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Intelligent Evaluation System of Pathology Teaching Based on PSO Neural Network

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Abstract

In order to improve the ability of intelligent diagnosis and evaluation of pathology teaching, a design scheme of intelligent evaluation system of pathology teaching based on PSO neural network is proposed. This paper constructs a sampling model of intelligent assessment information in pathology teaching, analyzes the distribution characteristics of big data in the intelligent evaluation system of pathology teaching, and adopts multi-mode intelligent control method to design the stability control of intelligent evaluation system for pathology teaching. The adaptive scheduling and learning algorithm design of intelligent assessment of pathology teaching is carried out by using big data's fusion scheduling method. According to the interference information component of intelligent assessment of pathology teaching, PSO neural network learning and equalization control are carried out. The classification method of PSO neural network is used to realize the classification and identification of various pathological diagnoses and the intelligent evaluation of pathology teaching. The intelligent evaluation system of pathology teaching is developed in embedded ARM and Linux environment. The system is divided into AD module, information transmission module, intelligent control module and human-computer interaction module. The test results show that the designed intelligent evaluation system of pathology teaching has good human-computer interaction performance and the reliability of the system is good.

Keywords: *PSO; Neural Network; Pathology; Teaching Intelligence Evaluation system*

1. Introduction

With the development of network information technology and intelligent control technology, the pathological teaching intelligent evaluation system is designed in the artificial intelligence environment to improve the pathological teaching intelligent evaluation ability. The pathology teaching intelligent evaluation system is the key to guarantee the quality of pathology teaching. In the MOOC resource scheduling and distance learning environment, combined with multimedia control technology, the optimal design of pathology teaching intelligent evaluation system is carried out. Combining the optimal scheduling and information transmission control of teaching resources, the big data information fusion model of pathology teaching intelligent evaluation system is established to improve the resource information sharing and intelligent fusion scheduling ability of pathology teaching. [1] The design pathology teaching intelligent evaluation system is of great significance in improving the teaching quality and optimizing the intelligent control of the teaching process. The research on related system design methods has received great attention.

The design of the pathological teaching intelligent evaluation system is based on the integration of big data information processing on the data sampling of teaching resource information, combined with the intelligent control and multimedia remote control method for the pathological teaching intelligent evaluation system. To realize the optimal design of pathology teaching intelligent evaluation system, this paper combines big data integration scheduling and information processing technology to improve the autonomic control ability of pathology teaching intelligent evaluation system, thus improving the intelligence of pathology teaching. In the traditional method, the design methods for the intelligent evaluation system of pathology teaching mainly include fuzzy control methods, BP control methods, etc. [2] Combined with the access of educational resources and big data, and the integration of multimedia resources, the optimal design of the teaching system is realized. In Literature [3], a design method of pathology teaching intelligent evaluation system based on Internet of Things architecture is proposed, which mainly includes the Internet of Things networking module, sensor information collection module and human-computer interaction module, which improves the pathology

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teaching intelligent evaluation system. Intelligent control capabilities. However, the human-computer interaction of the system is not good, and the resource integration capability is not strong. In Literature [4], a design scheme of pathology teaching intelligent evaluation system based on inversion control method and artificial neural network is proposed, and a sensor information sampling model is established. Combined with intelligent control technology, it realizes intelligent assessment and resource scheduling of pathology teaching in big data environment. However, the design of the system design is highly complicated, and the intelligent control performance is not good.

In view of the above problems, this paper proposes a design scheme of pathology teaching intelligent evaluation system based on PSO neural network. Firstly, this paper constructs the pathological teaching intelligent evaluation information sampling model, analyzes the big data distribution characteristics of the pathological teaching intelligent evaluation system, and adopts the multi-mode intelligent control method to carry out the stability control design of the pathological teaching intelligent evaluation system. Then, the big data fusion scheduling method is used to design the adaptive scheduling and learning algorithm for pathological teaching intelligent evaluation. The PSO neural network classification method is used to realize the classification and identification of various pathological diagnosis, and the pathological teaching intelligent evaluation is realized. Then, in the embedded ARM and Linux environment, the development and design of the pathology teaching intelligent evaluation system is carried out. Finally, the system test analysis shows the superior performance of the system designed in this paper to improve the intelligent assessment and control ability of pathology teaching.

