

Design of Electronic Information Interaction System Based on Cloud Computing

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Abstract: In the cloud computing environment, the reasonable design of electronic information interaction system can improve the real-time processing and signal analysis capabilities of electronic information. This paper presents a design method of electronic information interaction system based on cloud computing and embedded multi-mode control. Embedded ARM is used to develop cloud computing software core of electronic information interaction system. Multimode TCP/IP Ethernet technology is used to construct information transmission module and network communication module of electronic information interaction. ARM on-chip controller is used to complete reading, writing and signal reality of electronic information system. Time processing, hardware design and software development of electronic information exchange system in cloud computing environment, including serial port design, external memory design and AD interface design. Finally, the simulation results show that the system has better throughput performance and real-time processing ability, and improves the analysis and detection ability of electronic information and signals.

1. Introduction

With the development of signal and information processing technology, a large number of electronic information and data are interactively processed through cloud computing, which has been applied in various industries to improve the online analysis and large data processing capabilities of electronic information. In cloud computing environment, electronic information interaction includes integrated signal analysis, real-time processing of electronic information, signal detection and data parameter estimation. The process of electronic information interaction is a process of integrating signal processing and on-line signal analysis. A complete system of electronic information and signal processing system is needed to realize the functions of signal acquisition, information processing and data analysis and storage. Therefore, it is necessary to study an efficient electronic information interaction system for on-line scheduling and interaction of electronic information in cloud computing environment. Processing, combined with modern information processing such as cloud storage, can improve the real-time scheduling and analysis ability of electronic information. The research of related system design methods has attracted great attention.

2. Overall Design Framework of Electronic Information Interaction System

In order to realize the electronic information interaction and real-time information processing, the electronic information interaction system is constructed, the signal analysis is carried out, the interactive ability of electronic information is improved, and the electronic information interaction system is designed. The electronic information interaction system designed in this paper adopts three layers of network structure, which are basic hardware layer, cloud distributed computing framework layer and signal output application layer. The basic hardware layer mainly includes the development and design of integrated electronic information processing chip DSP, the design of core control hardware and AD design, etc. The D/A converter of electronic information interaction system is controlled by MUX101 programmable switch. The program-controlled amplifier VCA810

is embedded in the basic hardware layer of the system for analog signal analysis and digital signal processing, signal acquisition and large data processing in AD. The software layer is based on the model of C/S computing (Client/Server Computing, Client/Server Computing). The knowledge rule base is built to realize cloud computing and information interaction of electronic information, and the distributed computing frame is used. The information control terminal of the electronic information exchange system is set up in the overhead layer. The S3C2440 microprocessor is used as the core processing chip to design the I/O interface driver. The host control port (UHP) is set up through cluster deployment and mirror backup. The human-computer interaction is realized at the I/O port. The serial data line (SDA) of the electronic information exchange A/D conversion control register is controlled by full duplex synchronization. The port design of cluster server (Servers of Cluster) is carried out by hardware setting device address. User constructs microcontroller and its peripheral control memory through local client interface, realizes data conversion and AD output sampling of electronic information exchange system. According to the analysis of above design principles, the electronic information based on cloud computing designed in this paper is obtained. The overall structure of the intersystem is shown in Figure 1.

