Hindawi
Wireless Communications and Mobile Computing
Volume 2023, Article ID 9854909, 1 page
https://doi.org/10.1155/2023/9854909

Retraction

Retracted: Design of Distance Teaching System for Interior Design Course Based on Internet of Things and Education Platform

Wireless Communications and Mobile Computing

Received 8 August 2023; Accepted 8 August 2023; Published 9 August 2023

Copyright © 2023 Wireless Communications and Mobile Computing. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Z. Sun, X. Zhang, C. Peng, N. Song, and C. Luo, "Design of Distance Teaching System for Interior Design Course Based on Internet of Things and Education Platform," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 7440409, 7 pages, 2022.

Hindawi
Wireless Communications and Mobile Computing
Volume 2022, Article ID 7440409, 7 pages
https://doi.org/10.1155/2022/7440409

RETRACTED

Research Article

Design of Distance Teaching System for Interior Design Course Based on Internet of Things and Education Platform

Zhongping Sun,[1] **Xiaodong Zhang**,[2] **Changrong Peng**,[2] **Nan Song**,[3] **and Chencheng Luo**[4]

[1]*College of Environmental Art, Shanghai Art and Design Academy, Shanghai 200030, China*
[2]*College of Art, Hebei University of Economics and Business, Shijiazhuang 050061, China*
[3]*College of Arts and Media, Shenyang Institute of Technology, Shenyang 110121, China*
[4]*Design and Art College, Beijing Institute of Technology, Zhuhai 519088, China*

Correspondence should be addressed to Zhongping Sun; 194630333@smail.cczu.edu.cn

Received 14 July 2022; Revised 27 July 2022; Accepted 9 August 2022; Published 22 August 2022

Academic Editor: Hamurabi Gamboa Rosales

Copyright © 2022 Zhongping Sun et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Distance education system plays an important role in promoting the integration of professional characteristics and application practice. In order to solve the problem of network throughput decline caused by communication channel data conflict, a distance teaching system of interior design course is designed based on Internet of Things and education platform. In the hardware part, the audio acquisition circuit and video acquisition circuit are designed to ensure the quality of signal transmission. In the software part, the communication architecture is set based on the Internet of Things technology, and a course data anticollision algorithm is proposed, which uses the spread spectrum code to separate the corresponding data to avoid data collision. Based on the education platform, the function structure of distance education system is designed to complete the course management and maintenance. The experimental results show that the maximum throughput of the distance education system designed in this paper is 3.54 MB/s, which is 0.86 MB/s and 0.97 MB/s more than the system based on big data technology and artificial intelligence, and it can effectively avoid the problem of data conflict.

1. Introduction

Distance teaching system is gradually applied to college teaching. With the help of terminal computer and communication equipment and with the help of distance teaching platform, real-time interactive teaching and learning can be realized regardless of distance [1]. Teaching activities have changed from a rigid traditional learning process to a friendly and intuitive learning mode. The contents, pictures, audio, and video are well developed in various forms, and the comprehensive sensory stimulation greatly improves the students' interest in learning. The education platform provides more development space for the needs of university modernization construction and adapting to the characteristics of university teaching. In the aspects of smart classroom management and intelligent teaching activity management, many feasible and innovative application systems have been achieved [2, 3]. Enhancing the management level of university classrooms and improving the utilization rate of classroom resources to meet the diversity needs of indoor activities such as teaching in colleges and universities has become the key problem of information and modern classroom management [4]. To sum up, according to the individual and comprehensive development needs of university management, teachers, and students, the construction of university distance teaching system has become a research hotspot in the direction of modern, information, and digital university teacher management. In this paper, interior design course as the research object is based on the Internet of Things and education platform to design a distance teaching system. In the process of using distance teaching system for design teaching, it is expected to make up for the shortcomings of interior design course teaching by virtue of the technical characteristics of information technology, such as multiperception, interaction, and imagination. Distance education system makes some abstract art knowledge more vivid, so as to help students understand the relevant knowledge and concepts more sensibly.

