Design of Ideological and Political Network Teaching Assistant System Based on ZigBee

Jing Luo(✉) and Yu Guan

Fuyang Normal University, Fuyang 236041, China
yyyxa123@163.com

Abstract. The existing teaching assistance systems mostly focus on the development of individual applications, such as roll call systems and homework systems, and few have developed a complete set of teaching assistance systems. In view of this, design a ZigBee based ideological and political network teaching assistance system. The focus is on researching wireless communication modules based on ZigBee technology. ZigBee has advantages such as low power consumption, wide network coverage, and strong self-healing ability, which can achieve efficient communication of the system. On this basis, the login function interface, teacher red pen correction module, resource learning module and Electronic assessment module are designed to achieve the functions of resource upload, homework correction and so on. The system test results show that the system pages can adjust with the screen size. When the concurrent volume of virtual users and teachers gradually increases, the system can respond to teacher operations normally, with an average response time of less than 5000ms. The failure only occurs when the pressure reaches 290, which has high security and can effectively prevent information leakage.

Keywords: ZigBee · Ideological and political network teaching · Coordinator · Teaching assistant system

1 Introduction

As a base for talent cultivation and quality education, universities have a significant responsibility in both knowledge transmission and ideological education. The ideological and political theory course is the main channel for moral education in universities, and cultivating talents with excellent moral character is one of the main goals and tasks of talent cultivation in higher education. The ideological and political theory course that highlights moral education is an important content of higher education [1]. To promote the development of ideological and political education in universities, it is necessary to actively promote the application of information technology in ideological and political courses. The teaching assistance system is able to impart knowledge more targeted, while also providing a more user-friendly way for remote communication and learning between teachers and students. In addition to fully utilizing online teaching resources

G. Gui et al. (Eds.): eLEOT 2023, LNICST 543, pp. 48–62, 2024.
https://doi.org/10.1007/978-3-031-51465-4_4

for learning, the greater advantage of teaching assistance systems is that they can guide students to learn, enable them to better grasp knowledge, transform "teaching" into "guidance", and allow students to grasp and complete more links themselves. Traditional classroom teaching can no longer meet the needs of classrooms with a large amount of information, and students need more learning resources. The emergence of teaching assistance systems in universities can allow students to independently choose teaching resources for learning, which is conducive to cultivating students' self-learning ability [2, 3].

Therefore, the research and development of ideological and political network teaching assistance systems is imperative. The current commonly used design methods for network teaching assistance systems mainly include embedded computer remote assistance teaching system design based on Web technology and physical multimedia assistance teaching system design based on concept networks. The system hardware designed by the former consists of memory, central processing unit, input device, and output device, Memory includes teacher side memory and student side memory, and the central processing unit mainly consists of three parts: logical unit (ALU), control unit, and input/output unit. The software designs web server programs and database programs separately. The experimental results show that this method can effectively expand the assistance range and shorten the assistance time, but has a higher number of response failures. The latter constructs a physics multimedia assisted teaching system architecture with the logic layer as the core, designing theoretical knowledge modules, experimental modules, and student practice modules respectively. Based on the concept network, a large number of rules in the physics teaching system are attached to concepts, forming a conceptual network knowledge system. The theoretical knowledge system design is completed, and experimental modules are designed using image and animation display methods. Based on the theoretical knowledge and experimental modules, student knowledge is modeled, comparing students' knowledge with theoretical knowledge, using computers to score students' mastery of knowledge, achieving practice and feedback on exercise results, and completing the design of a physics multimedia assisted teaching system. The experimental results show that the system has good compatibility, but its security is not good.

In response to the existing problems mentioned above, this article designs a ZigBee based ideological and political network teaching assistance system. The system has the following innovative points:

(1) Design a wireless communication module for the ideological and political network teaching assistance system based on ZigBee technology. ZigBee has advantages such as low power consumption, wide network coverage, and strong self-healing ability, which is conducive to improving the system's response speed.
(2) The login function module can enhance system security and ensure user information security.