2. Description of the Overall Design Architecture and Development Environment of the System

2.1 Overall Architecture of the System

In order to realize the optimal design of pathology teaching intelligent evaluation system, a three-layer control structure model of pathology teaching intelligent evaluation system is established in the Internet of Things environment, which consists of data acquisition layer, pathology teaching intelligent information processing layer and human-computer interaction application layer. Combined with big data information fusion and fuzzy control processing [5], artificial intelligence technology is used to optimize the design of pathology teaching intelligent evaluation system, and information integration processing module is constructed to optimize the pathological diagnosis information design. This can improve the networking performance and data optimization acquisition ability of the pathology teaching intelligent evaluation system. For the network module of the system, the network transmission and integration control of the big data of pathology teaching resources are realized by Internet, GPRS, WiFi and 4G network networking, and constitute the IoT structure model. [6] The sensor data array is used in the information processing layer to collect the original data of the pathology teaching intelligent evaluation system. Combined with the big data processing technology, the parameter identification and control command transmission of the pathological teaching intelligent evaluation system are realized, and the pathological teaching intelligence designed in this paper is obtained. The overall architecture of the evaluation system is shown in Figure 1.

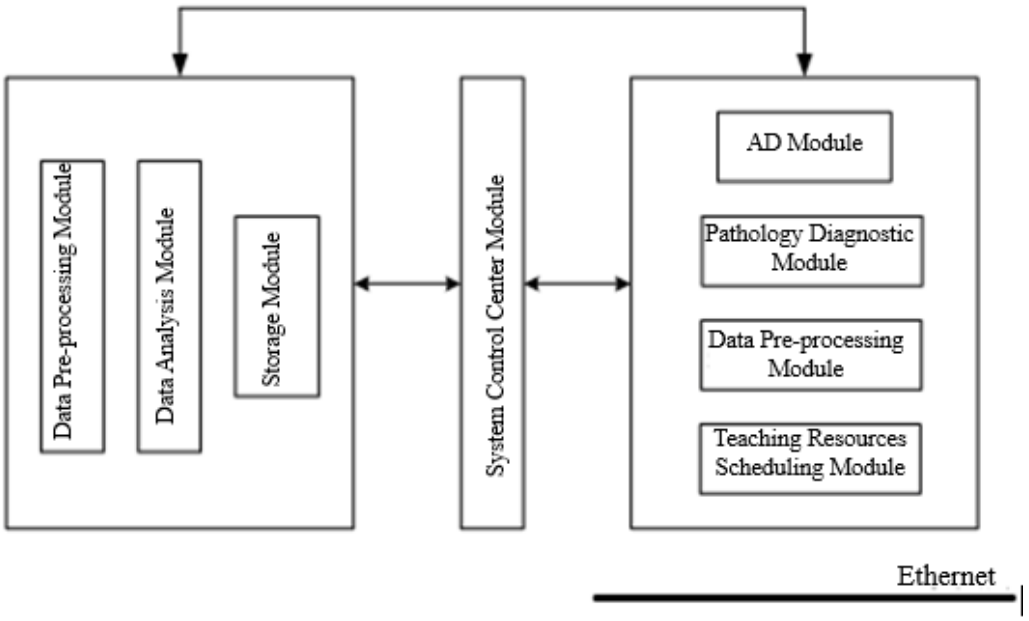

Figure 1. Overall Design Architecture of the System

According to the overall design analysis of the pathology teaching intelligent evaluation system shown in Figure 1, the system designed in this paper mainly includes AD module, information processing module, data preprocessing module and resource scheduling module. With integrated ARM control technology as the control center of the system, combined with data storage and optimized scheduling, the integrated information processing of the pathology teaching intelligent evaluation system is implemented. The network communication protocol based on ZigBee is established in Ethernet to realize the network design and bus transmission

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control of the pathological teaching intelligent evaluation system. [7]

