Design and application of medical image remote transmission system

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Abstract: *In order to solve the problem of long transmission time in the practical application of hospital image transmission system, which leads to low transmission efficiency and unable to realize the efficient use of limited resources, the design and Application Research of medical image remote transmission system is carried out. Through the hardware design of host computer display screen selection and web server selection, and the software design of medical image remote transmission protocol selection and analysis of medical image remote transmission content, A new transmission system is proposed. Experiments show that under the same number of images, the new system has shorter transmission time and higher transmission efficiency.*

Keywords: *Medicine; imaging; remote; transmission; system; application;*

1. Introduction

Under the background of the development of my country's medical industry and the integration of modern technology, doctors' diagnosis and treatment methods and treatment methods for patients are gradually showing a diversified trend. Conventional hospital diagnosis and treatment equipment includes CT machines, MRI equipment, gastrointestinal endoscopy, etc., which were used by early doctors. When this kind of medical equipment is used to diagnose and treat patients' diseases, it usually adopts the method of outputting film for medical image management, but this kind of film management method will accumulate a large amount of film in the hospital. When doctors need to call a specific medical image, they will waste more time. At the same time, the use of film storage for medical image management will also be affected by improper management, resulting in image distortion, damage, loss and other problems [1]. However, the problems raised have been well solved in the development of modern medical industry. In today's diagnosis and treatment system, most hospitals have basically realized film free radiotherapy, and in this process, the application of digital technology, It also provides support for medical image storage and post-management to a large extent [2]. In order to provide patients with better services and improve the efficiency of hospital diagnosis and treatment, this article will combine the development status of the medical industry, starting from the two levels of hardware and software, to carry out the research on the design and application of the medical image remote transmission system. In this way, medical treatment The high-efficiency and stable transmission of the film inside, in a true sense, realizes the multi-angle optimization of the diagnosis and treatment process.

2. Hardware design of medical image remote transmission system

The essence of the operation of the medical image remote transmission system in this article is to realize the acquisition, storage, transmission and processing of medical image data. Under normal circumstances, the acquisition of medical image data can be obtained through medical digital imaging and communication image equipment, or through non-standardized medical Acquired by digital imaging and communication equipment. When transmitting medical images, It is necessary to convert the data into the data format that can be recognized and transmitted by the system through the medical digital imaging and communication gateway [3]. Therefore, when designing the system hardware, this paper takes into account the dependence of image data storage and transmission, as well as the needs of remote transmission, and obtains the system hardware structure as shown in Figure 1.
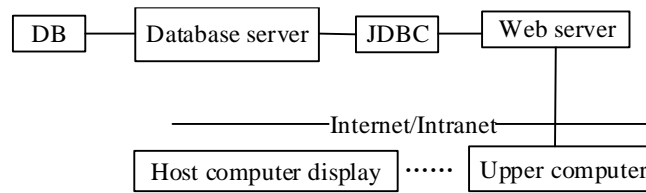
Figure 1 Hardware structure of medical image remote transmission system

Combine the content shown in Figure 1 to select various types of hardware devices. For system users, the system not only needs to provide high-quality medical images for them during operation, but also processes them according to the characteristics of medical images to achieve high-definition display of the images. Based on this, this article first selects the host computer display model. In this paper, ALX-1827-10 medical display is selected as the research objectHost computer display screen. The display resolution of this model is 2560×2048;The response time is 15 ms; It has DVI, VGA, HDMI and other ports; The contrast ratio is 1200:1; The brightness can be adjusted from 900cd / m2 to 1300cd / m2; The display area is 428.20 mm × 325.25mm (long × Width). The brand of this type of medical display has been established for a long time, and it has a good application market. At the same time, there are many technologies supporting its operation, Therefore, the application of this display to the system of this text can further improve the operating effect of the system and expand the scope of application.