2 Design of Ideological and Political Network Teaching Assistant System

2.1 Wireless Communication Module Design

The wireless communication module is designed based on ZigBee technology to realize the wireless communication of the system. ZigBee communication structure is the skeleton of the entire wireless network, which is directly related to the specific implementation of the wireless network. The communication structure design needs to achieve three directions of wireless communication: controller to gateway, gateway to the entire wireless network, and all nodes to gateway communication. Three types of devices are defined in ZigBee protocol: coordinator, routing node and terminal node; Only the terminal node is not a full function node and has no routing function [4]. In this system, there are two types of equipment: coordinator and routing node.

The system node needs to record the answer time, and the nodes in ZigBee network need a unified reference time, so the broadcast mechanism is used to synchronize the clock. The broadcast mechanism can avoid recording the network address of nodes in the network at the same time. Moreover, the network address of the coordinator in ZigBee network is fixed, so the coordinator can be used as a gateway, and nodes can upload data to the fixed address to facilitate the implementation of future programs. At the same time, because ZigBee single level communication distance fully meets the application of ordinary classroom space, a star communication structure of wireless network is designed as shown in Fig. 1.

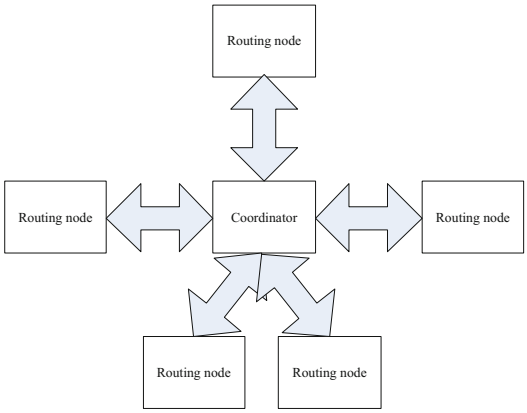

Fig. 1. Designed star communication structure

The coordinator is the most important part of the entire management system network. It needs to run first in the entire network. It forms a network through channels and network identifiers, and uniformly accesses and manages the added nodes, and manages all wireless networks together. In the same ZigBee communication network, there can only be one coordinator, which is indispensable hardware. A main coordinator is designed. The main coordinator consists of two parts, namely, the RF top plate and the support

bottom plate. The two parts can be combined by DIP20 physical plugging to form a unified whole. Among them, the RF roof adopts CC2430 of TI Company as the transmission processing core. The chip can use ZigBee2007 protocol stack, and uses 2.4G SMA communication antenna, IEEE 802.15.4 standard. The maximum transmission distance is 100m, which is suitable for the use of reconstruction projects. The support backplane includes various serial ports and interfaces, including reset system [5].

The main coordinator consists of power supply and switch/indicator light, reset button, RS232 interface, RJ45 Ethernet interface, switching cap skipping of communication mode (serial port and RJ45), JTAG download interface, RF roof, work indicator light and antenna interface. 5V DC power supply is used to supply power for ZigBee coordinator. Turn on the power supply and toggle it to the on position, and turn off the power supply and toggle it to the off position. When powered on, the power indicator red LED lights up. Reset key is used to reset the system without power supply, and reset the program of the chip to facilitate debugging and program operation. The overall circuit framework is shown in Fig. 2.

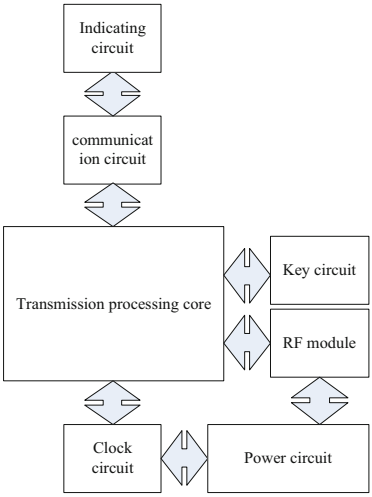

Fig. 2. Overall Circuit Frame

The coordinator can communicate with various universal serial devices through the standard nine pin RS232 serial port. In this design, the conversion connector of RS232 and USB is used to realize the connection management and control between the coordinator and PC computer. The coordinator exchanges data with the host computer through this interface, and transmits various monitoring information of ZigBee network to the software on PC. At the same time, the control command of the upper computer can be sent to the coordinator through this interface to control other ZigBee nodes, realizing all functions designed by the upper computer software platform and embedded terminal. The simulator interface developed by JTAG download interface system connects ZigBee emulator, which facilitates users to write, debug and simulate ZigBee protocol stack and other codes online.