2.2 Description of the System Development Environment and Analysis of the Functional Modules

On the basis of the above analysis of the overall design framework of the pathology teaching intelligent evaluation system, the functional modular design of the pathological teaching intelligent evaluation system is carried out, and the intelligent development design of the pathological teaching intelligent evaluation system is carried out in the embedded environment. For the core of the pathology teaching intelligent evaluation system designed in this paper, big data processing technology is adopted for integrated information scheduling and remote communication. The Internet of Things technology is used for the network design of pathology teaching intelligent evaluation system, and the user interaction experience design of pathology teaching intelligent evaluation system is adopted by centralized control. The big data integration scheduling model of pathology teaching intelligent evaluation system is constructed. The embedded integrated control of the teaching system is implemented by DSP microprocessor and embedded ARM. The GUI rendering technology is used to design the pathological teaching intelligent evaluation system. Combining RTCP control structure words for information fusion processing of pathology teaching intelligent evaluation system, this paper designs user interaction experience of pathology teaching intelligent evaluation system under .NET Framework application. This enhances the contextual interaction and perception capabilities of the pathology teaching intelligence assessment system. [8] In summary, the functional structure of the pathology teaching intelligent evaluation system designed in this paper is shown in Figure 2.

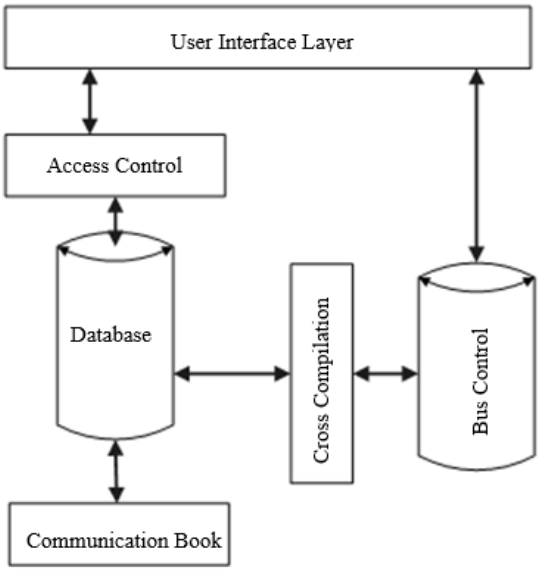

Figure 2. Functional Structure of Pathology Teaching Intelligent Assessment System

Human-computer interaction information transmission and interface design of pathological teaching intelligent evaluation system are carried out by CW, LFM and HFM reverse addressing. In the NET Framework environment, MVB integrated control technology is used for bus control and database development design. In the embedded ARM and Linux environment, the development and design of pathology teaching intelligent evaluation system is combined with integrated DSP technology to realize integrated information processing of the system.

3. Algorithm Design

3.1 Big Data Mining and Features Analysis

In order to analyze the big data distribution characteristics of the pathological teaching intelligent evaluation system, the big data fusion scheduling method is adopted for the adaptive scheduling and learning algorithm design of pathological teaching intelligent evaluation. [9] The big data feature sampling model for pathology teaching intelligence assessment is described as:

$$h(t) = H\sum_{m=1}^{M}\sum_{k=1}^{K(m)}\alpha_{mk}\delta(t - T_m - \tau_{mk}) \quad (1)$$

Herein, H refers to the transmission bandwidth of pathology teaching intelligent evaluation system; M is the multipath expansion loss, $K(m)$ is the attenuation coefficient of pathological teaching intelligent evaluation system in the m node. The big data impulse attenuation index ζ for constructing pathological teaching intelligence assessment is:

$$\zeta = \frac{Q^{+}(\theta)w}{w^{T}Q^{+}(\theta)w} \quad (2)$$

The IEEE802.3EFM communication protocol was used to construct the structural model of the pathological teaching intelligent evaluation system, and the interference intensity of the pathological teaching intelligent evaluation big data information sampling was obtained as follows:

$$|s(f)| = A\sqrt{\frac{1}{2k}\{[c(v_1)+c(v_2)]^2+[s(v_1)+s(v_2)]^2\}} \quad (3)$$

