considerations in our design. All operational behavior of the document can be recorded and log in authentication mechanism is necessary and file data stored in the platform has high strength encryption. Taking these needs, build a private cloud storage platform to meet these requirements (Jin *et al*., 2013).

Architecture of the collection platform based on hadoop: Many distributed file systems can be used to build the cloud storage platform, such as Google File System, HDFS (Hadoop Distributed File System) (Sun *et al*., 2011), FastDFS, MooseFS (White, 2009) and so on, through the analysis of comparison, we chose HDFS to store patient information to build a private cloud storage platform (Li *et al*., 2012). Hierarchical structure model is shown in Fig. 4.

Cloud storage platform building and some key technologies: Haddoop cluster consists of one NameNode, one SecondaryNode and three DataNode components. All nodes operating system are classic Linux operating system--Ubuntu 14.04, Hadoop version is stable version 1.0.1, the database is the NoSQL-class database--Hbase, which is designed for Hadoop. Server configuration information is shown in Table 1.

CONCLUSION

A cloud-based storage dietary obesity four diagnostic TCFM collection platform is designed and partly established. The four diagnostic information can be collected, saved, transmitted and shared. Not only can improve the collection efficiency and provide data supporting for the subsequent Chinese food medical dietary obesity clinic research.

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