The coordinator also uses the Neport Ethernet module. The coordinator can connect to the network through the Ethernet port, the jumper cap jumps to the UART position, and the coordinator communicates with the host computer through the serial port; Jump the jumper cap to the RJ45 position, and the coordinator will communicate with the upper computer through TCP/IP. The RF top plate adopts TICC2430 RF chip, which is connected to the ZigBee coordinator RF top plate through 2 * 10PIN array pins. There are two indicators: red and green. When the coordinator system is working, the RF roof panel red indicator lights up.

The distributed routing architecture is used in the routing node, and the input buffer mode is used. Of course, the structure can also be easily adjusted to the output buffer mode, depending on the specific application. Specifically, it consists of two modules. The input module includes three parts, IFC (Input Flow Controller) input flow control module, IB (Input Buffer) input buffer module and HD (Header Decoder) header decoding module.

The function of the input flow control module is to translate the handshake protocol and select the write virtual channel. in_Val: indicates that the upper level routing node has valid data coming and requests input; When a complete data packet is transmitted, the signal gives up the request. in_The ack signal is an input confirmation signal. When the Full signals from the IB module are not all high level 1, it means that at least one virtual channel has storage space to receive data packets. At this time, IFC will_The ack response signal is set to high level, and the superior routing node is notified to start data transmission; If the virtual channel used reaches full status during data packet transmission, stop responding and record the label of the current data packet and the virtual channel used for next use. At the same time, switch to the next virtual channel that is not satisfied, and prepare to start a new packet transmission.

The data cache module is used to cache data, which is mainly composed of N ($N \geq 1$) virtual channels. Each virtual channel uses a FIFO. The width of the virtual channel is the width of the data packet, and the depth of the virtual channel can be defined by the user.

The output module does not contain FIFO, so its structure is simpler than the input module, mainly including two parts: Arbiter arbiter and output flow controller OFC. The Arbiter arbiter is used to arbitrate between different input modules requesting the same output port. The RR (Round Robin) algorithm is still used here to schedule requests. Select a request and raise the corresponding x_gnt signal to notify the input port that data transmission is possible. Simultaneously notify the OFC output flow controller of the scheduling results. The output flow controller selects one channel of data as the output data based on the x_gnt allowed signal, and at the same time, pulls up the out_val signal to notify the lower routing nodes of the arrival of valid data. The ack signal feedback from the lower routing node is transmitted as a x_rd read enable signal to the input module. This way, when the input module receives both x_gnt and x_rd valid signals, the connection between the input and output modules is established, and the data packet begins to be transmitted.

The system needs to ensure that the data of all nodes can be collected reliably, and the data should be collected as soon as possible to avoid too many pauses in the teaching process and affect classroom teaching. By considering avoiding competition between

nodes, it is easy to get an ideal solution: the nodes in ZigBee network upload data to ZigBee gateway in turn without gaps. In this state, data can be collected reliably and the whole data recovery process only takes data transmission time, but it is impossible to achieve this effect in the actual process. The key problem is how to let all nodes upload data without gaps. In the formulation of the actual scheme, it approaches the ideal scheme to obtain the best performance.

The following is the proposed solution: use the transmission form with return confirmation in the MAC layer of ZigBee protocol. In this mode, the gateway can completely receive data from all nodes in the network. The nodes in ZigBee network obtain the right to send data through free competition. When the node successfully uploads data each time, it will receive the ack returned by the gateway.