In the formula, $A(t)$ is the delay extension of the pathological teaching intelligent evaluation output symbol, f_0 is the initial frequency of the teaching resource transmission for the pathology teaching intelligent assessment system. $k = B/T$ is the information transmission FM slope of the pathology teaching intelligent assessment system. B is the capacity of the channel. In the case of channel distortion, the output teaching resource information offset of the pathology teaching intelligent evaluation system is obtained as:

$$E = \|x(t)\|^2 = \sum_j\sum_k |C_j(k)|^2 = \sum_j E_j \quad (4)$$

In the pathology teaching intelligent evaluation system, the energy attenuation relationship of single-frame data transmission is:

$$\delta^2 = \sum_{i=1}^{m}\frac{F_i - F_{avg}}{F} \quad (5)$$

At the limited symbol rate, obtain the multipath feature component $P_r(t)$ of the big data output in the pathological teaching intelligent evaluation system:

$$p_r(t) = p(t) * h(t) + n_p(t) \quad (6)$$

In the formula, $h(t)$ is the impulse response function of the pathology teaching intelligent evaluation system. $n_p(t)$ is the interference item of the sampling output of the teaching resource information. According to the above analysis,

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combined with the resource optimization scheduling method, the big data mining and feature analysis of pathological teaching intelligent evaluation are realized.

3.2 Systematic PSO Neural Network Learning and Equalization Control

In this paper, the spread spectrum processing of the pathological teaching intelligent evaluation system is combined with the channel spread loss, and the PSO neural network learning and equalization control are performed according to the interference information component of the pathological teaching intelligent evaluation. The transmission function of PSO neural network learning is:

$$H(t) = S(f)\int_{-\infty}^{\infty} s(t)e^{-j2\pi ft}dt\sum_{i=1}^{c}\sum_{j=1}^{n}u_{ij}^{m}\left\|v_i - x_j\right\|^2 \quad (7)$$

PID control is carried out by using the pathology teaching resource big data fusion scheduling method to improve the intelligent control ability of the teaching system. The iterative function expression of PSO learning is:

$$\frac{\partial k\left(W^T z\right)}{\partial W} = sign\left(k\left(W^T z\right)\right)*\left[E\left\{z\left(W^T z\right)^3\right\} - 3W\left\|W\right\|^2\right] \quad (8)$$

$$k(x) = E\left(x^4\right) - 3E\left(x^2\right) \quad (9)$$

The output stability control of the pathological teaching intelligent evaluation system is controlled by the adaptive optimization control method of particle swarm. The inertia weight coefficient of PSO learning is defined as:

$$\{b_1', b_2', \cdots, b_v'\} = \arg\min_{\{b_1, b_2, \cdots, b_v\}}\left(\max_{\sum_{v=1}^{V} b_v \bullet x_v < 0, 1 \le n \le N} \left|\sum_{v=1}^{V} b_v \bullet x_v\right|^2\right) \quad (10)$$

Particle population $S = \{P_1, P_2, \cdots, P_m\}$, set $P_i^d(t)(i = 1,2,\cdots,m)$ refer to the position of the particle i in the space of the current d-dimensional space. In the range $[W_{\min}, W_{\max}]$, the adjustment formula is as follows:

$$W(t+1) = 4.0W(t)(1 - W(t)) \quad (11)$$

$$W(t) = W_{\min} + (W_{\max} - W_{\min})W(t) \quad (12)$$

Herein, $[W_{\min}, W_{\max}]$ is the PSO learning inertia weight in the pathological teaching intelligent evaluation process. The objective function obtained by the neural network control is:

$$\begin{aligned} \min imize \quad & \frac{1}{2}\|w\|^2 + C\sum_{i=1}^{n}(\xi_i + \xi_i^*) \\ subject\ to \quad & y_i - (w'\Phi(x_i) + b) \le \varepsilon - \xi_i \\ & (w'\Phi(x_i) + b) - y_i \le \varepsilon - \xi_i^* \\ & \xi_i, \xi_i^* \ge 0, i = 1,2,\cdots,n; C > 0 \end{aligned} \quad (13)$$

