



Design of Intelligent Financial Education Assistant System Based on Blockchain

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Abstract. The traditional financial education assistant system has the problems of long response speed and poor anti-interference effect of financial education information transmission. Therefore, an intelligent financial education assistant system based on blockchain is designed. Collect intelligent financial education data according to the data warehouse technology, analyze the collected intelligent financial education data through statistical analysis methods, build an auxiliary decision-making model based on the comprehensive financial data, and use the blockchain to realize the design of intelligent financial education auxiliary system, so as to realize the data conversion of intelligent financial education. The experimental results show that the average response speed of the intelligent financial education assistant system and the other two intelligent financial education assistant systems are 60.530 s, 67.220 s and 68.133 s respectively; When the noise intensity is 50 dB, 80 dB and 120 dB, the design system always has a high education information transmission accuracy, which shows that the design system can improve the Financial Education Assistance Effect of the intelligent financial education assistance system, and that the intelligent financial education assistance system integrated with the blockchain technology has better performance.

Keywords: Blockchain · Intellectualization · Finance · Educational support system · Decision model · Data characteristics

1 Introduction

Financial education assistance is not only an important embodiment of ability indicators, but also one of the industries with very strong market demand. The development level of financial education assistance system largely determines the overall management level of a user. With the gradual opening of the national financial market, all users, including telecom users, are also facing great competitive pressure. Financial education assistant system is an indispensable information management system for each unit to manage financial revenue and expenditure. It plays a great role in users' financial planning, financial control, financial supervision, financial application and so on [1, 2]. How to strengthen the management concept, reduce user costs and improve the competitiveness of users will be one of the key factors for the foothold of intelligent financial system.

After years of development, the financial information management of the user's financial department has a certain scale and efficiency. However, there are also problems inconsistent with the assistance of modern financial education, such as the cooperation between different systems, the interconnection between different systems, and the phenomenon of information island still exists.

Relevant scholars have made some progress in this field. In order to solve the problems existing in the reimbursement management of the current hospital, shixiaochuan and others have adopted the R & D mode of "mature software + customized development" under the promotion of blockchain and other technologies to build an intelligent financial system, but the problem of incomplete performance of the auxiliary decision-making model has been ignored in the design process [3]. Zhangxinqi designed a hospital financial system based on multi-scale deep learning. In the hardware design of the system, several sensors are added, and the coordinator is used to scan all the information in the financial database. In the software design, through the establishment of database forms, set the weights that can connect the same attribute financial information. According to the multi-layer perceptual network topology, a full interconnection mode based on multi-scale deep learning is designed to realize the system's deep extraction of data. However, no detailed solution is proposed for the problem that the performance of the auxiliary decision-making model is not comprehensive [4].

In view of the above problems, this paper designs an intelligent financial education auxiliary system based on blockchain, collects intelligent financial education data according to data warehouse technology, analyzes intelligent financial education data through statistical analysis methods, and uses blockchain to build an auxiliary decision-making model to realize the design of intelligent financial education auxiliary system. The design system can effectively improve the accuracy of education information transmission and response speed.

2 Hardware Design of Intelligent Financial Education Assistance System

The main objective of the demand analysis of the financial education auxiliary basic module is to develop a financial education auxiliary system that can meet the needs of users according to the needs of users, conduct a comprehensive investigation and Analysis on the needs of users, accurately define various design requirements of the development system, and describe in detail what the developed system can do, Whether the developed software can meet the needs of system users and whether it is developed according to the needs of users, so it is necessary to analyze the needs of users, comprehensively investigate and analyze users, and comprehensively clarify the needs of users. Considering the universality of industrial application, the data acquisition system designs analog, digital, switching, frequency and other data acquisition interface circuits and RS485 serial universal interface circuits according to the actual needs. Financial education auxiliary system is mainly used for external signal acquisition and equipment control. The collected signals are divided into three digital signals and three analog signals. The overall hardware architecture of intelligent financial education auxiliary system is shown in Fig. 1:

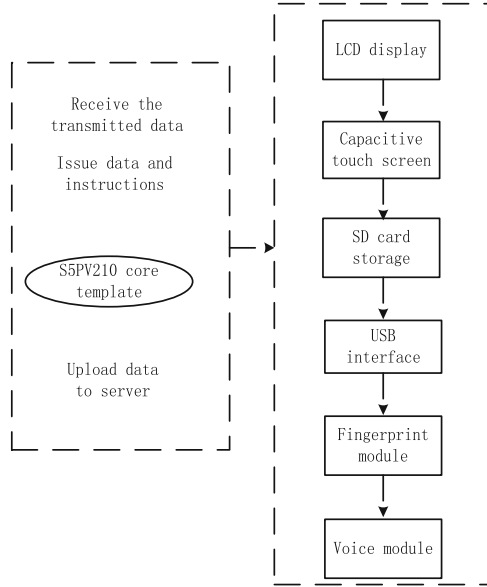


Fig. 1. The overall hardware architecture of the intelligent financial education assistance system

It can be seen from Fig. 1 that the system receives the data sent by the data acquisition system through the RS485_5 interface for processing, and displays the parsed information on the 8-in. LCD screen in real time. The operator can interact with the system through the 8-in. capacitive touch screen, which is convenient to operate. At the same time, the relay module control command is also controlled through the RS485 interface. Therefore, if Pro-SiVIC DDS data communication technology is used to send data from sensor objects in Pro-SiVIC, the output sampling frequency should not exceed the value specified in the above table. Ideally, external applications should set the same object data read rate. Otherwise, the data bandwidth flow between the sender and the receiver will be too large, which may lead to communication failure when exchanging a large amount of sensor data. Therefore, the system selects two microcontrollers, which are the MSP430 microcontroller from TI and the C8051 microcontroller from Silicon Laboratories. In the system, C801 and MSP430 communicate data through 11 IO ports, of which 8 IO ports are used for data transmission and reception, and three IO ports are used for data communication control. C805 1F has its own fully differential 24-bit Sigma-Delta analog-to-digital converter (ADC), with high acquisition accuracy and stable performance. The ADC features internal calibration, a sampling rate of up to 1 kHz, an on-chip temperature sensor and an asynchronous, full-duplex serial port. C8051 is responsible for the acquisition of three channels of analog data and the reception of one channel of RS485 sensor communication data, and then sends the data received by AD conversion and RS485 to the MSP430 microcontroller according to the protocol. All the collected data are encapsulated according to the protocol and sent to the data processing system. The specific protocol is shown in Table 1:

Table 1. Data processing protocol

Frame header	FEFB	Financial education auxiliary simulation channel	CRC check
Frame type	1 byte	Financial education aid RS485 communication 1	Financial education aid simulation channel 2
Financial education data length	2 byte	Financial education aid RS485 communication 2	Financial education aid simulation channel 1
Wind speed	1 byte	Financial education aid simulation channel 6	Financial education aid RS485 communication 1
Rotary encoding	2 byte	Financial education aid simulation channel 1	Financial education aid RS485 Communication 2
Inclination	6 byte	FEFA	Analog channel 1

As can be seen from Table 1, the data and instructions issued by the data processing system are received, and the reduced instruction set (RISC) architecture is adopted, which has strong processing capability and fast operation speed, and has a wide range of applications in the field of industrial control. DDS defines a service for efficiently distributing application data among the participants of a distributed application, which is not specific to a common object request broker architecture. This specification provides a Platform Independent Model (PIM) and a Platform Specific Model (PSM) that maps this PIM model to a CORBA IDL implementation. MSP430 is a 16-bit single-chip microcomputer. MSP430 is mainly responsible for the acquisition of frequency and digital quantities, the relay breaking control circuit, and the DAC waveform generation circuit with the DAC7614 chip as the core. MSP430 has four DART serial interfaces, three of which use RS48_5 serial communication mode, which can be extended to send and receive data from external AD acquisition modules. In the terminal design, the external AD acquisition module takes C8051 microcontroller as the core, and the external analog signal is converted by AD and then transmitted to the system through the RS485 interface.

