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Study on Convenient Intelligent Medical and Nursing Information System Based on Large Data

Ruoyu Xu
Hubei business college,School of Economics,wuhan,hubei,China

Abstract
To solve the problem of the low operating efficiency of the original big data automatic analysis system, this paper put forward the research of automatic big data analysis system based on intelligent medical treatment. Thesystem hardware was optimized, the expansion function board was added, and the two-stage conversion was set to ensure the stable output of voltage. Based on intelligent medical treatment, the framework of the big data automatic analysis system was established to judge the reliability of data, and then the data quality assessment algorithm was adopted to complete the design of the big data automatic analysis system based on intelligent medical treatment. The experimental results showed that compared with the original system, the operation time of the designed system was shortened by about 56%, and its operating efficiency was greatly improved, providing better services for patients and medical staff.
Key words: big data; Information systems; Smart Medical

With the development of information and communication technologiesas well as the change of information perception modes, traditional medical modes and health service modes have changed, and it has become a development trend to convert patients' information into data information. Medical science is based on data analysis andis assisted by scientific and technological means, aiming to timely and accuratelyunderstand patients' conditions through their electronic medical records and health records. Therefore, the huge medical data platform will become the best assistant for disease diagnosis and treatment. Due to the low operating efficiency of the original big dataautomatic analysis system, the research on automatic big data analysis systems based on intelligent medical treatment was proposed.

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I. HARDWARE DESIGN

To meet the hardware requirements of the current intelligent medical system in the field of big dataautomatic analysis, the circuit of the storage module was optimized based on the original hardware facilities, so that the storage module could operate normallywhen processing complex data.

1.1 Overall structure of system hardware

The automatic analysis system of big data was extended and designed on the core control board, and the core control board was connected with the expansion function board through the FMC interface. The core control board mainly includes a FPGA clock and related circuits, and the original hardware was optimized on the expansion board.

1.2 Circuit Design of the Storage Module

Due to the complexity of the data to be processed, the whole data storage module needs a variety of power supply voltages. The nuclear voltage required by the main control chip is 1.2V, the auxiliary voltage is 1.5V, the external input voltage is 28V, and the data interface circuit is 3.3V. Therefore, the voltage of the storage module was converted. As the voltage value allowed by most power conversion chips was less than 28V, it couldn't be completed in a single conversion, so a two-stage conversion was set. First of all, the 28V high voltage was converted into a more stable 5V voltage, and then the 5V voltage was converted into other required voltage values. At the front end of the converter module, a filter module was set up to isolate noise and make voltage output more stable.

II. SOFTWARE DESIGN

After the system hardware platform was completed, the software part of big data automatic analysis system based on intelligent medical treatment was designed.

2.1 Data reliability judgment

As far as the automatic analysis of big data is concerned, data reliability evaluation is essential. The authenticity and reliability of the data were judged, and the analytic hierarchy process was used to synthesize the evaluation results to ensure the accuracy of the results obtained from the automatic analysis of big data.

First of all, the collected information was imported to the database to screen the data information in the database, and the data quality was divided into five dimensions. Different evaluation rules were set for each dimension of data to analyze which data in the database would have an impact on the overall quality of data, and prioritize the evaluation of the data information that had a greater impact on its quality. After the preliminary evaluation, the data with low reliability was removed from the database, the five dimensions of data quality and their corresponding proportions were determined, and then the evaluation

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rules of the five dimensions were set reasonably based on the actual situation. Based on this, the data quality was evaluated andthe final credibility evaluation results were obtained by comprehensively considering the evaluation results of each dimension.

Qualitative prediction method was used to determine the accuracy of the results, and the results were divided into four categories:the positive category was predicted as the number of positive categories; The positive category was predicted as the number of negative categories; the negative category was predicted as the number of negative categories; The negative category is predicted as the number of negative categories. Its accuracy is as follows:

$$P = \frac{\mathrm{TP}}{\mathrm{TP+FP}} \tag{1}$$

Where TP is the number of positive categories predicted by the positive category; FP is the number of positive categories predicted by the negative category. The recall rate of untrusted data is as follows:

$$P = \frac{\mathrm{TP}}{\mathrm{TP+FN}} \tag{2}$$

Where FN is the number of negative categories predicted by the negative category. According to Equations (1) and (2), the harmonic average of accuracy and recall rate can be obtained as follows:

$$F = \frac{\mathrm{2TP}}{\mathrm{2TP+FP+FN}} \tag{3}$$

According to the above calculation, the reliability was analyzed, and the trusted data set was obtained. Then the data quality of indicators of different dimensions was calculated. Part of the code of the data quality assessment algorithm is as follows:

```
intaddition()；
{
// Analyze data set reliability
ENDFOR
// Remove untrusted data
Return；
}
```

So far, the evaluation results of data credibility have been obtained, and on this basis, the Hadoop distributed infrastructure was used to establish the big data automatic analysis modelbased on intelligent medical treatment.

