Research on multimedia digital real-time signal transmission based on probability and statistics

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Abstract. Aiming at the problem of poor transmission effect and low transmission integrity of multimedia digital real-time signal, this paper studies the optimization, and puts forward a method of multimedia digital real-time signal transmission based on probability and statistics method.Based on the principle of information feature collection, a real-time signal transmission model of multimedia digitization is constructed, and the transmission rate of multimedia digitization real-time signal is effectively controlled according to the collected information, so as to ensure the integrity of signal transmission.Finally, the experiment proves that the multimedia digital real-time signal transmission method based on probability statistics method has high integrity and can better improve the signal transmission effect.

Keywords: Probability statistics; multimedia; digitization; real time signal; signal transmission

1 Introduction

The accurate transmission of multimedia digital real-time signal has good benefits for long-distance real-time signal transmission, but at the same time, the long-distance real-time signal transmission link is interfered by many factors in the process of signal transmission, which is easy to cause the problem of transmission delay.Because the multimedia signal is very large, it needs a good compression method for digital multimedia to guarantee the signal quality,Only when the signal is compressed to a certain extent can real-time transmission be carried out, but there is no reliable guarantee in the current real-time signal transmission link,In the transmission process of weak network signal, a long time delay will cause more compression packets to be lost, resulting in the sluggish and unclear phenomenon of multimedia signal.Therefore, it is necessary to adjust the transmission delay in the long-distance real-time signal transmission link to meet the smoothness and reliability of multimedia digital real-time signal.The key problem of real-time signal transmission delay is pointed out. Furthermore, the influence of transmission delay of multimedia digital real-time signal is discussed.After a series of comparison, analysis, research and discussion, the problem

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points of transmission delay are obtained. Finally, the problem of multimedia digital real-time signal delay is improved to solve the problem of transmission delay and improve the signal sensitivity of transmission delay.

2 Multimedia digital real time signal transmission

2.1 Multimedia digital real-time signal acquisition

According to the location relationship, size and total number of spatial objects of the multimedia digital real-time signal's neighbor objects, the specific feature collection process is as follows:

It is assumed that in the process of multimedia digital real-time signal transmission, the order of signal space filling curve is m, and the spatial range of signal set S can be divided into $2^M \times 2^M$ grid, each grid has four-dimensional Hilbert coding [1].The spatial four-dimensional Hilbert coding linear filling curve aggregation feature is used to decompose the massive signal coding blocks, mark the corresponding storage sequence of each coding block H_2, and form the corresponding spatial signal partition matrix, as shown below:

$$F=\begin{vmatrix} H_{2\mathrm{de}0} & H_{1a0} & s_0 \\ \cdots & \cdots & \cdots \\ H_{2\mathrm{de}n} & H_{1an} & s_n \end{vmatrix} \quad (1)$$

In the above algorithm: $H_{2\mathrm{de}n}$、H_{1an}、s_n represents the space element of real-time signal. If the source signal $S=\left[\mathrm{s}_1(t),\mathrm{s}_2(t),...,\mathrm{s}_n(t)\right]^T$ of real-time signal is an unknown n-dimensional source signal vector, a is an unknown mixed matrix, $S=\left[\mathrm{s}_1(t),\mathrm{s}_2(t),...,\mathrm{s}_n(t)\right]^T$ is a dimensional noise vector, and $X=\left[\mathrm{x}_1(t),\mathrm{x}_2(t),...,\mathrm{x}_n(t)\right]^T$ is the output dimensional observation signal vector, then:

$$X = AS + F\mathrm{m} \quad (2)$$

According to this element, the corresponding signal coding and the corresponding massive signal block storage label after matrix matching are obtained, thus completing the signal element division [2].According to the single division of the corresponding signal feature set, the collected multimedia digital real-time signal assumes that the length is larger than the width, then the transverse direction of the massive signal is a positive direction set, and the longitudinal direction is a reverse direction set, so as to calculate the spatial element interval of

the massive signal.Through this interval, the coding block is decomposed to realize the acquisition and division of signal characteristics [3].According to the results of real-time signal feature division of multimedia digitization, the massive signal is controlled through protocol transformation to realize real-time collection, analysis and combination of massive signal in the process of large-scale transmission. The model construction is shown in Figure 1.