The Internet of Things is a cutting-edge paradigm that demands technology, expertise, and infrastructure that are only available in wealthy, industrialized nations. However, IoT solutions, particularly IoT education, can greatly help poor countries, offering a chance to catch up more quickly as well as a lucrative business for outsourcing. It is estimated that the IoT market will be worth between 22 and 50 billion dollars by 2020.

It is now possible to create a variety of systems with less infrastructure investment because of affordable microdevices like the Raspberry Pi and Adriano.

2. Hardware Design of Distance Teaching System for Interior Design Course

The hardware circuit is the basic link of distance education system. Because the interior design course involves a large number of audio and video data, this paper designs the audio acquisition circuit and video acquisition circuit of the remote teaching system hardware.

2.1. Design Audio Acquisition Circuit. Considering the project requirements and circuit design requirements, this paper selects TLV320AIC3101 chip as the audio codec chip of this system. The chip has the advantages of low power consumption and audio signal playback. The lowest power consumption is 14 mW. It has six audio signal inputs, including a pair of fully differential stereo inputs and a pair of single-ended stereo inputs. In the design of this system, we need to select two pins as dual channel input. The circuit principle is shown in Figure 1.

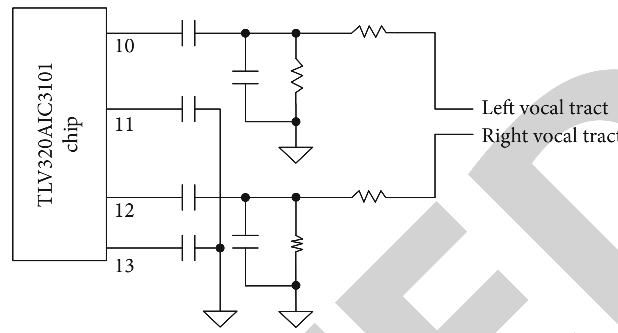

Figure 1: Principle of audio acquisition circuit.

Using port 10 MICILP as the left channel signal input and port 12 MICIRP as the right channel signal input, we can acquire dual channel stereo. I2S bus standard is the most widely used structure standard in the field of audio data transmission. It is mainly aimed at the high-speed data transmission between audio devices. This standardized data transmission mode greatly improves the universality of system data transmission. In the design of this system, the audio signal input and output use dual channel structure, so the BCLK frequency needs to be twice the product of sampling frequency and quantization bit [5]. WCLK level is used to distinguish the data of left and right channels. When the serial data line transmits audio data, it will fix the high position, which is the second clock pulse of BCLK after the channel is selected. The I2S standard also makes the master-slave devices have strong adaptability, which can make up the redundant bits and discard the missing bits to adapt to the data transmission bits of the connected devices, which makes the master-slave device matching more simple and convenient. TLV320AIC3101 is a powerful chip with many function configuration registers. Through I2C bus to configure the relevant registers and complete the initialization work. Then, the chip can normally start to collect the analog audio signal, and the processed digital signal will be transmitted to the main control chip by I2S bus. Multichannel buffered serial interface (McBSP) is a module used by the master chip to receive audio data. In this system, the main control chip is needed to compress, encode, and package the audio and video signals, so the audio data is transmitted to the main control chip through McBSP. If it is just for simple test of audio chip, audio data can be directly output from LINEOUT without the main control chip.