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2.2 Big data processing mode conversion based on intelligent medical treatment

The data processing of large-scale data analysis system needs to be assisted by the Hadoop distributed system infrastructure and adopt master-slave structure. The namenode manages the file system and maintains the information list, while the data node is responsible for the storage of information and the response of user read/write requests. The specific situation is shown in Figure 1.

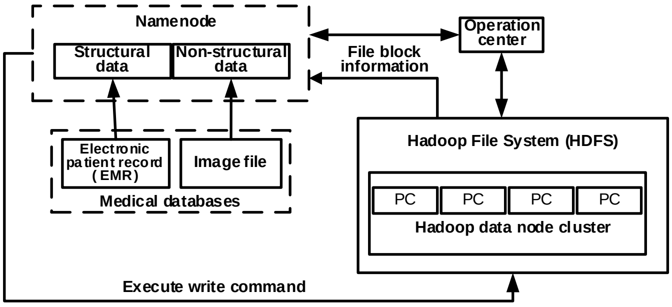

Figure 1 Schematic diagram of data layer operation

According to the operation process in Figure 1, the big data automatic analysis template based on intelligent medical treatment was generated to query and analyze the collected large-scale data. So far, the research on the automatic big data analysis system based on intelligent medical treatment has been completed. To verify the performance of the system, simulation experiments were designed.

III. SYSTEM PERFORMANCE TEST

To verify the effectiveness of the big data automatic analysis system based on intelligent medical treatment, a comparative experiment was conducted by contrasting the original system.

3.1 Performance Test Process

The performance test was conducted in the network center of the affiliated hospital of a well-known medical university. Due to the large amount of data transmission required in this experimental process, a disk array storage platform needed to be used to realize storage expansion of medical servers, and a fiber Channel switch was used to complete data exchange among experimental devices. Its topology is shown in Figure 2.

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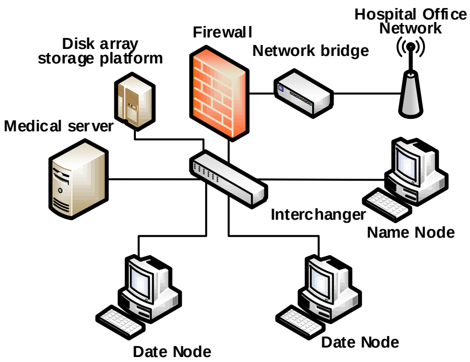

Figure 2 Experimental topological structure diagram

In the experiment, 1 million pieces of clinical prescription data of a chronic disease were used to run the designed analysis system and the original system simultaneously. Then the time spent on data association analysis was compared between the two systems, and the comparison results were obtained.

3.2 Test result analysis

A contrast experiment was conducted between the original system and the designed system, and the specific comparison results were obtained.

the operating time of the designed system was significantly shortened compared with the original system. The specific operating efficiency difference is shown in Table 1.

TABLE 1. Comparison table of experimental results

Minimum support (1 million in total)	Running time of original system /s	Running time of designed system /s	Time shortening rate /%
0.1	32.1	14.3	55.4
0.2	35.0	16.4	53.1
0.3	28.7	13.7	52.2
0.4	34.2	12.5	63.4
0.5	35.1	14.9	57.5
0.6	33.8	15.2	53.4
0.7	32.6	13.8	57.6
0.8	34.3	16.5	51.8

According to the data in Table 1, under the circumstance of the samesample size, the running time of the original system was within the range of 30 ~ 36 s, and its running speed was relatively slow, so it cannot completeautomatic analysis of big datain a short period of time, accurately find the required information, and meet the needs of medical staff and patients; The operating time of the designed system as stable within the range of 12 ~ 18s. Compared with the original system, its operating time was shortened by about 56%, and the operating efficiency was steadily improved. Therefore, it can be seen that the designed system can accurately and quickly complete the automatic analysis of big data and optimize the user experience.

Combined with the actual situation of major hospitals at present, a big data automatic analysis system based on intelligent medical treatment was designed. The system is characterized by low implementation cost, accurate data analysis, and strong scalability, and optimizes a series of problems of the original system. So it is expected to provide support for medical staff in clinical diagnosis, promote the intelligent information construction and development of various major hospitals, and provide a theoretical basis for research in related fields.

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