Introduce the learning factors C_1 and C_2, and then the extremal evolution of each particle individual is:

$$C_i(t+1) = 4.0C_i(t)(1 - C_i(t)) \quad (14)$$

$$C_i(t) = C_{\min} + (C_{\max} - C_{\min})C_i(t) \quad (15)$$

Herein, $i = 1,2$, $[C_{\min}, C_{\max}]$ is the adaptation of the particle i. According to the above analysis, the recursive calculation form of the equilibrium control of the pathological teaching intelligent evaluation system is obtained:

$$\boldsymbol{C}_{(i+1)} = \lambda_i^{-1}\boldsymbol{C}_{(i)} - \beta_{i+1}^{-1}\alpha\boldsymbol{u}\boldsymbol{u}^T \quad (16)$$

$$\boldsymbol{D}_{(i+1)} = \boldsymbol{D}_{(i)} + \beta_{i+1}^{-1}\alpha\boldsymbol{z}_{i+1}\boldsymbol{u}^T \quad (17)$$

Herein, the tapping factor of the pathology teaching intelligent evaluation system is λ_i. In the recursive process, by adaptively adjusting the inertia weight, it is judged whether the convergence criterion is satisfied:

$$\varepsilon(k) = d(k) - y(k) = d(k) - \sum_{i=1}^{M} W_i x(k-i) \quad (18)$$

If it is satisfied, multipath expansion is performed according to the frequency domain characteristics of the pathological teaching intelligent evaluation system, and the offset of the system control is obtained as follows:

$$F_{fitness} = \frac{1}{m}\sum_{i=1}^{m}(f_i - y_i)^2 \quad (19)$$

Take the individual extremum corresponding to the particle with the best fitness value as the initial global extremum G_{best}^d. Through the PSO neural network learning, the optimal control matrix $\boldsymbol{W}$ of the system output is obtained as:

$$\boldsymbol{W}_{opt} = \arg\min_{\boldsymbol{W}} \lambda\left\|(\boldsymbol{X} - \boldsymbol{D}\boldsymbol{W})\boldsymbol{G}\right\|_F^2 \ \ s.t\ \left\|\boldsymbol{w}_i\right\|_0 \le k \ \ \forall i \quad (20)$$

This paper adopts big data analysis technology to reduce the fading characteristics of pathological teaching intelligent evaluation, reduce the output error rate in the pathological teaching intelligent evaluation process, and improve the performance of pathological teaching intelligent evaluation. [10]

4. Hardware Development and Design for the System

Based on the above-mentioned system control algorithm and big data information processing algorithm design, the hardware development design of the system is carried out. The hardware development design of pathology teaching intelligent evaluation system is implemented by embedded ARM. The system is divided into AD module, information transmission module, intelligent control module and human-computer interaction module. The DSP integrated signal processor is used for the big data information processing of the pathological teaching intelligent evaluation. The SDICmdSta register and the SDI Response Register 0-3 register are used for the information interaction design and bus scheduling of the pathological teaching intelligent evaluation. Design LOCAL bus and PCI bus for program scheduling and cross-compilation control. For the system's MVB integrated control module, the 5409A bit reverse addressing method is used for integrated control. Four AD8582 are used for AD sampling and data conversion control to obtain the analog switch circuit for path control of the pathological teaching intelligent evaluation system. The CPLD is used to control the liquid crystal display interface, and the interface design and human-computer interaction design of the pathology teaching intelligent evaluation system are carried out in parallel. In summary, the hardware composition of the pathology teaching intelligent evaluation system designed in this paper is shown in Figure 3.