3 Software Design of Intelligent Financial Education Assistance System

3.1 Collect Intelligent Financial Education Data

Intelligent financial education assistance is mainly for managers to use scientific statistics, calculation and analysis methods to analyze various financial data, financial statements and operation data of users, so as to judge the financial status and operation results of users in a certain period, so as to evaluate the performance of users' business activities systematically and objectively, Correctly predict the future of user development, so as to make corresponding decisions effectively. The acquisition target of system data has obvious intelligent characteristics. It is to prepare user investment plan according

to historical data and user development objectives. It has the function of automatic production and management of investment scheme. Individual evaluation of investment projects, such as economic evaluation, risk evaluation and social evaluation. The established intelligent model is used to realize the comprehensive evaluation of investment projects. Intelligent financial education assistance is not only the deep extension of users' financial data and financial management activities, but also the core and goal of users' financial management activities. Through the correlation analysis of various financial statements and financial data, we can further master users' financial status, provide scientific, reasonable, correct and effective reference for users' managers and decision makers to formulate business strategies. Through the analysis of financial statements, it can effectively evaluate the user's three abilities, profitability, debt repayment and asset operation ability, predict the user's future development trend, and provide a reliable basis for the user's management to correctly carry out business management and financial decision-making. The data acquisition and extraction structure is shown in Fig. 2:

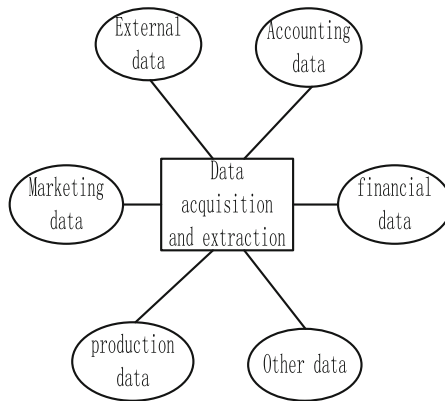


Fig. 2. Data acquisition and extraction structure

As can be seen from Fig. 2, the data collection step provides the whole system with a data support environment oriented to the subject of analysis, and provides functions such as statistical query, OLAP, and data mining. The comprehensive layer adopts massive data warehouse technology, collects and extracts the operational data of each department, analyzes and organizes it, and saves it into a special data warehouse. The design of an intelligent financial decision model must meet the overall goals of the system. It supports not only structured decision-making problems in user financial management decisions, but also semi-structured and partially unstructured decision-making problems. Support users' financial management issues at different management levels, such as supporting high-level management's macro-management decisions on financing, investment, profit distribution, and budgeting. 3. Support communication between users in order to support interdependent decision making. 4. Support users to modify and expand the database, model library, method library, knowledge base. 5. Provide convenient man-machine dialogue and good data transmission function. Intelligent financial education assistance

not only provides reliable data and basis for financial activities, but also provides data for the decision-making and management of all aspects of user operation and management activities. Supervise and control, and provide specific basis for assessment and evaluation of user's operation and management performance.

3.2 Blockchain Builds an Auxiliary Decision-Making Model

Blockchain is the underlying technology of bitcoin and the core of building its data and transactions [5, 6]. Blockchain technology is a data chain that packages data into blocks and arranges them in chronological order. Through the technical advantages of computer encryption algorithm, it ensures that the data can not be tampered with and counterfeited [7]. Therefore, the blockchain based Ledger has the characteristics of decentralization, distrust and tampering. The availability of blockchain includes two aspects. On the one hand, from the perspective of developers, the API provided by blockchain applications is difficult to be used in other services and applications. Financial aided decision-making model is a decision-making model that automatically analyzes the financial situation of enterprises and provides accurate and timely information support for managers at all levels of enterprises to make decisions by using the knowledge of relevant computer technology, management and other disciplines and based on the financial comprehensive analysis model. Based on the above description, the calculation formula of capital preservation and appreciation rate can be obtained:

$$H = \frac{\delta - q}{L} \times 100\% \quad (1)$$

In formula (1), δ represents the total equity at the end of the period, q represents the amount of newly added (+ decreased) equity during the period, and L represents the total equity at the beginning of the period. According to the calculation results, the highest score of the index can be adjusted to 1.2 times the standard score value, and the lowest score can be adjusted to 0.6 times the standard score value. The average ratio difference per point is the difference between the 1-point ratios of the scores of various financial indicators. The calculation formula is:

$$D = \sum \frac{\phi - m}{\eta - h} \quad (2)$$

In formula (2), ϕ represents the highest ratio of the industry or company, m represents the standard ratio of the industry or company, η represents the highest score of the revised index of the industry or company, and h represents the revised standard score. When designing the model, the object-oriented design idea is adopted, and the major analysis themes and small sub-themes, as well as the dimension objects and dimension levels that are concerned when statistics and analysis of business information are determined according to the requirements. Financial information is a decision-making model. It is a complex computer-aided decision-making model centered on financial analysis. It involves related financial knowledge, operations research knowledge, statistical knowledge, artificial intelligence and computer knowledge. All related disciplines are interconnected and intersected. Integrated Auxiliary Decision Model. Financial information is in the core position in various application systems of the enterprise

and comprehensively reflects the overall operation of the enterprise. Its main function is to provide managers at all levels of the enterprise with all kinds of financial information related to the enterprise now and in the future, and provide managers with correct and timely decision-making services. According to the application type of data warehouse, a database specially used to store data and an expert system to store relevant knowledge information and models can be established respectively. The special database uses the massive storage, extraction and analysis function of the data warehouse to process and store the collected information. The stored information includes the internal information accumulated by the enterprise for a long time and the information related to the external environment. After determining the subject and dimension, the behavior record structure of users' selection and use of investment business, i.e. fact table, is determined based on the division principle of the contact point between users and business support system. An analysis topic corresponds to one or more fact tables, and a sub topic corresponds to the fact table one by one in the system. The financial account book report is an important part of the financial management system. Through the enterprise's account book report, the enterprise can effectively realize relevant financial analysis and statistics, flexibly define and configure various financial statements, and effectively maintain and manage various reports. The enterprise's financial account book mainly includes account summary table, enterprise balance sheet The profit statement and cash flow statement of the enterprise. Internal information data usually includes enterprise financial data information, enterprise financial data information, enterprise sales data information, enterprise production data information and other related internal data. Support middle-level management control decisions, such as production decision, cost decision, sales decision, plan management control in inventory decision, etc. Support grass-roots operation control decisions, such as production decisions, sales decisions, inventory decisions, etc. The special data warehouse should be able to automatically identify the integrity and effectiveness of the data, check the data source from time to time, and automatically update the data warehouse in real time once the data of the data source is found to change, so as to maintain the integrity and effectiveness of the data.

3.3 Design System Software Data Conversion Function

The blockchain distributed ledger sets up multiple nodes through the same algorithm. These nodes work together to maintain the update and operation of the network. Multiple nodes can ignore the distance space for transaction and data sharing at any time. Nodes access the ledger through the public key and private key. Any transaction initiated between nodes will be broadcast in the blockchain network. The bookkeeping node obtains the bookkeeping right through the algorithm, records the transaction information completely and adds it to the blockchain information. The bookkeeping node will receive bookkeeping reward. Other nodes will update their blockchain ledger in time after receiving the broadcast of successful bookkeeping. Once recorded, the information in the ledger cannot be changed at will. Each node has the same real and tamper proof ledger, which is the unique bookkeeping method of blockchain. Data warehouse solves the problem of inconsistent data. While collecting a large amount of transaction level data from the underlying database, the data warehouse integrates, transforms and synthesizes the data. The calculation formula of single indicator data in the conversion

system is:

$$G = r - \frac{t}{z} \quad (3)$$

In formula (3), r represents the actual ratio of the calculated indicator, t represents the standard ratio of the calculated indicator, and z represents the ratio difference per minute of the indicator. The calculation formulas for the data of multiple indicators in the conversion system are:

$$W = \sum V + K \quad (4)$$

In formula (4), V represents the standard score of the calculation index, and K represents the adjusted score. The establishment of the data warehouse and the extraction and conversion of source data in this system use Microsoft's data warehouse generation tools and data conversion service tools to convert data from different data sources into a unified SQLSEVER database format. The application management of blockchain can be classified into three categories: one is basic information storage, that is, users can establish a database on the blockchain network as a proof of retention. The second is a more complex authentication application, which uses the blockchain network to process complex logical data, such as binding personal identity information with various applications and transaction information, and directly using the combination of the main chain and the branch chain. Link to achieve faster and faster data support. It ensures that no matter what kind of model construction, mathematical method and programming language is used, as long as the effective model can be run independently, each sub-model can become the model resource of the system, which is uniformly managed and scheduled by the system, and the model is easy to be repeated. Use. The subroutine model operation method is adopted, and the model is connected with the system through the plug-in loading method, which ensures the relative fixedness of the system structure and the relative independence of the model, makes full use of the existing resources, and makes the system have better scalability, Maintainability and generality [8–10]. The third is transaction-based applications, such as the free exchange of different currencies through the blockchain network, which requires the overall operation of the entire blockchain network to complete multiple links such as initiation, review, transaction, and accounting. From a financial point of view, the successful implementation of the three functions is completed by relying on the distributed ledger under the blockchain technology.

4 Simulation Analysis

4.1 Test Preparation

After configuring JDK and other related basic equipment, log in using the Internet, enter the URL in the address bar of the home page, and enter the login interface after entering the URL. When debugging the MiniUSB interface, after connecting the PC and the MiniUSB interface with a data cable, it is found that the connection cannot be made normally, and the PC cannot identify the peripherals of the data processing system where the MiniUSB interface is located. There is no design error in the analysis of the circuit

schematic diagram, and there is no leakage or virtual soldering of the components. Supply power to the 5 V system power supply outside the MiniUSB to eliminate the reason that the USB interface of the PC has insufficient driving capability, but the MiniUSB still cannot be connected normally. Use the core version of the programmed Linux system for testing. When the system is powered on and started, you can see the kernel printout information through the serial port.

4.2 Analysis of Results

Response Time

The intelligent financial education assistant system based on Internet of things and the intelligent financial education assistant system based on SOA are selected for experimental comparison with the intelligent financial education assistant system in this paper to test the response time of the three systems under different concurrent users. The experimental results are shown in Figs. 3, 4 and 5:

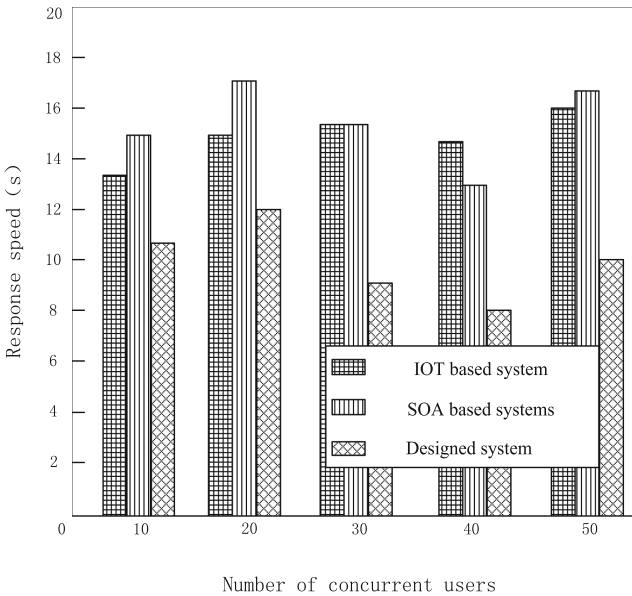


Fig. 3. The number of concurrent users is 50. The response speed (s)