2.2. Design the Video Capture Circuit. The video signal processing chip adopts TVP5146M2 chip, which has 10 signal input terminals, and its working mode is selected according to the actual project requirements. The configuration mode is the same as TLV320AIC3101, and the mode selection is completed by I2C bus configuration register, where 00H is the address of pin configuration register. This paper designs a multichannel video input circuit to adapt to the output mode of different video acquisition terminals, mainly including CVBS and S-Video access mode. The output format of TVP5146M2 includes 10-bit 4 : 2 : 2 YUV and 20-bit 4 : 2 : 2 YUV. A significant advantage of YUV format is that it can separate brightness and chroma and improve the robustness of signal transmission; even if the chroma signal is destroyed, it can display gray image. According to the requirements of the project, the standard 10-bit YUV 4 : 2 : 2 format is selected in this design, and the embedded synchronization mode is selected for the signal type. Because the main control chip has only one 8-bit video signal receiving port, we connect the high eight bits of the output port of TVP5146M2 with the main control and discard the low ones. The first task of video signal acquisition circuit and audio signal acquisition circuit is the same, which is to convert analog signal into digital data [6]. In this system, the video processing chip needs to convert the video data into 10-bit YCbCr-4 : 2 : 2 format and then transfer the data to the main control chip. The principle of video acquisition circuit is shown in Figure 2.

In this system, 14.31818 MHz passive crystal oscillator is used to provide clock for video processing chip. It is worth noting that the chip cannot be reset by software, so it can only be solved by hardware design. Here, we use the management function of the power chip to connect the reset pin with the power chip. There are four analog video signal inputs. Among them, VIDIOIN1 and VIDIOIN2 are CVBS composite video signal inputs. The two pins S_VIDIO1 and S_VIDIO2 are S-terminal inputs. Inductors and

RETRACTED

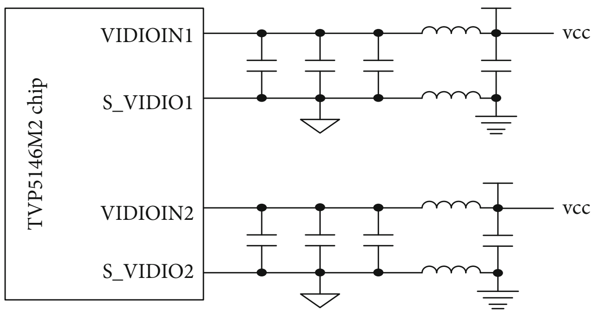

Figure 2: Principle of video acquisition circuit.

capacitors are designed on the signal pins to filter, which can reduce the interference of clutter on video signal and ensure the transmission quality of video signal. The vertical synchronous signal line vs. horizontal synchronous signal line and pixel synchronous clock line are connected with each other. I2C bus includes data line and clock line, which is used to configure the registers of video signal processing chip to make it work normally. In this design, CCD camera is used as the video signal acquisition terminal, which transmits the p-mode analog video signal to TVP5146M2 chip. The analog video signal is digitized, chroma and brightness are separated, and the signal is synchronized by TVP5146M2 chip. Then, the digital video signal of l0-bitYCbCr-4 : 2 : 2 format is obtained. The main functions of the video processing front-end module in the main control chip are to modify the resolution, convert the video format, and control the CCD. The main function of the back-end module is to collect and mix video data and bitmap data and provide video output interface to provide conditions for subsequent video display.