2.2 Login Function Interface and Programming Implementation

The system is object-oriented for college teachers and students, including users with three kinds of permissions, namely administrators, teachers, and students. After different users log in to the system, corresponding permissions are automatically assigned. Administrators have all the functions of the system, teachers and students correspond to different functions, and the initial password is set uniformly. After logging in to the system, users click the button on the top right, modify the avatar and password.

The user requests the system interface route app. Use ('/api/admin', admin). The server returns the admin login page, enters the login page, enters the user name and password, clicks the login button, triggers the on Submit function, uses Ajax to interact asynchronously with the background, and requests access to the login interface through post. The pool connection pool connects with the MySQL database to ensure that multiple threads work. The foreground parameters are passed to the login interface. After receiving the parameters, the login interface will query the database for the presence of the user. If the query fails, an err will be returned, and a prompt box "User name or password error" will pop up. Next, if the parameters exist, the parameters will be compared with the information in the database and cooperate with the session to determine whether the user has logged in. If the user has logged in on other devices, then a prompt box "The user has logged in, please do not log in again" pops up. Finally, the user successfully logs in and saves the login information to the session. Node.js sends a cookie with the HttpOnly attribute to the front desk. This cookie will remain for 24 h. After 24 h, clear all login information [6, 7] through the callback function.

In addition to the above, the system carries out page responsive development based on the built-in layout of Bootstrap. The responsive drive of the page comes from the screen width. By obtaining the screen width, the screen is divided into 24 grids, and then different styles are specified according to different screen widths.

2.3 Design of Teacher Red Pen Correction Module

The red pen correction module is mainly used for teachers to correct ideological and political workbooks and test papers. In this module, teachers can choose to correct homework books or test papers. When correcting test papers, they can choose manual correction or

automatic correction. This module has two difficult parts: correction process, drawing students' and teachers' handwriting.

The correction process can be divided into two situations: one is manual correction, which means that the teacher selects the assignment book or test paper to be corrected in the system for correction, and uploads the teacher's correction handwriting to the system; One is automatic correction, which means that the system can automatically correct the objective questions in students' test papers, such as selection, judgment, etc.

a. Design and Implementation of the Perception Layer for Manual Correction

The perception layer corresponds to the bluetooth pen device used by teachers in the process of correction. The bluetooth pen device is used to collect teachers' correction handwriting dot codes. After the bluetooth pen collects the dot codes, it conducts certain processing, and then transmits the data to the system background through the BLE communication module.

b. Design and implementation of network layer for manual correction

The Bluetooth pen and the system are connected by the BLE communication module. The BLE protocol stack is mainly composed of the following parts, as shown in Table 1 [8].

The BLE protocol is used to complete the network communication between the Bluetooth pen and the teacher end system. After the connection between the Bluetooth pen and the tablet is established, the BLE communication module obtains the handwriting dot code data from the Bluetooth pen regularly and packs them, and then transmits the data through the BLE protocol. The specific process is that the Bluetooth pen calls the send method to send handwriting dot code data every 3 s or when the amount of dot code data reaches 500 or when the last time a new dot code is acquired reaches 5 s, and transmits the data to the LL layer. The LL layer first selects the physical channel for transmission, and then assigns this connection to a transmissible address, add the header and payload length fields of the LL layer. The header field identifies the packet as a data packet, and the payload length field is the length of the entire L2CAP field. Finally, add the CRC24 field to prevent data from being tampered with during transmission. LL layer packs and transmits data to L2CAP layer, which specifies the connection interval as 10ms, and specifies the logical channel number 0004 (representing ATT layer). After addition, data is transmitted to ATT layer, which uses the notify communication command to transmit data to GATT layer, which packets and packages the sent data before transmission, finally, the data is transferred to the system background for compressed storage [9].

c. Design and Implementation of Manual Correction Data

In the process of using, it is necessary to obtain various information of the Bluetooth pen, so as to display the status of the Bluetooth pen in the teacher end system. The conversion methods of dot codes in different paper sizes are different, and A4 paper is mainly used in the implementation of this system.