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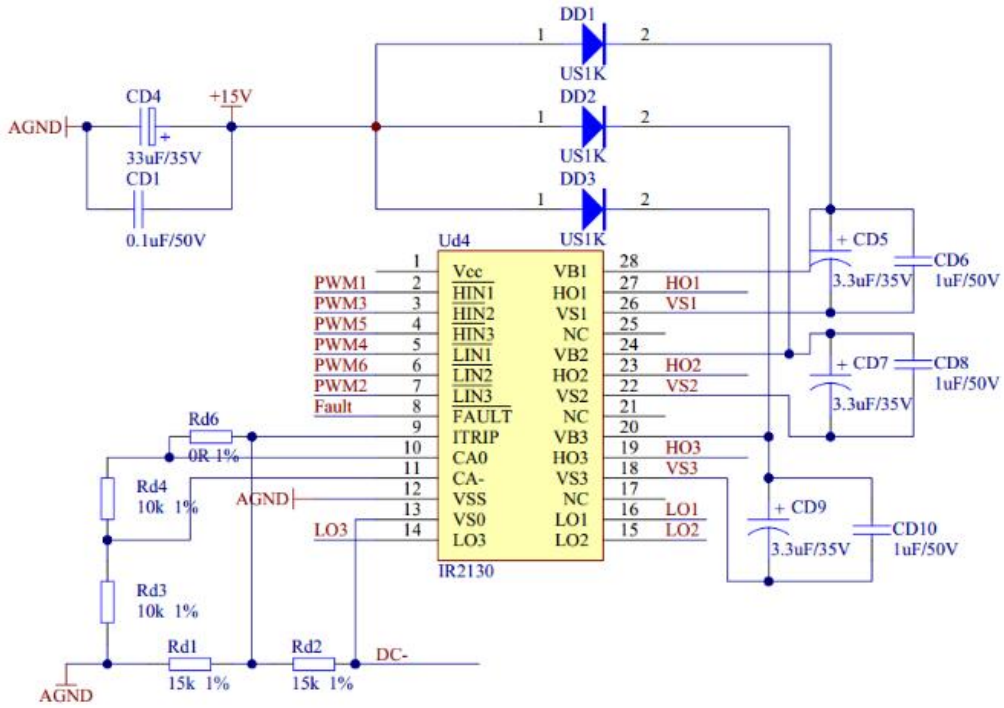

Figure 3. Composition of the System's Core Hardware

5. Analysis of the Experiment Test

In order to test the performance of the system designed in this paper, the system debugging is carried out. In the system debugging, the maximum bias voltage is designed to be 200V, and the driving voltage is 10~20V. The working mode of A/D sampling is PWM mode, and the execution frequency of the system is 40KHz. According to the above test parameter setting, the output of the parameter test result of the system is shown in Figure 4.

```
[root@FriendlyARM bin]# ./latency -t 0 -p 1000 -T 120 -h
== Sampling period: 1000 us
== Test mode: periodic user-mode task
== All results in microseconds
warming up...
RTT|  00:00:01  (periodic user-mode task, 1000 us period, priority 99)
RTH|----lat min|----lat avg|----lat max|-overrun|---msw|---lat best|--lat worst
RTD|     -3.675|      9.837|     73.719|       0|     0|     -3.675|     73.719
RTD|     -3.675|      9.955|     86.519|       0|     0|     -3.675|     86.519
RTD|     -3.675|      9.837|     65.422|       0|     0|     -3.675|     86.519
RTD|     -3.675|     10.074|     66.963|       0|     0|     -3.675|     86.519
RTD|     -3.675|      9.718|    101.097|       0|     0|     -3.675|    101.097
RTD|     -3.675|     10.311|     65.422|       0|     0|     -3.675|    101.097
RTD|     -8.297|      9.955|     78.815|       0|     0|     -8.297|    101.097
RTD|     -3.675|      9.837|     64.711|       0|     0|     -8.297|    101.097
RTD|     -3.675|     15.526|    161.661|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.955|     79.882|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.955|     67.437|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.955|     82.726|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.955|     66.726|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.837|     64.474|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.837|     65.660|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.955|     69.452|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.955|     82.608|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.837|     64.948|       0|     0|     -8.297|    161.661
RTD|     -3.675|     15.052|    154.194|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.955|     65.778|       0|     0|     -8.297|    161.661
RTD|     -3.675|      9.837|     66.489|       0|     0|     -8.297|    161.661
RTT|  00:00:22  (periodic user-mode task, 1000 us period, priority 99)
```

Figure 4. Test of the System Parameters

Analysis of Figure 4 shows that the designed system can effectively achieve intelligent assessment of pathology teaching, and the stability and reliability of parameter output is better. Test the logic control performance of the system, and the results are shown in Figure 5.