As can be seen from Fig. 3, the average response speed of the intelligent financial education auxiliary system in this paper and the other two intelligent financial education auxiliary systems are 10.698 s, 15.303 s and 16.442 s respectively; As can be seen from Fig. 4, the average response speed of the intelligent financial education auxiliary system in this paper and the other two intelligent financial education auxiliary systems are 63.576 s, 72.151 s and 71.988 s respectively; As can be seen from Fig. 5, the average response speed of the intelligent financial education auxiliary system in this paper and

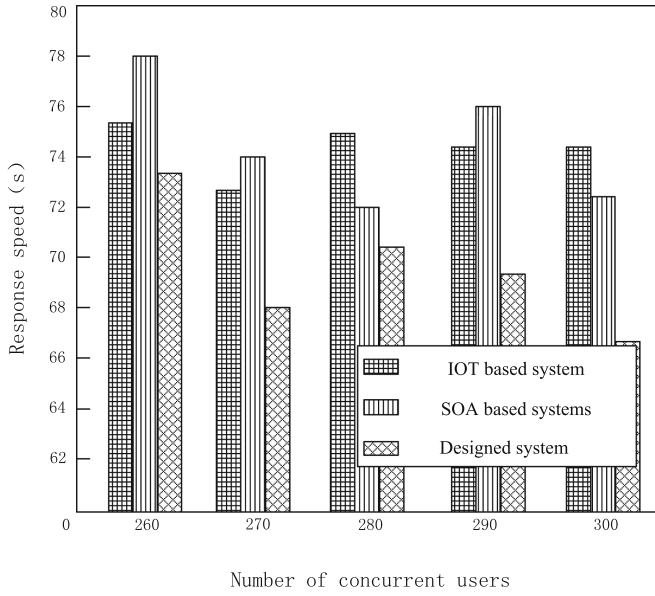


Fig. 4. The number of concurrent users is 300. The response speed (s)

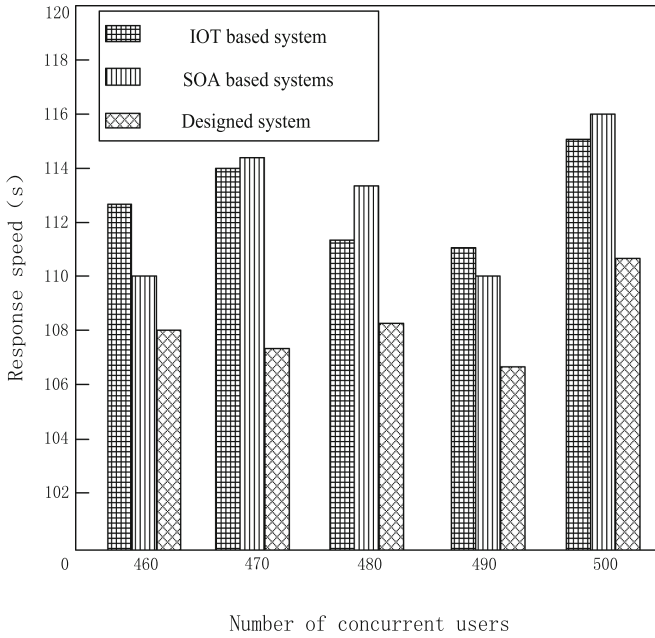
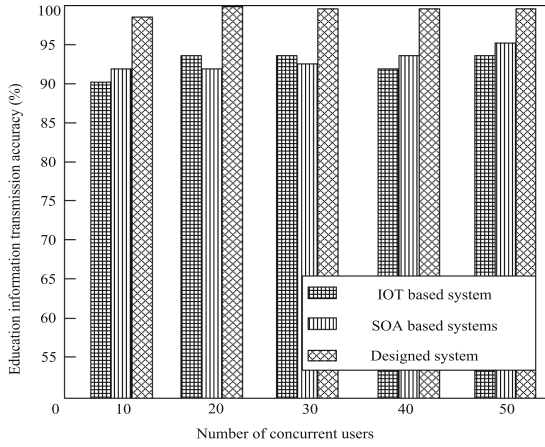
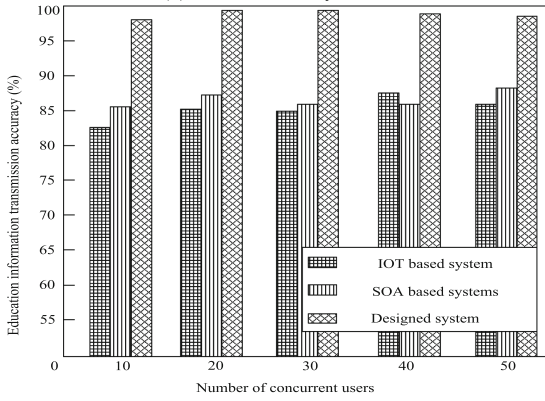