The flow chart of manual correction is as follows: the system page displays the list of students in the current class after the teacher selects the homework book to correct. The teacher can click the tag on the student's homework book with the smart pen. At this time, the smart pen will identify the student's name and student number. After the identification

Table 1. Composition of BLE protocol stack

S/N	project	form	effect
1	Core layer	LL layer	Select the RF channel for communication, the method of identifying the air data packet, the time point of sending the data packet, etc
2	Assign Layer	PHY layer	Specify the radio frequency band used, modulation and demodulation methods
3	Normative layer	HCI layer	Standardize the communication protocol commands of the two chips
4	Analytic layer	GAP layer	Parse the simplest valid packet in the LL layer, and GAT simply specifies and defines this packet
5	Decisive layer	L2CAP layer	Encapsulate the data transmitted by LL layer using encrypted channel or ordinary channel and manage the connection interval
6	Security layer	SMP layer	Consider ensuring the security of the connection without affecting the user's experience
7	Define Layer	ATT layer	Define commands and operation data. BLE uses attributes to describe the data in the transmission process, including the commands that can be used for the data
8	Standardize management	GATT layer	Standardize the data content of ATT layer and manage the data of ATT layer by category

is successful, the current student's status will be changed to being corrected on the pad, and the teacher will correct the student's homework. The teacher can also click the name of the student to be corrected on the pad, and the status of the student will be changed to being corrected. When the teacher finishes correcting a student's homework and clicks the name of the next student, the system will change the status of the current student to correct completed, select the clicked student as the current student, and change its status to being corrected. When the teacher clicks the correction completed, he will jump to the homework display page to display the students' homework. The system page displays the list of students in the current class after the teacher selects the test paper to be corrected and selects the test paper to be corrected. The following process is consistent with the homework book correction. The difference is that when the teacher clicks the correction completion, it will first judge whether the teacher has corrected the current test papers of all students in the current class. If all the corrections are completed, it will jump to the test paper statistics and analysis page, including the answer overview, answer details,

high-frequency wrong questions, analysis of knowledge points in the test paper, so that teachers can understand students' mastery of these knowledge points. If the teacher has not finished correcting all the test papers, a pop-up window will prompt that the teacher has not finished correcting all the test papers, please continue to correct.

Unlike subjective questions, objective questions need to consider whether students' answers contain scoring points. Just compare them with correct answers. If they are correct, scores will be given. If they are incorrect, scores will not be given. The implementation of automatic correction function can reduce the pressure of teachers' correction. Teachers only need to correct the subjective questions of an examination paper.

The technical architecture of automatic correction function is composed of teacher side, HTTP, MQ message queue, rule engine, fault alarm, HTTPMQ message queue, good rule engine fault alarm, multi-threaded asynchronous processing, and database. The key to realize the automatic recognition function is model training. In this paper, the KNN algorithm of machine learning is used to train handwritten data and produce a handwritten data recognition model. The main steps of the algorithm are: a. Calculate the distance between test data and training data; b. Sort according to the increasing relationship of distance; c. Select K points with the smallest distance; d. Determine the occurrence frequency of the category of the first K points; e. The category with the highest frequency among the first K points is returned as the prediction classification of test data.

2.4 Design of Resource Learning Module

The resource learning module is a function that both teachers and students have. The premise for students to learn teaching resources is that teachers upload relevant teaching resources. After creating relevant courses, teachers enter the resource management page, where they can upload courseware, experiments, videos and other relevant resources to the server. Before uploading, they need to select the courses corresponding to the resources. After uploading, they can view the uploaded resources. Students can learn relevant teaching resources uploaded by teachers, including courseware, experiments and videos.

According to the specific analysis of this module, create a resource database table. The exname field represents the resource extension, the url field is the address used to store learning resources, the type field represents the resource type, including courseware, experiment, and video, and the status field represents the resource upload status. The resource data table is shown in Table 2.

