



Design and Implementation of Mobile Intelligent Education System Based on Cloud Architecture

Dan Yu(✉)

Media College, Hulunbuir University, Hulunbuir 021008, China
yudan5698@126.com

Abstract. Because there are many intelligent education features, and the current mobile intelligent education system uses relatively backward education feature extraction technology, the extracted education features are fuzzy, resulting in excessive CPU utilization during the operation of the system. In order to solve this problem, a mobile intelligent education system based on cloud architecture is designed. Hardware part: adopt the active serial FPGA configuration method, load the program that controls the FPGA chip; Software part: use mobile internet technology to identify the type of mobile learning, optimize the traditional format, obtain intelligent education features under the support of cloud architecture, and calculate service resources. The distance to the user's location is used to build a course resource management model and improve the intelligence of the education system. The experimental results show that the average CPU occupancy rates of the designed system and the other two systems are 20.169%, 30.087%, and 29.987%, respectively, indicating that the performance of the mobile intelligent education system integrated with the cloud architecture is better.

Keywords: Cloud architecture · Mobile Internet technology · Network media · Online education · Mobile communication · Learning resources

1 Introduction

Mobile intelligent education refers to an educational model in which learners use mobile devices and mobile Internet technology to learn and communicate at different times and in different places [1]. Moreover, the business combination mode on the client side and the backend server side has also developed rapidly, and some combination modes with high business scalability have appeared, such as MVC, MVP, etc. At the same time, some server distributed frameworks that optimize the system structure also appear, such as Dubbo. The goal of mobile education is to provide learners with assimilation-competent learning anywhere and at any time. In the information age where the mobile Internet dominates the development of science and technology, new knowledge and new things are changing with each passing day, providing smarter and more convenient services for the fast-paced life. The emergence and development of these technologies make it possible to build a high-performance system platform. Mobile learning is an extension

of digital learning, with digital learning environment, digital learning resources and digital learning methods. The characteristic of mobile education is that it can adapt to and support more and more floating population, and at the same time has great compatibility with mobile terminals. Since the system platform can be based on content, it can be applied to different groups of people according to different content, and users can customize the content they are interested in, so the application and commercialization prospects are very considerable. Lifelong learning has become necessary and possible, and the development of mobile Internet provides a strong technical guarantee for lifelong learning. In the near future, education will move from schools to communities, families, and poor and backward places, changing the predicament of unbalanced educational resources. In the mobile online education environment, the user's request and access to services are a dynamic change process. One is the dynamic growth of the number of users, which requires the system to be capable of capacity expansion and business expansion. The Internet makes people do not need to sit in the classroom for face-to-face education, and the mobile Internet allows people to learn even on the move, so that they can learn anytime, anywhere. E-learning will become an integral part of people's daily life. In addition, the most important thing is that the time period and frequency of users' access to mobile educational resources also change dynamically. In order to deal with sudden and resource shortages, it is necessary to make dynamic adjustments, which are unchanged from the user's point of view, that is, users cannot see the process of dynamic adjustment, and they have been enjoying smooth and stable services. In order to realize the real "Anyone, Anytime, Anywhere, Anystyle" in the field of education, a research direction based on mobile communication and the Internet came into being, called mobile education. Mobile online education has developed rapidly in recent years with the advancement of technology and social concerns. Mobile education covers learning concepts and mobile Internet technology. It is a form of learning that meets students' learning needs with the help of various mobile terminal devices and network media. Learning devices include, but are not limited to, PDAs, MP3 players, laptops, mobile phones and tablets. The mobile education system provides users with multimedia information (including text, pictures, audio and video, etc.) education services, and realizes a variety of functions, such as login authentication, browsing information, streaming media on demand, interactive live broadcast, registration, payment, sharing, community discussion etc. Mobile education has the remarkable characteristics of small size, large class capacity and strong randomness. At the same time, it has digital teaching resources, and the implementation method is also digital.

Yu Shengquan et al. believe that education informatization should be transformed from focusing on platform construction and resource construction to focusing on service construction. Based on the service architecture of cloud network fusion, the collaborative construction method is adopted to design the service architecture of cloud network fusion. The system has excellent operation performance, but ignores the fuzzy characteristics of intelligent education, resulting in high CPU usage [2]. Jing Chunhui et al., based on the channel data such as smart wristband, camera and score system, conducted data optimization and split processing, and determined the user roles of all stakeholders by using the user experience role construction method, so as to improve the quality of education. In practical application, it is found that the system can effectively improve

students' academic performance, but the problem of fuzzy characteristics of intelligent education is not described in detail, resulting in the CPU occupancy rate is difficult to meet the application requirements [3]. Li Qian designs a network distance education system based on ASP under the background of MOOC. The hardware design part of the system classifies the hardware components and divides them into three modules according to the classification standards for specific research: In the communication module of the system, the network remote monitoring camera is selected for data image monitoring to ensure the integrity of the image collection and improve the data processing performance of the system; In the transmission module, LX-VGA-3UVA optical fiber transmitter is selected to transmit image data to ensure the quality of data transmission and realize efficient data arrangement. In the receiving module, the cloud management fiber transceiver JRGT-1002M is used to receive data signals, improve the system operation, reduce the operation time, improve the operation efficiency, and achieve the purpose of system hardware design. The proposed system software design mainly solves the application problems existing in the system software, constantly integrates the design basis of hardware components, reduces the contradiction between the data system software and hardware, promotes the development of the data system, and realizes the overall operation of the system software. However, in practical application, it is found that the response speed of this system is fast, but the CPU usage is too high, and the practical application effect is not good [4]. Because more intelligent education characteristics, and the current mobile intelligent education system used by the education after feature extraction technology is more, lead to the extracted fuzzy education characteristics, lead to excessive CPU usage during the process of system operation, in order to solve the problem, in the cloud architecture to support intelligent education characteristics, combining feature extraction result to calculate the distance from the center of the service resources to the user, In this way, the curriculum resource management model is constructed to improve the intelligence degree of the education system.