3. Software Design of Distance Teaching System for Interior Design Course

3.1. Setting up Communication Architecture Based on Internet of Things Technology. According to the principles of hierarchical data design, distributed building function modules, and meeting the needs of system diversity, the function division of the remote teaching system of interior design course realizes linkage through control logic and reserves enough system application interface and expansion interface, so that the system has a reasonable, scalable, and multiapplication system architecture [7]. The IOT application system architecture is vertically divided into four layers: service-oriented terminal layer, application-oriented indoor monitoring layer, data-oriented middle layer, and physical front-end hardware layer. Among them, the software platform runs through four layers of architecture. Service-oriented terminal layer: this layer is aimed at providing decision services, data services, and interaction for users. On the one hand, it connects with the software platform to obtain data services and submit service requests, and on the other hand, it provides interaction interface with the next layer [8]. Through mobile terminals, computers, and other terminal devices, users can not only connect with the lower level remote education system through the interactive channel but also realize cross layer interaction through the software platform, so as to obtain data perception, data mining, intelligent control, and other functions [9]. Through the indoor multimedia computer, wireless access point, all kinds of sensor equipment, and other automatic control equipment connection realize intelligent control. Application-oriented indoor monitoring layer: this layer mainly provides application environment for intelligent control and real-time status monitoring of teaching equipment, as well as status monitoring of teaching display screen. Data-oriented middle layer: this layer provides all kinds of data storage management, data forwarding, and data mining support for the system application platform. Among them are the data mining module for different types of university user needs and mobile terminal big data resources, combined with sampling samples based on curve fitting linear data mining. Thus, data support for information services is provided for users, including perception data service, multimedia data collection service, and decision data service [10]. Using the Internet of Things technology to set the data communication architecture, data forwarding network is the main platform of service support. All kinds of sensors and linkage control terminals are deployed to connect with sensor relay nodes. All kinds of sensor terminal equipment are connected with data service terminal through relay node. The sensor relay node establishes a connection with the wireless base station, next jumps to the Internet of Things gateway, and establishes a connection with the upper server through the campus network to realize data interaction [11]. The distance education system receives data or issues control commands through uplink or downlink and then sends them to the indoor monitoring system server through the campus network. The indoor server issues commands to the front-end devices such as control terminals and sensors to realize remote control. For the part of multimedia collection and equipment control in the classroom, the front-end equipment is connected with the wireless access node, and the multimedia data is sent to the server for storage. The multimedia device control part can be scheduled in advance on the software platform through the classroom or the administrator, send the detailed information to the indoor teaching equipment through the wireless base station or campus network, and make the control response [12]. In the connection part between the classrooms of interior design course, different classrooms can be connected to the university server nodes through the campus network or the wireless base station or the wireless base station provided by the Internet mobile operators, and the distributed network structure communication is adopted.

3.2. Design Course Data Anticollision Algorithm. When a large number of sensor nodes and heterogeneous wireless networks access to the gateway of distance learning system at the same time, a large number of data will flow to the gateway. It is an important work of the gateway to manage these data efficiently. The data management of the gateway of distance education system based on Internet of Things technology is divided into four aspects: data forwarding, data aggregation, data analysis, and data security. Data gateway is

RETRACTED

a bridge between Internet of Things and traditional Wan. When it connects a large number of wireless Internet of Things devices, how to achieve efficient routing and reliable management of terminals is a major problem faced by the gateway. In the underlying network of the Internet of Things, multiple nodes share channel resources. If multiple nodes access to the channel at the same time, data information may conflict with each other, making it difficult for the receiving node to distinguish the received data, resulting in the waste of channel resources [13]. This is the most important problem to be solved in network security. A good data anticollision algorithm can make nodes use the shared channel fairly and orderly. ALOHA algorithm is the simplest data anticollision mechanism; nodes do not need synchronization time to transmit data. Each node sends data according to its needs. As long as there is data to be sent, it will be sent immediately. If the data on the channel collides, the node randomly delays for a period of time and retransmits until the transmission is successful. Although the algorithm is simple and easy to implement, the probability of data collision on the channel is great, which makes the real-time performance of the transmitted data decline, and the channel utilization rate is not high. To solve this problem, this paper introduces CDMA based on ALOHA to improve the feasibility of data anticollision strategy. The data to be transmitted is first encoded, then spread spectrum modulated, and then radio frequency modulated with carrier signal. The final transmission signal is as follows:

$$o(t) = \beta(t)\alpha(t). \quad (1)$$

In formula (1), $o(t)$ represents the final transmitted signal; $\beta(t)$ represents a spread spectrum modulated signal; $\alpha(t)$ represents the encoded signal; t indicates the transmission time. Because the rate of the spread spectrum modulated signal is much higher than that of the coded signal, the frequency band of the information to be transmitted is broadened. Signal transmission in wireless channel is easily interfered by noise and other signals. Then, the received signal is

$$o'(t) = \beta(t)\alpha(t)\cos\theta + \mu(t). \quad (2)$$

In formula (2), $o'(t)$ represents the interfered signal; θ represents the RF demodulation of the signal by the coherent carrier; $\mu(t)$ is the sum of interference signal and noise. After wideband filtering, the following formula is obtained:

$$o''(t) = \frac{1}{2}\beta(t)\alpha(t) + \mu'(t). \quad (3)$$

In formula (3), $o''(t)$ represents the transmission information after baseband filtering and decoding; $\mu'(t)$ means spread decoding. Assuming that the order of the selected orthogonal spread spectrum code is n, then the number of optional spread spectrum codes is n. Because the terminal node randomly selects the spread spectrum code, the probability that the node a selects n spread spectrum code as follows:

$$p_a(n) = \frac{1}{n}. \quad (4)$$

In formula (4), $p_a(n)$ represents the probability of selecting spread spectrum code. In each terminal node, a spread spectrum code is written randomly. When the terminal node sends data, it will encode the data with its own spread spectrum code and send it. The gateway needs to save all the spread spectrum codes and the corresponding relationship with the terminal node. After receiving the data, it uses the spread spectrum code to separate the corresponding data [14].

In the process of separation, the teaching information of interior design course is obtained by global coordinated control method and accelerated gradient method:

$$l = s(k) + b_g + S_e, \quad (5)$$

where $s(k)$ is the teaching information of adjacent areas and b_g is the global coordination control parameter. The overall view distribution model of teaching information of central coordinator is $k(x)|\gcd(h(x), x^n - 1)$, and the distribution function of reference value replacing adjacent areas is as follows:

$$I(t) = h(x) + \frac{l + s(k)}{q}. \quad (6)$$

In this paper, the parallel solution method of multiple subregions is adopted. Among them, $h(x)$ is the tracking parameter of teaching information full view fusion, and Q is a delay dependent variable. By using the decomposition and coordination principle, the boundary filling variable of teaching information full view fusion is $\boldsymbol{x} = (x_1, \cdots, x_m)^T \in \boldsymbol{GF}(2^n)^m$, that is, from student a's 2n dimensional grid structure model, the similarity of personalized feature mining of teaching information in art design course is obtained. The check matrix of personalized feature mining of teaching information in art design course is as follows:

$$f(v) = w(z) + b(k) + I(t), \quad (7)$$

where $w(z)$ is the n-dimensional unit matrix parameter, $b(k)$ is the method value of teaching information full view fusion, the detection statistics of feature mining is $V * U^T = 0$, the above formula represents the fuzzy directional clustering fusion center of heterogeneous multi-core platform, and the big data information processing model is established, combined with teaching information full view mining; the fuzzy state parameters are as follows:

$$v(m) = \sum_{v=1} f(v) + [G(q) + b(k)]. \quad (8)$$

RETRACTED

Only when the code domain and the time domain coincide, that is, when the node using the same spread spectrum code sends data in the same time domain, the transmitted data will collide. At this time, it can backoff randomly according to ALOHA. Whether it is traditional Internet or wireless sensor network, hierarchical routing is a good choice. On the basis of data anticollision mechanism, routing management reduces routing table entries and limits the increase of routing table through routing aggregation technology, so as to improve routing efficiency. It also makes terminal network address contain topology information through routing aggregation, which simplifies wireless sensor network and facilitates terminal management. Effective device authentication, user authentication, business security, and device security management mechanisms are needed between the gateway and the teaching platform. At the same time, the gateway supports the monitoring and updating of the status and performance of a large number of sensor nodes and timely synchronizes to the teaching platform.