So the design of resource learning module is completed.

2.5 Design of Online Examination Module

In the online examination module, intelligent test paper generation is realized through genetic algorithm. The specific process is as follows:

Step 1: Set the initial conditions for generating the test paper, the difficulty of the test questions, the score of the test questions, the question type, the order of the question number, etc.

Table 2. Resource Data Table

S/N	Field Name	Chinese field name	data type
1	id	Resource id	Varchar
2	name	Resource name	Int
3	exname	Resource suffix	Tinyint
4	size	Resource size	Tinyint
5	author	Uploader	Varchar
6	url	Upload Path	Varchar
7	type	Resource Type	Int
8	status	state	Int

Step 2: generate different test papers according to the set initial conditions, and these initial test papers form the initial population.

Step 3: Calculate individual fitness value according to fitness function.

The fitness function affects the performance of the test paper to judge the quality of the test paper. There are many attributes that affect the performance of the test paper, such as the difficulty of the test question, the score of the test question, the score of passing the test question, the question type, the order of the question number, etc. Each attribute has different constraints on the test question, and its weight is also different. In this system, the proportion of the difficulty of the test question and the score of different question types in the total score of the test question is used as the independent variable of the function.

A knowledge point contains many questions. Can first work out the average difficulty of all the questions contained in the knowledge point. The formula for calculating the average difficulty is:

$$R_E = \frac{\sum_{j=1}^{t} U_j}{H} \tag{1}$$

In Eq. (1), R_E refers to the average difficulty of the test questions covering the knowledge point; U_j refers to the difficulty of each question; H refers to the number of questions; t refers to the number of questions [10].

The average difficulty formula of all questions in the whole question bank is:

$$Y_E = \frac{\sum_{j=1}^{t} Q_j}{H} \tag{2}$$

In formula (2), Q_j refers to the difficulty of each question; Y_E refers to the average difficulty.

The constraint formula for whether the proportion of scores of different question types in the total score of the test questions is reasonable is:

$$V = \frac{\sum_{j=1}^{y} q_{j1}}{L} \tag{3}$$

In Eq. (3), L refers to the total score of the test questions; q_{j1} refers to the question type in the examination paper; y refers to the number of different types of questions; V refers to the proportion of the scores of different question types in the total scores of the test questions.

The calculation formula of fitness function is:

$$fit(y_i) = 1 - (|Y_E - W_E| \times r_1 + V \times r_2) \tag{4}$$

In Eq. (4), r_1 and r_2 refer to the weights. Assign r_1 a value of 0.6 and r_2 a value of 0.4.

Step 4: According to the roulette wheel strategy, judge the individual fitness. The ones with high fitness will remain, and those with low fitness will remain to the next generation for crossover and mutation operations to form a new generation of population.

Step 5: Repeat steps 3 and 4 to determine whether the maximum number of iterations is reached.

Step 6: Generate the test paper.

3 System Non Functional Test

3.1 Compatibility Test

Test the designed ideological and political network teaching assistant system based on ZigBee, and first test the compatibility. Since the system will operate on pads of different screen sizes during actual use, in order to test whether the system can display normally on screens of different sizes, different panels are used to test the compatibility of the system. The test results are shown in Table 3.

Table 3. Compatibility Test Results

S/N	Plate model	operating system	Whether the display is normal
1	Glory tablet V6	Android	normal
2	Lenovo TB3-X70	Android	normal
3	ipad2	IOS	normal
4	iPadmini6	IOS	normal

By running the system on different tablets, can find that the system runs well under the system with Android $\geq$ 4.4.4 and IOS $\geq$ 9.0.2, and the page display is normal. Because the page adopts a responsive system layout, it can ensure that the system page can be adjusted with the screen size.

3.2 Performance Test

A system should not only meet user needs in function, but also in performance. Therefore, in addition to testing system compatibility, non functional testing also needs to test system

performance. Performance testing is to test the performance of the system on the basis of meeting the functional requirements of users. Good performance of the system can also greatly improve the user experience.