Secondly, in order to realize the remote transmission of the text system, it is also necessary to select the system Web server model, and choose the FTP875-50 model server as the text Web server. This model server has a 2.6GhzCPU frequency; the hardware capacity is 16T; and the power supply is 650WW. Compared with other Web servers used in data transmission systems, this type of Web server has larger capacity and memory, so it can support the transmission of medical images in this system [4].At the same time, the storage capacity of the server is adjustable, so according to the needs of the system in the follow-up operation process, the storage capacity can be further expanded and the system operation performance can be improved by increasing the external equipment or changing the configuration at any time.

3. The software design of medical image remote transmission system

3.1. Select medical image remote transmission protocol

After the Web server selected in this article completes the establishment of the remote transmission environment for medical images, when two upper computers communicate, it is necessary to ensure that they have a unique identifier to achieve one-to-one transmission. Therefore, the choice is made for the remote transmission protocol of medical images. In order to avoid the problem of patients' medical privacy being leaked during the transmission process, when selecting the transmission protocol, it is necessary to ensure the security of the transmission. Considering that there are a lot of complex operations related to transmission in traditional TCP / IP protocol, it is difficult to ensure that the transmission is not affected. Therefore, this paper chooses socket network communication protocol as the medical image remote transmission protocol, and combines with DICOM standard image transmission rules to realize the supervision of data and transmission environment in the process of transmission [5].Due to the large amount of data transmitted by medical images, usually the data amount of an ultrasound image can reach tens of megabytes. Therefore, in the process of remote transmission of medical images, high accuracy of data transmission must be ensured. Therefore, This article uses connection-oriented streaming non-blocking sockets.In the process of medical impact transmission, the parameters of the connection are analyzed to determine whether the context of the connection conforms to the standard of socket network communication protocol, and then the transmission language of both sides is negotiated to provide guarantee conditions for the transmission.

3.2. Analyze the remote transmission content of medical images

On the one hand, in order to protect the patient's medical privacy, on the other hand, in order to reduce the operation pressure of the transmission system in this paper, when remote transmission of medical images is carried out, it is necessary to encode them according to the remote transmission line protocol selected in this paper, Only by analyzing the transmission content can the real medical image content be obtained. The receiver can realize the analysis of the remote transmission content of medical

images through the following formula:

$$\delta(x) = \mu x(1-x) \qquad (1)$$

In formula (1), $\delta(x)$ represents the remote transmission data received by the receiver; μ is the conversion coefficient of medical image data. The formula (1) is used to analyze the received data and iteratively process the reorganized data. In the process of falling, the receiver and receiver specify the number of iterations and the string after the iteration, Ensure that the entire process will not be acquired by other users, so as to realize the remote and secure transmission of medical images.

4. Comparative experiment

Combined with the above discussion in this article, the theoretical design of the medical image remote transmission system is realized. In order to further explore the advantages of the system in the actual application field, apply it to the same operating environment as the traditional regional sharing transmission system at the same time, complete the following Comparative Experiment:

Micros 56.02 is selected as the operating system of the two transmission systems, The CPU is Intel E8-2600v1, the memory is 16G, and the hard disk is 2TB. Enter the image information of a certain hospital patient into the system database, and complete the database installation and corresponding configuration. Choose 1000 patient images of this hospital, and transmit them by two kinds of transmission systems respectively. After completing the transmission, record the experimental results and get the results shown in Table 1.

Table 1 Comparison of experimental results of two transmission systems

Number of images	Transmission time of the system in this paper	Traditional system transmission time
200s	15.24s	18.32s
400s	25.24s	29.25s
600s	32.26s	52.16s
800s	41.26s	65.24s
1000s	51.74s	82.14s

From the experimental results in Table 1, it can be seen that the transmission time of the system in this paper and the transmission time of the traditional system are not much different in the transmission of 200 and 400 patient images. The transmission time of the system has produced a larger and larger difference, obviously the transmission time of the system in this paper is shorter. Therefore, through comparative experiments, it is proved that the medical image remote transmission system proposed in this paper has higher transmission efficiency in practical application.

5. Conclusion

In order to improve the rational utilization rate of medical image resources, this paper proposes a new transmission system, and proves the practical application performance of the system through experiments. The application of this system in practice can effectively increase the channels for obtaining image data information and realize the balanced utilization of limited network broadband resources.

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