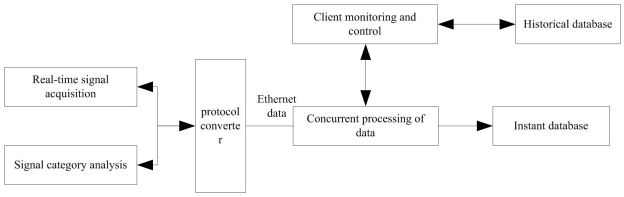

Fig. 1. Construction of multimedia digital real-time signal transmission model

Take communication server as the core, maintain the connection between signal converter and client, and provide support for signal transmission control [4].All the non current signals inside the server are converted into the history signal library, and the real-time signals are read through calling and communication interface [5].There are usually two kinds of signals in the history signal library, namely control command signal and monitoring command signal [6].Once the multimedia starts or stops, the control command of signal transmission forms the signal frame through the communication device, and then it is transmitted to the charger which can automatically cut off the power through the protocol. The problem of signal transmission concurrency is solved by multi thread scheduling, which provides a good environment for the realization of control technology.In the process of mass multimedia real-time data transmission, the problem of path blocking of transmission nodes is very easy to occur. In the process of signal characteristic data packet transmission, large-scale collision is the main cause of data packet loss,At the same time, due to the limitation of data link communication time limit, multimedia real-time signal transmission is incomplete. In order to achieve the integrity of multimedia real-time signal transmission, transmission integrity control technology needs to be studied. The specific research content of control principle is as follows:

① Determine the coordinates of signal transmission initialization node, determine the grid and conflict area of each signal transmission node, and set the node counter;

② Count the data transmission speed of the signal transmission node;

③ Check whether all nodes are of the same type of signal transmission node. If so, record the transmission speed of each node in the signal transmission grid. If not, the transmission speed of the signal transmission node itself needs to be calculated;

④ Check whether the transmission cycle ends. If yes, the average speed of the new

composite node and grid of this type of node needs to be published. If not, the transmission speed of the node itself needs to be calculated;

⑤ According to the signal transmission routing protocol, the transmission priority of the signal transmission node is calculated;

⑥ Check whether all signal transmission nodes are of the same type. If so, record the transmission speed of each node in the grid. If not, adjust the current channel competition window;

⑦ Check whether the energy is exhausted. If so, the node exits. If not, check whether the cycle ends, if so, it ends. If not, the new cycle begins. Further standardize the real-time information transmission control level, as shown in the table below

Table 1 Real time information transmission effectiveness control scheme

Relationship	Control method		
$t'_s < t'$	No control measures		
$t'_{min} < t' < t'_s$	Changing data transmission frequency	Adjust transmission rate	Take anti-interference measures
$t' < t'_{min}$	Replace the data link network		

According to the information in the table above, the multi-level division of multimedia digital real-time signal features is carried out to provide data support for the integrity acquisition control value.

2.2 Multimedia digital real time signal transmission rate control

Based on the above signal acquisition results, further analyze and control the wave frequency of non concurrent signal transmission, and study the integrity of mass information transmission and the precise effect of signal control technology of multimedia digital real-time signal in the same network storage environment [7].In view of the congestion problem in the transmission process of massive multimedia digital real-time signals, it is necessary to analyze the congestion situation of each transmission node and select the optimal signal output path [8].Draw and display the specific signal congestion situation, as shown in the figure below:

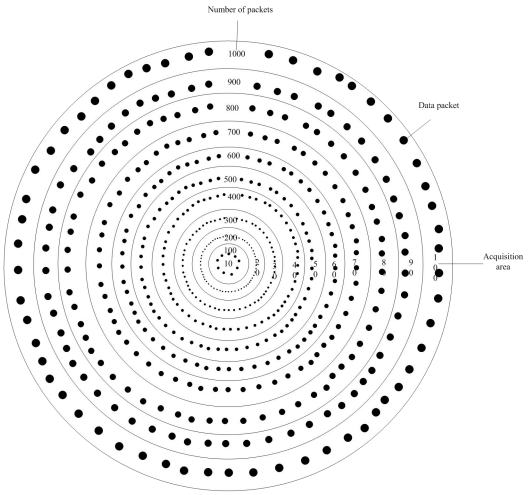

Figure 2 congestion wave frequency of multimedia digital real-time signal

Based on the above characteristics of congestion wave frequency, the collected inflow signal wave frequency is detected and recorded to control and process the transmission speed of morning signal packet.It is equally allocated to its own nodes and other sub nodes to ensure the accuracy of the control of the integrity of parallel signal transmission [9].Record the transmission time and interval of the signal packet, and calculate the signal service time and arrival time by using the mobile weighting method. When the arrival time is less than the service time, the signal transmission congestion is more serious; otherwise, it means that the signal congestion is not serious and the signal transmission speed is faster [10].According to the above analysis results, cl-aptc protocol and probability statistical method are used to control the single node signal transmission rate, actual transmission rate and signal chain transmission effectiveness.The specific control steps are as follows:

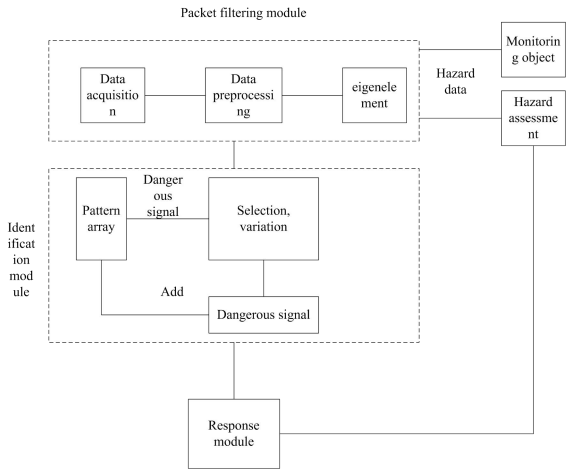

Fig. 3. Single node signal transmission control steps

Based on the above steps, the wave frequency generated in the process of signal transmission is further managed and controlled. When the storage space of a node is less than the transmission rate adjustment threshold, the signal node will not be congested;When the storage space of a node is larger than the transmission rate adjustment threshold and smaller than the maximum storage space of the node, the signal node may be congested.The signal transmission rate is adjusted based on the wave frequency of single node signal transmission [11].Determine the size of the signal transmission wave frequency, and record the information transmission wave frequency rate of the most node as 0.

The expected value of the average transmission signal through n-1 -period grid is recorded as e, the threshold value of signal transmission rate adjustment is T_1, the maximum storage space is N, the total number of information transmission nodes in a grid is r, when $E < r^* T_1$, the signal transmission will not be congested; when $r^* T_1 < E < r^* N$, the signal transmission will be congested, the node transmission rate needs to be adjusted.

By setting the node transmission rate weight, the optimal input and output speeds of different nodes are obtained [12]. Based on the above-mentioned principle and the commonly used DSP algorithm, the two-way address of information transmission is accessed in one way.In the process of signal transmission, it is easy to generate some abnormal signals and interference values, which leads to differences in relatively fixed signal transmission [13].Therefore, it is necessary to improve and optimize the signal transmission path in combination with the principle of neural network, and further optimize the common neural

network structure, as shown in the figure below.