3.3. Design the Function Structure of Distance Education System Based on Education Platform. The operation of this system needs to be designed based on the education platform to realize the personnel management, the construction of virtual classroom, the online video playing, the electronic whiteboard, the online message, the in station mail sending and receiving, and the resource display. The platform refers to the specific role of the user to implement the corresponding permission control processing work, and each user has the permission implementation content corresponding to its role [15]. On the whole, the types of roles involved in the platform are as follows: (1) students: this is the most important user in the system. With the help of the system, students can complete the learning work of interior design courses well, join the corresponding discussion group, and interact with others, so as to better learn and use various resources given in the system. (2) Teacher: this is also the main service users in the system. With the help of the system, teachers can well complete the application and practice arrangement of interior design courses [16]. (3) Administrator: this is the daily management operation and routine maintenance operation personnel of the whole system. Among all personnel, the authority is the largest. The function of this platform needs the cooperation of the foreground and the background. The foreground is responsible for teacher platform, student platform, registration function, and login function. Among them, the function of the student platform is to effectively process the personal information, resource display, recent courses, and other contents related to students [17]. In particular, given the students' classroom, students can use it to realize online video access, course browsing, group interactive discussion, and other operations, which is the key point for students to complete efficient learning. The teacher platform can deal with the launch and maintenance of each course, provide students with the necessary resources for effective teaching, and enrich the knowledge storage of the whole system. From the perspective of functional logic of students and teachers, the following requirements should be met. First, they have

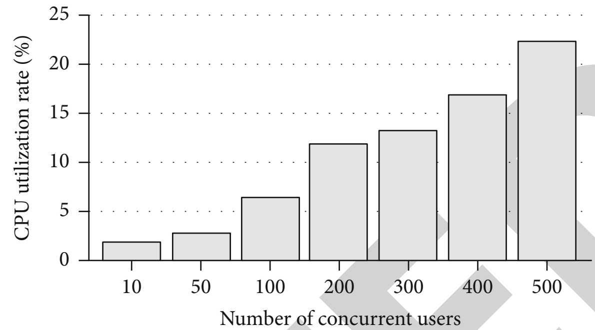

Figure 3: CPU occupancy test results.

completed the student registration. The system will refer to the submitted information for analysis; if it is not perfect, it will return to continue to supplement, and then, the registration can be completed. Second, students should have been effectively authenticated in the system [18–20]. In the case of students entering the system, the system will verify the login information given by them and save the verified information in the corresponding form before they can complete the login. The emphasis of the background part is the audit processing, subject management, and routine maintenance of the course information and teacher information. The key to the implementation of information maintenance is to realize the initialization of system operation, efficient recovery of data dictionary, and backup of important resources [21–23]. In terms of personnel, the two roles of students and teachers should be managed effectively. From the perspective of functional logic, administrators can perform maintenance and routine management in the platform when they log in to the system. The key of information maintenance is to realize the initialization of system operation, the efficient recovery of data dictionary, and the backup of important resources. In initialization, there are not only initialization maintenance of default settings but also construction initialization of new necessary files. Dictionary recovery is to deal with the situation that the system can be recovered quickly and stably in the case of malicious tampering with file information [6, 24]. There are two parts in the audit, one is the audit of the course delivered by the teacher, and the status of this part will be clearly displayed in the system. The second is the effective audit of newly registered teachers, which is a unique form of audit for teachers. Based on the above process, this paper completes the related work of system design from two parts of hardware and software.

4. Experiment

4.1. Experimental Preparation. Considering that the development and implementation involve a lot of content, there will be some mistakes in the implementation of the distance teaching system. Perform reasonable test operation, and find corresponding error situation before the system goes online. Developers find out the reason according to error feedback and give the processing strategy. This ensures that high-quality system programs are available. Considering all

RETRACTED

Table 1: Experimental comparison results.

Time (mm: ss)	System throughput (MB/s)		
	Distance education system designed in this paper	Distance education system based on big data technology	Distance teaching system based on artificial intelligence
00 : 05	0.62	0.42	0.48
00 : 10	3.54	2.68	2.57
00 : 20	1.75	1.33	1.36
00 : 25	2.48	1.14	1.18
00 : 30	2.32	1.06	1.09
00 : 35	2.73	1.02	0.98
00 : 40	1.98	0.68	0.72
00 : 45	1.02	0.54	0.48
00 : 50	0.25	0.12	0.18
00 : 55	0.19	0.03	0.04
01 : 00	0.00	0.00	0.00

factors, the black box test is selected here to realize the test analysis operation. The starting point of the test is to judge whether there is any error in the interface, to clarify the effect of each function and the accuracy of the response data. The test results of CPU occupancy are shown in Figure 3.