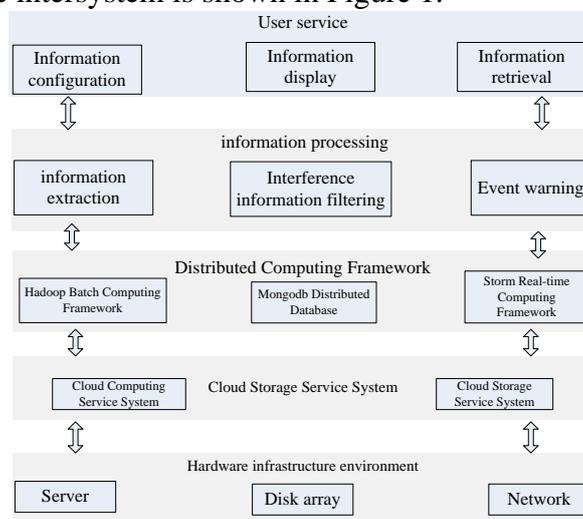


Figure 1 The overall design framework of information interaction system

3. Hardware Design of the System

On the basis of the overall design and principle analysis of the electronic information interaction system, the hardware design of the system is carried out. The hardware design is based on the embedded ARM core. The functional structure of the electronic information interaction system includes electronic information acquisition module, central control module, AD module, serial port design, external memory design and interface design. The electronic information exchange system based on cloud computing designed in this paper uses VXI bus module technology to transmit data bus and communicate signals. The collected electronic information is processed by cloud computing through information integration control. The high-speed signal processing is carried out by using DSP chip. Then the sampled values of sensors are read for spectrum analysis of electronic information. The DSP integrated signal processor is used. For high frequency amplification and filtering of electronic information, RS232 interface circuit and USB interface circuit are used for bus data scheduling between LOCAL bus and PCI bus. Local bus clock and PCI clock are established in asynchronous mode. Clock circuit is constructed to realize interrupt reset. The hardware structure of electronic information interaction system is shown in Figure 2.

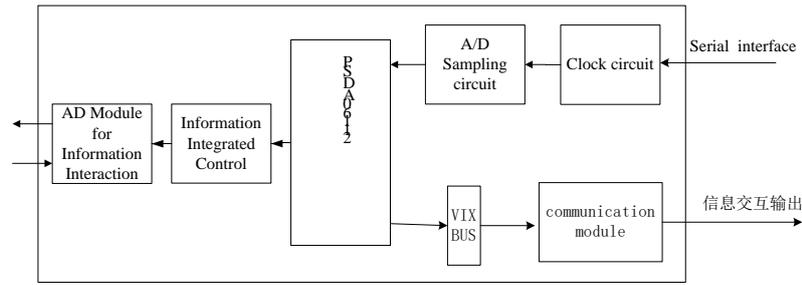


Fig. 2 The hardware structure of the system

According to the hardware structure of the system shown in Figure 2, the circuit design of each functional module is described as follows:

(1) AD module. AD module uses sensor array to sample electronic information data, and adopts distributed sensing technology in cloud computing environment to collect and integrate electronic signals. AD sampling of electronic information can be divided into three modes [4]: Direct Master, Direct Slave and DMA. The AD circuit of the electronic information exchange system uses K9F1208UOB of Samsung Company as the data acquisition chip, and converts the D/A converter into the information processing terminal of the control signal input, realizing the electronic information fusion processing and on-line driving. According to the above analysis, the AD module circuit is obtained as shown in Figure 3.

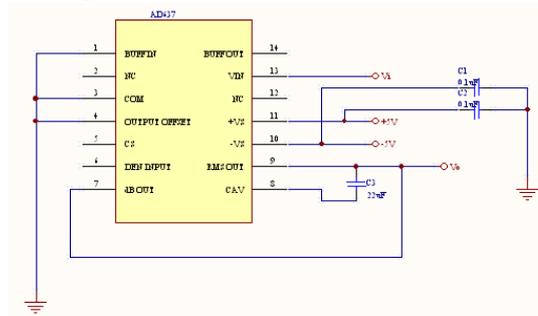


Figure 3 AD circuit

(2) Clock circuit module. The clock module is the function of controlling the interruption and reset of the clock in the electronic information exchange system. The signal is transmitted to MUX101 through the D/A converter. The amplification factor is adjusted by the DSP. The A/D sampling data displayed on the PC is displayed. The on-line control and serial structure design of the clock circuit are realized by using three multi-channel buffer serial ports. The clock circuit module is controlled by the full-duplex clock bus in the MCBSPs, and the clock circuit module is obtained. The design is shown in Figure 4.