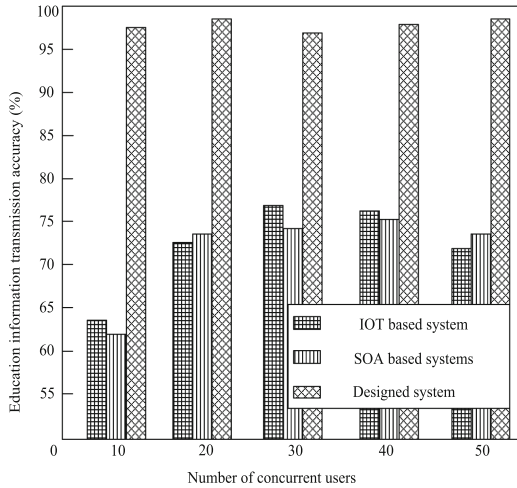
Fig. 5. The number of concurrent users is 500. The response speed (s)



(a) Noise intensity 50dB



(b) Noise intensity 80dB



(c) Noise intensity 120dB

Fig. 6. Transmission accuracy of educational information under different noise interference

the other two intelligent financial education auxiliary systems are 107.315 s, 114.205 s and 115.968 s respectively.

Anti Interference Effect of Financial Education Information Transmission

In order to verify the anti-interference effect of the financial education information transmission of this method, the intelligent financial education auxiliary system based on the Internet of things and the intelligent financial education auxiliary system based on SOA are used to compare with the intelligent financial education auxiliary system in this paper. The anti-interference effects of the financial education information transmission under the noise intensity of 50 dB, 80 dB and 120 dB are obtained respectively.

According to Fig. 6, when the noise intensity is 50 dB and the number of experiments is 10, the education information transmission accuracy of the Internet of things system is 90.5%, the education information transmission accuracy of the SOA system is 92.6%, and the education information transmission accuracy of the designed system is 98%; When the noise intensity is 80 dB and the number of experiments is 10, the accuracy of educational information transmission of the Internet of things system is 83%, that of the SOA system is 85%, and that of the designed system is 97%; When the noise intensity is 120 dB and the number of experiments is 10, the accuracy of educational information transmission of the Internet of things system is 63.8%, that of the SOA system is 62%, and that of the designed system is 96.8%; The above data shows that the design system always has a high accuracy of education information transmission when the noise intensity is 50 dB, 80 dB and 120 dB, indicating that the design system can improve the Financial Education Assistance Effect of the intelligent financial education assistance system.

5 Conclusion

This paper designs an intelligent financial education assistant system based on blockchain. Collect intelligent financial education data according to the data warehouse technology, build an auxiliary decision-making model using the blockchain, and realize the design of intelligent financial education auxiliary system. The experimental results show that:

- (1) The average response speed of the intelligent financial education auxiliary system in this paper and the other two intelligent financial education auxiliary systems are 60.530 s, 67.220 s and 68.133 s respectively, indicating that the intelligent financial education auxiliary system integrated with blockchain technology has better performance.
- (2) When the noise intensity is 50 dB, 80 dB and 120 dB, the accuracy of education information transmission of the designed system is 98%, 97% and 96.8% respectively, indicating that the designed system can improve the Financial Education Assistance Effect of the intelligent financial education assistance system.

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