According to the test results in Figure 3, the CPU utilization rate of the system shows an upward trend with the increase of the number of concurrent users, but it does not exceed 23%, so it meets the design requirements. The designed system has good carrying capacity and stability and can support the smooth progress of distance teaching. After testing, the system running results are consistent with the expected results and can realize the function of distance teaching.

4.2. Experimental Results and Analysis. On the basis of system function test, the performance advantage of the design system in information management is further analyzed. This experiment selects the distance teaching system based on big data technology and artificial intelligence as the control group and compares with the distance teaching system designed in this paper. In this paper, throughput is selected as a measure of system performance. Throughput directly reflects that the utilization of channel resources, data collision, and transmission errors will lead to retransmission, resulting in throughput decline and channel waste. The experimental results are shown in Table 1.

According to the experimental comparison results in Table 1, under the same load, with the increase of running time, the throughput of the system first increases and then decreases. This system has a considerable throughput, and the maximum throughput is 3.54 MB/s, which is 0.86 MB/s and 0.97 MB/s more than the system based on big data technology and artificial intelligence. The above results show that the throughput performance of the system designed in this paper is significantly better than that of the distance teaching system based on big data technology and artificial intelligence, which can effectively avoid the congestion problem of a large number of nodes sending data at the same time and has good dynamic interaction.

5. Conclusion

The distance teaching system of interior design course designed in this paper can effectively meet the growing personalized needs of students and improve their autonomy in learning. But on the whole, there are still some deficiencies in this design and research. With the continuous development of Internet technology, the development direction has gradually changed from the web end to the mobile end. In the later research, more efforts can be invested in the mobile end, and the functions of the web can be transplanted to the mobile end as much as possible to facilitate the use of users. At present, the functions involved only include the commonly used course management and resource control, and more applications can be added later, such as the intelligent examination system for classroom online examination. We also need to consider more intelligent applications suitable for students to better serve students.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] L. Bangqi and Y. Tingting, "Research of the overall structure of intelligent education system and the regional practice patterns," *Journal of Distance Education*, vol. 37, no. 3, pp. 103–112, 2019.

[2] A. Alshehri, M. J. Rutter, and S. Smith, "An implementation of the UTAUT model for understanding students' perceptions of learning management systems," *International journal of distance education technologies*, vol. 17, no. 3, pp. 1–24, 2019.

[3] T. Alasmari, "Learning in the covid-19 era: higher education students and faculty's experience with emergency distance

RETRACTED

RETRACTED

education," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 16, no. 9, pp. 40–62, 2021.

[4] R. Kanth, J. P. Skoen, A. Toppinen, K. Lehtomaeki, M. J. Laakso, and J. Heikkonen, "Innovative and efficient teaching methodology for digital communication systems using an e-learning platform," *Journal of Communications*, vol. 14, no. 8, pp. 689–695, 2019.

[5] Y. Xugang and L. Bo, "Design of audio-video synchronous compression and transmission system based on DM6467T," *Modern Electronics Technique*, vol. 42, 2019.

[6] M. B. Alazzam, F. Alassery, and A. Almulihi, "Federated deep learning approaches for the privacy and security of IoT systems," *Wireless Communications and Mobile Computing*, vol. 2022, 7 pages, 2022.

[7] X. Jing, Z. Hongying, F. Fei, L. Donglin, and L. Qingwei, "Design of distributed video and audio system based on doublebitstream," *Video Engineering*, vol. 44, no. 2, pp. 11–14, 2020.

[8] S. Venkatraman, B. Surendiran, and P. Kumar, "Spam e-mail classification for the Internet of Things environment using semantic similarity approach," *The Journal of Supercomputing*, vol. 76, no. 2, pp. 756–776, 2020.