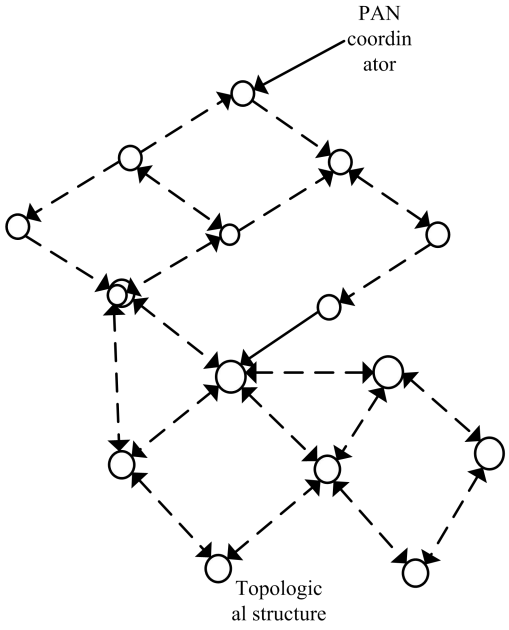

Fig. 4. Information transmission neural network structure

Based on the above structure, the frequency conversion parameters of the received multimedia digital real-time signal are further optimized. If q is the baseband signal formed by the inherent frequency conversion of the equipment, it can be expressed in $iR_n \le \mathrm{p} \le (i+1)R_n$ as follows:

$$\mathrm{s_i} = X + \frac{r * T_1 E + r^* N - 1}{2F(\mathrm{q_i e}^i + z_i)} \quad (3)$$

In the above algorithm, R_n represents the signal transmission period; z_i represents the mean value of information transmission; $\mathrm{q_i}$ represents the baseband form of multimedia data.The multimedia signal received by VDE receiver of multimedia data has the problem of time delay and frequency offset. Therefore, it is necessary to estimate the time delay and frequency offset of the signal and correct them [14].For the modulated baseband signal of multimedia wireless ad hoc network, the baseband form $\mathrm{q_i}$ in $iR_n \le \mathrm{p} \le (i+1)R_n$ can be

expressed as:

$$q_i=\sqrt{2p'}e^i \quad (4)$$

Where p' is the monitoring power of multimedia digital real-time signal transmission.The current algorithm for the transmission symbol phase of multimedia signal can be recorded as follows:

$$f_i = f_{i-1} + \Delta a \ (s_i - q_i) \quad (5)$$

In the above algorithm, f_{i-1} represents the characteristic phase at the end of the previous signal transmission symbol, and Δa represents the phase change of the current information transmission symbol. The transmission rate of multimedia real-time signal is further calculated, and the specific algorithm is as follows:

$$v_0=\left[\log_2 \frac{f_i(K'-I)}{H_1+D_0}\right]H-k \quad (6)$$

In the above algorithm, D_0 represents the total amount of signals; H_1 represents the storage size of signal blocks.The information set of statistical coding signal elements is recorded as K'. assuming that the total number of coding blocks of multimedia digital real-time signal is I, if the storage size H of the signal block is greater than the maximum threshold percentage of the storage mass signal block, then the coding speed should be divided into sample set k.Based on the above algorithm, it can effectively optimize the transmission rate of multimedia digital real-time signal and improve the effectiveness of multimedia digital real-time signal transmission.

2.3 The realization of multimedia digital real-time signal transmission

Based on the above algorithm, the multimedia digital real-time signal transmission method is further optimized.If the standard value of multimedia digital real-time signal transmission in a secure environment is e, in order to avoid other factors interference, ensure the information security of users, and avoid the problem of transmission data leakage.Combined with probability and statistics algorithm, the transmission signal is authenticated and judged.In the process of signal transmission, the user's identity information and password, scanning information and related digital password are authenticated and retrieved [15].After the realization of identity authentication, the real-time signal transmission

protocol is further optimized. Aiming at the non coordinated real-time signal transmission characteristics, fuzzy inference technology is used to provide technical support for automatic modulation recognition of signal.After acquiring the new real-time signal transmission characteristics, it is necessary to judge whether the previous priority thread of real-time signal transmission is blocked and whether the latter priority thread is occupied, and observe the likelihood of different real-time signal transmission signals.The specific calculation formula is as follows:

$$S = f_{\mathrm{i}}(a)\sum_{\mathrm{i}=1}^{n}\mathrm{ke}+\omega_{\mathrm{i}}(v_0-1)^n \quad (7)$$

In the above algorithm, n is the real-time signal transmission quantity; ω_{i} is the weight of signal component i; $f_{\mathrm{i}}(a)$ is the analysis model function.According to the above algorithm, the likelihood degree of real-time signal in different periods can be obtained. According to the likelihood degree, the transmission path of real-time signal transmission can be accurately simulated, and then the output path of signal can be selected and tracked.

