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Research on the Quality Management of Hospital Statistical Data Based on the Internet of Things

Xu Lixiang

Linshu County People's Hospital, Linyi, China
XLX19921214@163.com

Abstract: *Due to the inefficiency of traditional statistical data quality management methods, the slow data collection results in the slower statistical data collection. Aiming at this problem, we study the hospital statistical data quality management methods based on the Internet of Things. This method is mainly based on the basic characteristics of the Internet of Things, and establishes a data collection process with RFID technology as the core; on the basis of the detection process, through the calculation of the operation link, the possible problems and loopholes in the calculation data are found; finally through the information collection Technology to further optimize the quality of the statistical data of the Internet of Things. In terms of experimental analysis, the traditional method and the method in this paper are measured for the efficiency of data collection, and the time required for the same collection of values is calculated, and the method designed in the article is more efficient and more suitable for the quality management of hospital statistical data.*

Keywords: *Internet of Things; RFID technology; statistical data; quality management; collection; intelligence*

1. Introduction

The emergence of the Internet of Things is a brand-new information technology revolution. In the construction of hospital informatization, RFID technology is used to manage the quality of statistical data. Informatization is a more important link in the medical reform. Whether the Internet of Things technology can change the efficiency of statistical data is the main Research direction. The Internet of Things is composed of three parts. The "things" refers to the people and things in the hospital's target, medical equipment and doctors, etc.; "connected" refers to the wired network connection in the hospital system; "network" refers to wireless signals and wired networks The connection between them forms a new network. Establish and improve new operating procedures in accordance with the standards of the Internet of Things, thereby optimizing the quality of statistical data. The article uses traditional methods as a research comparison, and it is concluded in the experiment that the quality management of hospital statistical data under the Internet of Things is a more suitable method.

2. Hospital statistical data quality management method based on the Internet of Things

2.1. Set up the Internet of Things statistical data collection process

The actual operation of the Internet of Things technology requires three parts to identify objects in a targeted manner; the second part is to read the inherent attributes of the data, and the inherent data is transferred for transmission and the data format is adjusted; the final processing center will Pass the correct object information to the information processing center, and then complete further calculations [1]. Data collection is an important part of the operation of the Internet of Things, and it is also the key to making it more intelligent than traditional data statistics. Front-end data collection can choose radio frequency identification technology (ie RFID), which is more adaptable to various environments, and the use of data identification tags can make the operation more convenient. Figure 1 shows its operating principle:

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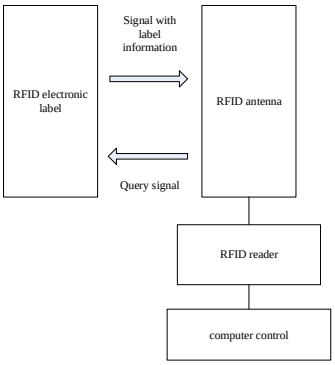

Figure 1: Principle of RFID technology operation

The radio frequency signal reader can receive the abnormal data source and other problems, and then transmit it to the electronic tag. The reader reflects the radio frequency signal, and the abnormal data can be located after analyzing the frequency signal [2]. The actual RFID collection process is designed as follows:

Step1: Statistically organize the initialization of the data;

Step2: Check whether the processing result is abnormal, if it is abnormal, verify the request from the computer server, otherwise adjust the single-channel signal;

Step3: Wait for the transmission to be interrupted, check and confirm whether it is interrupted;

Step4: If the parallel conversion of the collected information signal is interrupted, otherwise repeat the above steps again;

Step5: Detect whether the signal is completely converted, it can be read and transmitted after the complete conversion, otherwise the information is sent;

Step6: Activate the sending command, read the data for transmission, and finally complete the collection of statistical data.

2.2. Detect vulnerabilities in statistical data collection

Abnormal data will appear during the statistical data collection process. For the distance from the different reference node 1.2.3 to the information node A that needs to be collected, the calculation formula is as follows:

$$\begin{bmatrix} (1-x_1)^2+(2-y_1)^2+(3-z_1)^2 \\ (1-x_2)^2+(2-y_2)^2+(3-z_2)^2 \\ (1-x_3)^2+(2-y_3)^2+(3-z_3) \end{bmatrix} = \begin{bmatrix} a_1^{\,2} \\ a_2^{\,2} \\ a_3^{\,2} \end{bmatrix} \quad (1)$$

In formula (1), 1.2.3 of the RFID reader, there are a total of three reference nodes, the spatial coordinates are $1(x_1, y_1, z_1)$, $2(x_2, y_2, z_2)$, $3(x_3, y_3, z_3)$ in sequence; the spatial coordinate of the information node A is $A(x_A, y_A, z_A)$; $a_1^{\,2}$, $a_2^{\,2}$, and $a_3^{\,2}$ respectively represent the three reference nodes The distance to the information node A can be solved by formula (1), and the information node coordinates of A can be determined. Need to use RFID technology to scan the initial time, set the basic threshold to be T; set M_t to be the number of repeated scans of data under time; set M_{t+1} to be the number of repeated scans of data under the condition of a specific time $t+1$. The available calculation formula is:

$$M_t - M_{t+1} > T \quad (2)$$

Combining formula (1) and formula (2), when the number of repeated scans exceeds the set threshold, it can be determined that time $t+1$ is the initial position of the initial scan of abnormal data.