The LoadRunner test tool is used to test the performance of the main interfaces of the system. LoadRunner is a load testing tool that predicts system behavior and performance. It tests system performance by simulating real-time concurrent load of tens of millions of users and real-time performance monitoring, and quickly locates problems. Run the script generated by the LoadRunner test tool in the system to monitor the script running in real time. After the test results are generated, analyze the test results, find out the problems in the system, and judge whether the system performance can meet the expectations.

The specific test method is to test the performance of the system through the phased increase of the number of users, test the average response time of the system, the number of successful and failed accesses, and the concurrency range of the system. The standard for passing the performance test is: when the number of concurrent users is 200, the system performance is stable. The test scenario here is for the teacher to log in to the system and select the in class mode to start the class. Set the initial teacher concurrency to 10, increase 40 teachers every 5 s, and the maximum value is 450, so as to simulate 490 teachers starting the class at the same time. Set the teacher concurrency in LoadRunner, and set 10, 50, 90, 130, 170, 210, 250, 290, 330, 370, 410, 450 teachers respectively. Run the test script in the test scenario to get the test results, and collate the test results to get the system performance test results table (Table 4).

Table 4. System Performance Test Results

S/N	Virtual teacher concurrency	Respond or not	Number of response failures	Average response time (ms)
1	10	Normal response	0	586
2	50	Normal response	0	852
3	90	Normal response	0	1269
4	130	Normal response	0	1695
5	170	Normal response	0	2158
6	210	Normal response	0	2698
7	250	Normal response	0	3365
8	290	Normal response	15	3965
9	330	Normal response	36	4587

The system performance test results are shown in the table above. It can be seen from the test results that when the number of concurrent virtual teachers increases gradually, the system can respond to teacher operations normally, and the average response time is less than 5000ms. Failure occurs only when 290 is measured. On the whole, all data meet the expected performance test objectives. This pressure test is only carried out for a single server. The number of 200 concurrent servers can meet the demand. Clusters

will be used on the system input line. The cluster's high scalability, high availability, and high manageability can effectively improve the system performance, improve the system error tolerance, and meet high concurrent user requests. To sum up, the system meets the performance requirements of users through performance testing.

3.3 Safety Comparison Test

The security of a system is an important way to protect the privacy of users, and security testing can eliminate the security risks of the system. First, perform the SQL injection test. The second place to strengthen security protection is permissions. The system should ensure that each user can only see the data within his/her own permissions. For this, the user name verification should be bypassed for testing. The third place to strengthen security protection is to modify and submit data information. For this, the system should test by capturing and modifying data. The fourth place that needs to be strengthened is the security risk of cross site scripting. For this, will test the system for XSS attacks. In the test, the traditional ideological and political network teaching assistant system is used as a comparison method to jointly conduct security test. The comparison test results are shown in Fig. 3.

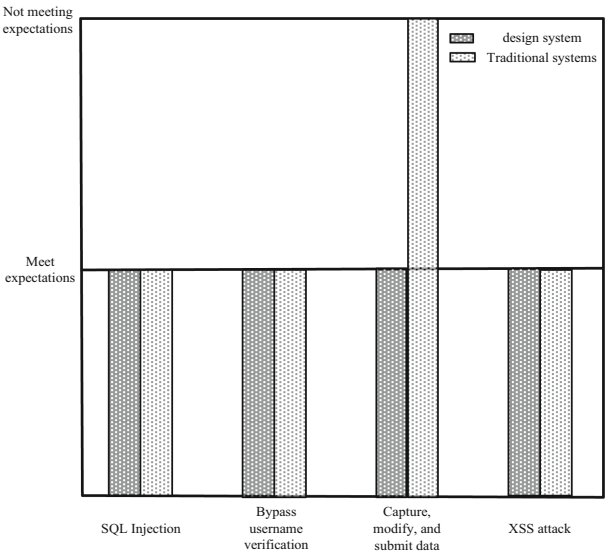

Fig. 3. Comparison Test Results

The expected result of XSS attack is that the statement entered in the input box will not be executed; The expected result of packet capturing modification of submitted data is that the system fails to pass the modified data and meets the expectation; The expected result of bypassing the user name verification is that the system prompts the user name or password error, instead of entering the home page as expected; The expected result of SQL injection is that the system prompts user name or password errors, rather than system

errors. It can be seen from the above test results that the security of the designed system is higher than that of the traditional system, which can effectively prevent information leakage.