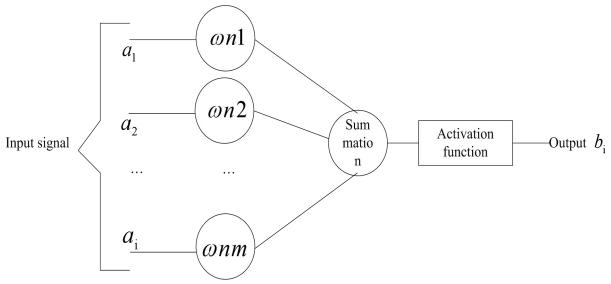

Fig. 5. Real time signal output path

The signal is identified by the signal tracking results obtained above. The tracking signal path is divided into three paths, which are the transmission path of the source, the intermediate transmission path and the receiving path of the terminal. The three paths are transmitted to $f_{\mathrm{i}}(a)$, and the signal likelihood is judged in the analysis model function. The method of product reasoning is used to identify the signal. The recognition process is as follows:

（1）Obtain multimedia real-time signal through A / D converter;

（2）Analog signal digitization, signal processing, acquisition of complex signal and spectrum;

（3）The amplitude and frequency of instantaneous transformation are obtained by using

complex signal, and the variance and accumulation of instantaneous amplitude and the maximum value of power spectral density are obtained respectively;

（4）Set the parameters of each threshold, and use the automatic modulation method to identify the signal characteristics, and display the identification results through the screen.

The periodic rotation system is used to update the real-time signal, construct the signal feature cluster, and divide it into two output stages, namely the initial stage and the stable stage.In order to fast cluster transmission and management of real-time signal acquisition nodes, the specific process is shown in the figure below.

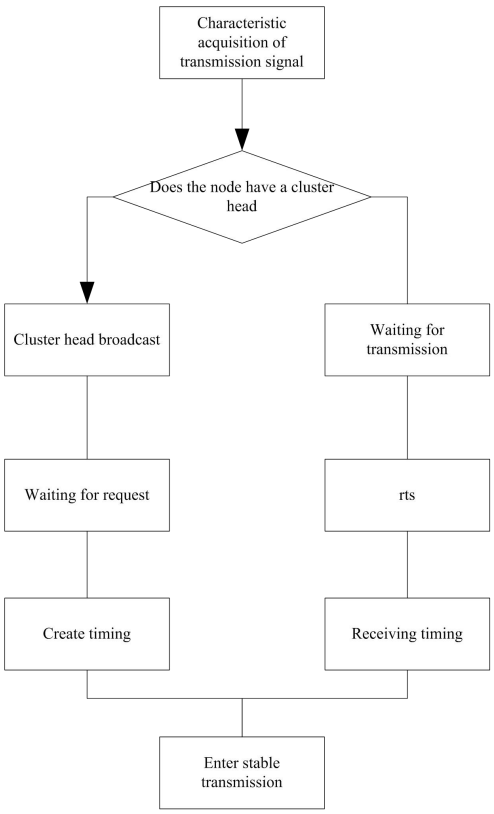

Fig. 6 Real time signal acquisition and cluster transmission management steps

In this process, the multimedia control layer protocol is used to limit the data link for data transmission. In view of the channel conflict during signal transmission, the relevant node transmission rate and data packets are sent.The real-time signal transmission time slot is allocated by using the multiplexing method of shared transmission medium.Multimedia real-time signal transmission module is mainly realized by path covering in the network. In the process of data transmission, we need to avoid the congestion caused by heterogeneous

network as much as possible, and treat the transmission information and multimedia output data for classification processing.Because the order of the packets arriving at the destination is very strict in multimedia transmission, TCP socket is used to realize the order transmission of multimedia;For signal transmission, the arm node should be used as the connection client and the server as the server. The user needs to improve the speed of signal acquisition through the interface. Therefore, the picture transmission process is designed as shown in the figure.