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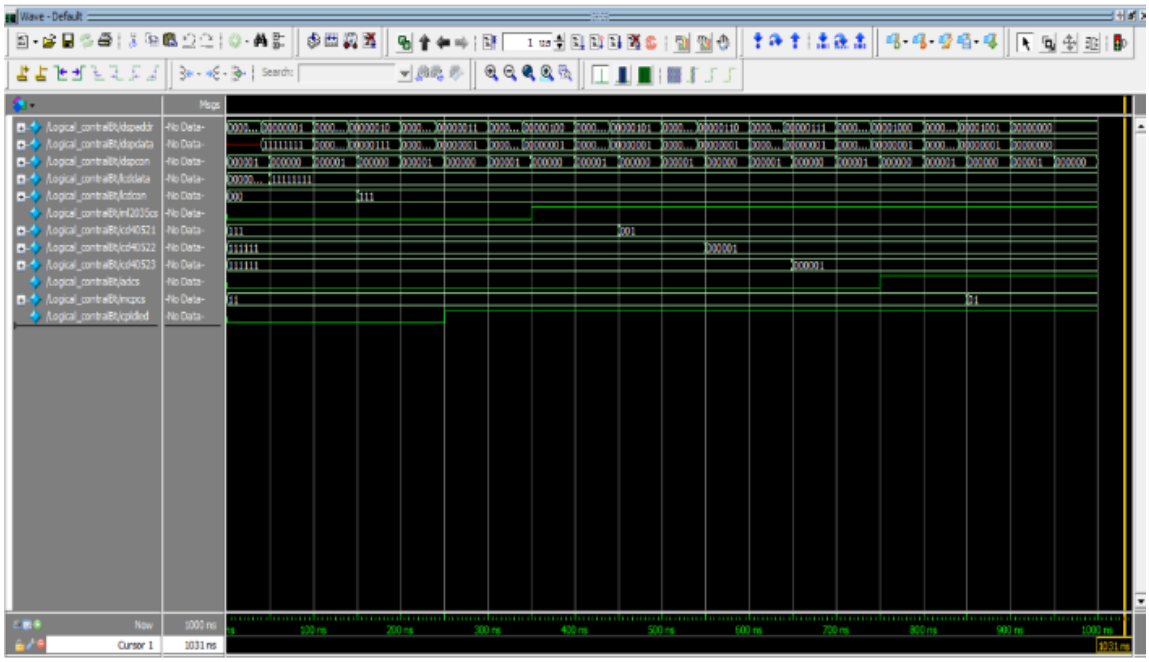

Figure 5. Simulation Result of the System Control Logic

Analysis of Figure 5 shows that the designed system has good control logic performance and improves the ability of pathology teaching intelligence assessment. Test the output delay of the system, and the results are shown in Table 1. According to the analysis of Table 1, the execution time of the system is short, the real-time performance is good, and the performance is reliable and stable.

Table 1 Comparison of Output Delay (s)

External Module	System in this Paper	PID	BP
CHIP	0.212	1.242	1.436
DAT	0.321	2.221	3.232
CPIO	0.102	2.544	2.455
PLL	0.421	1.032	3.093

6. Conclusion

This paper designs a pathological teaching intelligent evaluation system to improve the teaching quality and the intelligent control ability of the teaching process. This paper proposes a PSO neural network based pathology teaching intelligent evaluation system design. The pathological teaching intelligent evaluation information sampling model was constructed, and the big data distribution characteristics of the pathological teaching intelligent evaluation system were analyzed. The multi-mode intelligent control method is used to design the stability control of the pathological teaching intelligent evaluation system. The big data fusion scheduling method is adopted for the adaptive scheduling and learning algorithm design of pathological teaching intelligent evaluation. According to the interference information component of pathological teaching intelligent assessment, PSO neural network learning and equalization control are carried out to realize the intelligent assessment of pathology teaching. In this paper, the development and design of the pathology teaching intelligent evaluation system is carried out in the embedded ARM and Linux environment. The research shows that the designed pathology teaching intelligent evaluation system has good human-computer interaction performance, the system has good reliability, high control performance and has certain application value.

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