In order to further verify the application effectiveness of the system designed in this article, user satisfaction was used as a testing indicator. The results were compared between the embedded computer remote assisted teaching system based on Web technology, the physical multimedia assisted teaching system based on concept networks, and the system designed in this article. The results are shown in Table 5.

Table 5. User Satisfaction Test Results

Number of users/person	This article designs a system	Embedded Computer Remote Assisted Teaching System Based on Web Technology	Concept network-based multimedia assisted teaching system for physics
10	95.3	85.6	90.7
20	94.2	84.2	87.6
30	93.6	80.3	85.2
40	91.8	79.9	83.0
50	90.3	76.6	81.5

From the data in Table 5, it can be seen that the user satisfaction of the system designed in this article is higher, indicating that it can meet user needs and has better application effects in practical applications.

4 Conclusion

To address the issues of long response time and poor security in existing systems, a ZigBee based ideological and political network teaching assistance system is designed. The system is based on ZigBee technology to design a wireless communication module for the ideological and political network teaching assistance system, effectively improving the system's response speed. The security login function of the login function module effectively improves the security of the system. The experimental results show that the designed system has a shorter response time and can effectively ensure user information security, achieving higher user satisfaction, indicating that its application value is higher.

Aknowledgement. 1.Anhui Province first-class course "Introduction to Mao Zedong Thought and Theoretical System of Socialism with Chinese Characteristics" social practice course (2020xsxxkc331).

2.Quality Engineering Project of Department of Education, Anhui Province: Research on the Teaching Model of Bisection Class in the Intelligent Classroom Environment take financial management section for example (2021jyxm1120);

References

1. Artyukhova, N.S., Saykina, O.S., Solovyeva, A.A.: Gender stereotypes in teaching aids on Russian as a foreign language for beginners. RUDN J. Lang. Stud. Semiot. Seman. **12**(4), 1236–1246 (2021)
2. Huajian, W., Zhifeng, W.: Design of simulation teaching system based on modular production and processing. Comput. Simul. **39**(04), 205–209 (2022)
3. Tabler, T.: Application of computer-based tools for mathematics teaching at various types of lessons in gymnasiums. Polonia Univ. Sci. J. **42**(5), 117–125 (2021)
4. Samorodova, E.A., Belyaeva, I.G., Bakaeva, S.A.: Analysis of communicative methods effectiveness in teaching foreign languages during the coronavirus epidemic: distance format. XLinguae **14**(1), 131–140 (2021)
5. Zahrotin, A.: Development of integrated science learning instruments using a humanistic approach with economic drawings. Jurnal Pena Sains **8**(1), 8–14 (2021)
6. Allen, H.W., Paesani, K.: Genre instruction, textual borrowing, and foreign language writing: Graduate teaching assistant perspectives and practices. Lang. Teach. Res. **26**(4), 755–776 (2022)
7. Yarosh, J.H.: The syllabus reconstructed: an analysis of traditional and visual syllabi for information retention and inclusiveness. Teach. Sociol. **49**(2), 173–183 (2021)
8. Cheng, X., Liu, K.: Application of multimedia networks in business English teaching in vocational college. J. Healthc. Eng. **2021**(4), 1–9 (2021)
9. Qi, S., Li, S., Zhang, J.: Designing a teaching assistant system for physical education using web technology. Mob. Inf. Syst. **2021**(6), 1–11 (2021)
10. Wu, X.: Research on the reform of ideological and political teaching evaluation method of college English course based on "online and offline" teaching. J. High. Educ. Res. **3**(1), 87–90 (2022)