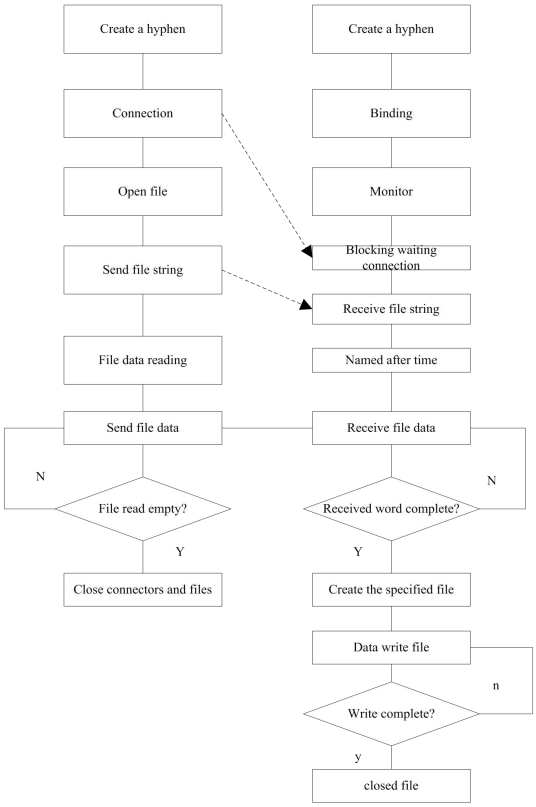

Fig. 7. Multimedia real-time signal transmission process

Based on the above process, it can effectively realize the accurate transmission and management of multimedia digital real-time signal, and improve the accuracy and effectiveness of data transmission management.

3 Analysis of experimental results

In order to verify the effect of multimedia digital real-time signal transmission based on probability and statistics method, the traditional methods are compared and detected, and the detection results are recorded. In order to ensure the validity and confirmation of the experimental detection, the experimental environment and experimental parameters are set

uniformly.

3.1 Experimental environment

Using MATLAB software to analyze the integrity of mass data transmission under big data storage, and keep the location of network nodes unchanged. The experimental environment is set as follows: fix the nodes on the plane of 120m × 120m, the number of nodes is 80, and the running PC host is configured as Pentium (R) 4cpu2.40 GHz. Further set the experimental parameters, as shown in the table below:

Table 2 Experimental parameter settings

Parameter name	Parameter setting
Adapter frequency	12Mb/s
communication mode	TCP/IP Protocol communication
Number of keys	3-5
Security protocol level	A-F
Hard disk memory	16GB
Number of experiments	4

3.2 experimental result

In the above experimental environment, carry out comparative detection, and record the detection results of the two groups of methods. In the experimental process, the data transmission integrity and data transmission security are taken as the reference basis, the higher the two values, the better the signal transmission effect. The specific experimental detection results are as follows.

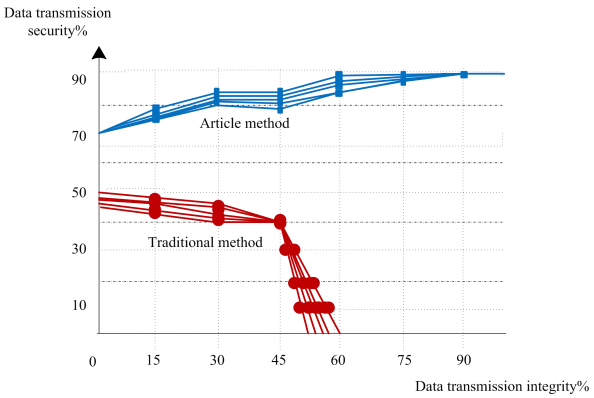

Fig. 8. Comparison test results

3.3 empirical conclusion

Based on the above detection results, it can be seen that compared with the traditional signal transmission method, the multimedia digital real-time signal transmission method proposed in this paper has higher transmission integrity and data transmission security in the practical application process, which fully meets the research requirements.

4 Concluding remarks

In order to solve the problem of poor transmission effect of multimedia digital real-time signal, this paper optimizes and improves the transmission delay and the loss of compression packet in the long-distance real-time signal transmission link.To maximize the quality of signal transmission. Through the research on the influence of transmission delay in real-time signal transmission link, the influence value of long-distance real-time signal transmission can be obtained to improve the reliability, safety and efficiency of transmission link.

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