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In this position, set the initial data acquisition time; set it as the time window, and obtain the formula for calculating the initial scan time of abnormal data:

$$t = t_{\alpha} + (t+1) \cdot \beta \quad (3)$$

Substituting the numerical points into the formula can locate the abnormal data and find the loopholes in the data collection.

2.3. Information collection technology management statistical data quality

Information collection in the Internet of Things can be divided into three layers. The first layer is the most basic perception layer. The data collection performed at the perception layer affects the application layer of the third layer, which is a more important part of the operation; the composition of the network layer The structure is determined according to the mode of information transmission, generally the Internet and data control centers, etc.; the final data will be transmitted to the application layer, and the last layer will use the required data in actual applications [3]. The statistics of data are the first to start with information collection. In the current hospital system, doctors and patients are the sources of information data collection in the system. The required data is obtained from people or objects and transmitted to the next link. The data is analyzed and processed in the network application platform, and the final information will be conveyed to the outpatient clinic for management [4]. No matter what type of data needs to be counted, it is carried out on three levels. Using formula (3), we can find out the abnormal problems in the data in time.

Information collection is the prerequisite for data statistics. Its technology consists of three parts. The first is the sensor network. As the core of data collection, it is the processing link of the perception part of the task, which is divided into the data collection part, the information processing link and the power supply link. In practice, multiple networks can be filed with the base station as the center to save the corresponding calculation costs; the second is the server, which mainly implements the processing of the user terminal part, and is connected to the sensor network, which can process information on the basis of storage. And transfer, storage can be transferred to the server for processing; the last is the WEB terminal. Compared with the first two, this part is the most terminal for users to operate. The user can log in by himself, check the update of the node, and then update For tasks such as perception and monitoring, the results of data collection and analysis are finally viewed in the form of visual charts [5]. This is a complete set of information collection technology operation framework, and statistical analysis can be carried out during information collection to complete a more efficient quality management plan.

3. Experiment analysis

In order to verify that the information collection technology proposed in the article can perform statistical data quality management analysis more reasonably and efficiently, this method is used as an experimental group and a traditional method is selected as a control group to compare the differences between the two groups in hospital statistical data quality management sex. Set the experimental test as follows: Under the same data conditions, which group is more efficient in data quality management. This experiment selected Hospital A as a pilot for data collection and statistics. The comparison results of the two groups of data are shown in Figure 2 below:

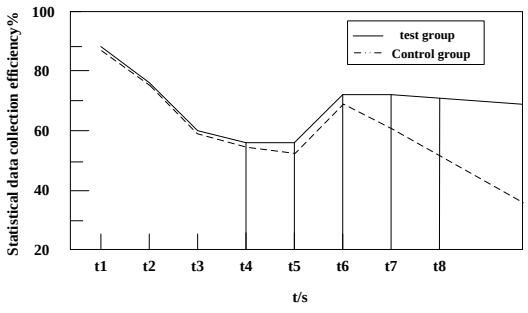

Figure 2: Comparison of statistical data collection efficiency

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According to Figure 2, there is no significant difference between the experimental group and the control group in the early stage. The minimum difference is between t1-t4 and the difference is less than 10%. During the test time range, the value of t6-t8 begins to increase, and the maximum difference starts at t8. There was a difference of 20%, and the control group still had a significant downward trend, while the experimental group basically stabilized, indicating that the experimental group was more efficient and more stable in collection.

In order to further verify that the experimental group requires a shorter time, based on the 512bits value, the two groups are compared and analyzed, as shown in Table 1:

Table 1: Comparative analysis of the acquisition time of the two technologies

Numerical value/bits	test group	Traditional group
10	2ms	2ms
50	9ms	15ms
215	50ms	70ms
512	80ms	120ms

It can be seen from Table 1 that the higher the value of the two sets of data, the greater the difference in efficiency comparison, the maximum difference is 40ms at 512bits. It can be seen that the Internet of Things can shorten the time for hospitals to collect information for the hospital's statistical data quality management. Improve work efficiency.

4. Conclusion

The researched quality management method is based on the Internet of Things to provide more reliable technical support for the statistics of the hospital. In this experiment, only the efficiency of data collection is compared. Later, comparative experiments can be carried out on the accuracy of statistical data and the degree of data accommodating, etc., through more angles to verify and analyze, and it is the statistics in the actual hospital system. Data quality management provides more reference data.

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