[9] S. M. Amini and A. Karimi, "Two-level distributed clustering routing algorithm based on unequal clusters for large-scale Internet of Things networks," *The Journal of Supercomputing*, vol. 76, no. 3, pp. 2158–2190, 2020.

[10] Z. A. Almusaylim and N. Zaman, "A review on smart home present state and challenges: linked to context-awareness Internet of Things (iot)," *Wireless Networks*, vol. 25, no. 6, pp. 3193–3204, 2019.

[11] P. Azad, N. J. Navimipour, A. M. Rahmani, and A. Sharifi, "The role of structured and unstructured data managing mechanisms in the Internet of Things," *Cluster Computing*, vol. 23, no. 2, pp. 1185–1198, 2020.

[12] M. A. Paredes-Valverde, G. Alor-Hernandez, J. L. Garcia-Alcaraz, S. Z. Maria, L. O. Colombo-Mendoza, and J. L. Sanchez-Cervantes, "Intellihome: an Internet of Things-based system for electrical energy saving in smart home environment," *Computational Intelligence*, vol. 36, no. 1, pp. 203–224, 2020.

[13] A. Seyfollahi and A. Ghaffari, "Correction to: reliable data dissemination for the Internet of Things using Harris hawks optimization," *Peer-to-Peer Networking and Applications*, vol. 13, no. 6, pp. 1903-1904, 2020.

[14] M. Chekin, M. Hosseinzadeh, and A. Khademzadeh, "An anti-collision algorithm based on balanced incomplete block design in RFID systems," *International Journal of RF and Microwave Computer-Aided Engineering*, vol. 29, no. 11, pp. 1–14, 2019.

[15] M. Golsorkhtabaramiri, N. Issazadehkojidi, N. Pouresfehani, M. Mohammadialamoti, and S. M. Hosseinzadehsadati, "Comparison of energy consumption for reader anti-collision protocols in dense RFID networks," *Wireless Networks*, vol. 25, no. 5, pp. 2393–2406, 2019.

[16] M. B. Alazzam, F. Alassery, and A. Almulihi, "A novel smart healthcare monitoring system using machine learning and the Internet of Things," *Wireless Communications and Mobile Computing*, vol. 2021, 7 pages, 2021.

[17] A. H. Albashtawi and K. Bataineh, "The effectiveness of google classroom among EFL students in Jordan: an innovative teaching and learning online platform," *International Journal of Emerging Technologies in Learning (iJET)*, vol. 15, no. 11, pp. 78–89, 2020.

[18] J. Maldonado, J. Pineda, R. Garrido, and G. Castro, "A teaching methodology based on an educational experimental platform," *IEEE Latin America Transactions*, vol. 17, no. 8, pp. 1363–1370, 2019.

[19] D. A. Tamburri and G. Casale, "Cognitive distance and research output in computing education: a case-study," *IEEE Transactions on Education*, vol. 62, no. 2, pp. 99–107, 2019.

[20] H. Ghadirian, K. Salehi, and A. Ayub, "Assessing the effectiveness of role assignment on improving students' asynchronous online discussion participation," *International journal of distance education technologies*, vol. 17, no. 1, pp. 31–51, 2019.

[21] Z. Bogdanovic, K. Simic, M. Milutinovic, B. Radenkovic, and M. Despotovic-Zrakic, *A Platform for Learning Internet of Things*, International Association for the Development of the Information Society, 2014.

[22] Y. Xiaozhe and R. Youqun, "Development of virtual reality and EEG linkage system and exploration of its educational research function," *Journal of Distance Education*, vol. 37, no. 1, pp. 45–52, 2019.

[23] L. I. Xiang, "Design of university distance education system based on ASP technology under background of the Internet," *Modern Electronics Technique*, vol. 43, no. 23, 2020.

[24] K. Lee, S. Kim, J. Jeong, S. Lee, H. Kim, and J.-S. Park, "A framework for DNS naming services for Internet-of-Things devices," *Future Generation Computer Systems*, vol. 92, pp. 617–627, 2019.