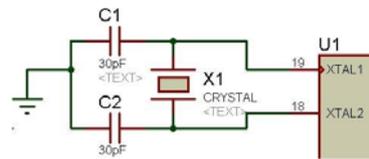


Fig. 4 Clock circuit

(3) Control module circuit. The control module circuit of the electronic information interaction system is designed with the serial port receiving and receiving information monitoring chip. The control conversion accuracy of the electronic information interaction is 12 bits. In the control transmission channel number setting and 7864 control signal design, the four-way synchronous bus control method is used to realize the online integrated control of the electronic information interaction. The control circuit design is shown in Fig. 5.

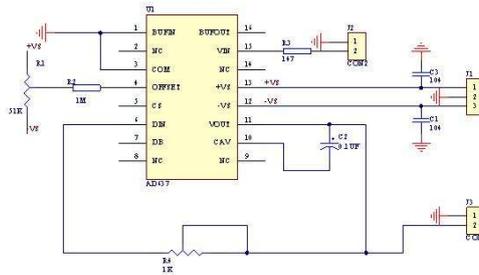


Fig. 5 Design of control circuit

(4) Output interface module. The output interface module includes A/D converter AD7864, which realizes 8-channel synchronous sampling and 4-channel synchronous output of electronic information interaction. FLASH is used to design the buffer interface of chip selection, reading and writing of electronic information, and double-port PIX bus scheduling method is used to design the serial interface and interface of write signal and data space selection signal.

On the basis of the above modularized design of electronic information interaction system, the read-write and real-time signal processing of electronic information system are accomplished by using ARM on-chip controller, and the integrated development and design of the system are carried out.

4. System Software Development and Network Communication Design

The software development of the system realizes the functions of bus scheduling, cloud computing and electronic information exchange output. The information transmission module and network communication module of electronic information exchange are constructed by using multi-mode TCP/IP Ethernet technology. The output bus control of electronic information and the high-speed processing of electronic signal are carried out through the bottom VISA software interface. The PXI-6713 is bridged by VXI bus. The module communicates with the host computer.

5. Experimental Testing

In order to test the ability of this system to simulate electronic information interaction cloud computing, the experiment is designed with the simulation software of matlab. The address bus A[15:0], the sampling rate of AD is set to 15KHz, the sampling scale of electronic information interaction data is 1000-10000Gbit, the interference intensity is -12dB, the internal storage area is divided into 11 sectors, and the spatial addressing area is 256K*16 bits. Circumstances and parameters are set to simulate and analyze electronic information interaction.

To compare the performances of different interactive systems, this method and traditional methods are used to obtain the accurate probability comparison of electronic information interaction as shown in Figure 6. The analysis shows that the throughput, accuracy and performance of this method are higher than those of traditional methods.

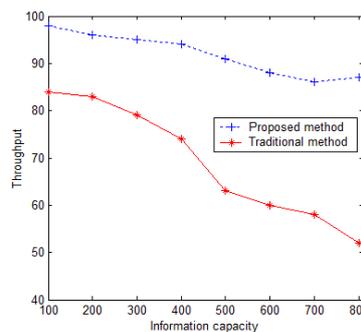


Fig. 6 Accurate transmission probability of information interaction

6. Conclusion

In order to realize the electronic information interaction and real-time information processing, construct the electronic information interaction system under cloud computing, carry out signal analysis and improve the interactive ability of electronic information, the system designed in this paper is divided into basic hardware layer, cloud distributed computing framework layer and signal output application layer. The hardware design of the system is carried out, with emphasis on the development and design of AD module, clock circuit module, control module and output interface module. The software development is carried out in the embedded multi-mode environment to realize the integrated design of electronic information interaction system under cloud computing. The test results show that the design of electronic information exchange system based on this method can improve the detection and analysis ability of electronic information and signal and the online real-time transmission ability. It has good throughput performance and accuracy, and has good application value.

References

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