2 Hardware Design of Mobile Intelligent Education System

In this design, the active serial FPGA configuration method is adopted. The serial configurator is used to store the configuration information of the FPGA. After power-on, the FPGA automatically loads the data to reconfigure. Therefore, the process of updating the FPGA program in this system is the process of writing data to the serial configuration chip. The main function of the power module is to provide stable power for the entire hardware system and manage the power accordingly. Since the input power is 9 V and the power required by the hardware system is 5 V and 3.3 V, the core function of the power module is a step-down and filtering process. The update of all FPGA programs in this system is controlled by ATmega128 A, and the nCE and nCONFIG pins of FPGA are connected with PD6 and PD7 pins of ATmega 128 A, which are used to control the program loading of the FPGA chip. The most commonly used step-down methods are: transformer step-down, voltage-stabilizer chip step-down, etc. Since the volume of the transformer is too large to be applied in this project, this paper adopts the step-down method of voltage-stabilizer chip. The chip communication mainly includes four pins DATA, ASDI, nCS, DCLK. Like the MCU system design, the download and debugging

interfaces are reserved for use in the development stage. The voltage regulator chip is very small in size, flexible and convenient to use, and is very suitable for providing regulated power supply for embedded systems. The circuit switch architecture is shown in Fig. 1:

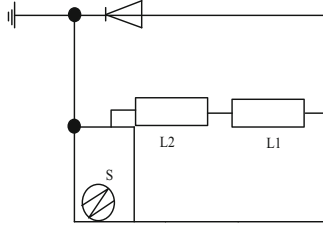


Fig. 1. Circuit switch architecture diagram

As can be seen from Fig. 1, L1 and L2 are controlled by the main switch S as two branch circuits. For different application environments, this system selects two video conferencing systems based on H.320 protocol and H.323 protocol. The difference between the two is that H.320 protocol is usually used as the standard of private line video conference TV. The transmission channel can choose E1, DDN and ISDN interface according to the needs, and can use the dedicated line mode or dial-up mode 0 when networking. The H.323 protocol is defined for the IP network, which uses TCP/IP, RTP/RTCP and RSTP, etc. protocol to support real-time encoding and transmission of video, audio, and data over packet-switched networks. The 5 V power supply voltage regulator chip uses 78M05, its input voltage range is 7 V to 20 V, the output voltage is 5V, and the maximum current it can provide is 350 mA. These characteristics fully meet the design requirements of the hardware system. Two kinds of interfaces are reserved in the system design of this section: JTAG interface and AS download interface. JTAG is a standard interface for chip testing commonly used in the industry. The voltage regulator chip of the 3.3 V power supply is AMS 1117-3.3, its input voltage range is 4.5 V to 12 V, the output voltage is 3.3 V, and the maximum current it can provide is 1 A. These characteristics also meet the design requirements of the hardware system. ALTERA's FPGAs basically support JTAG commands to download FPGA programs, and the JTAG configuration method has a higher priority number than any other method. Among them, the JTAG interface has four signal pins which are essential. Because the DSP chip has special requirements for the power supply, when selecting the power supply for the DSP, the chip TPS767D318, which is specially used for DSP power supply produced by TI, is selected as the power supply chip. The power supply method used by the hardware control platform is internal power supply, and a 7.4 V lithium battery is selected, which has large capacity and strong driving ability. Considering the system voltage situation comprehensively, it is found that there are 5 V and 3.3 V in the system use. The main function of the AD module is to convert the analog voltage into a digital quantity and provide it to the DSP for processing. The schematic diagram of the reset circuit is shown in Fig. 2:

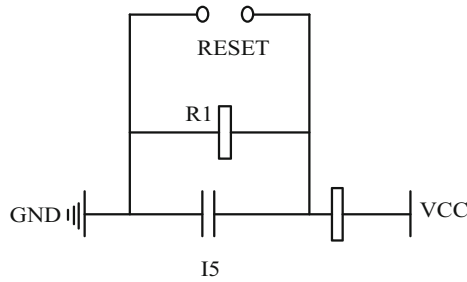


Fig. 2. Schematic diagram of reset circuit

As can be seen from Fig. 2, the communication pins of the serial configurator are respectively connected with the SPI function pins PBO-PB3 of ATmega128 A for writing configuration information. In this paper, the information provided by the sensor is an analog voltage, and then the AD module converts the collected voltage into a digital quantity that DSP can process. There are three working voltages of 1.5 V, of which 5V is the main working voltage of the system, and 3.3 V and 1.5 V are the voltages required by some devices respectively. When the switch is pressed, the battery interface provides 7.4 V power, and the AMS 1117-5.0 is used to convert the voltage to 5V, and then the AMS 1117-3.0 and AMS1117-1.5 are used to convert the 5V to 3.3 V and 1.5 V, respectively. MS320C2812DSP itself integrates a 12-bit AD conversion module, but the range of this AD module can only be 0 V to 3.3 V, which cannot meet the needs of sensor signals from 0 V to 5 V, so this article chooses an external AD sampling module. Note that the output end of the AMS1117 chip needs to be connected to a single capacitor of at least 10 μ F during use, thereby improving its transient response and stability of power consumption. Based on the above description, the steps of hardware design of the mobile intelligent education system are completed.

3 Software Design of Mobile Intelligent Education System

3.1 Identify the Type of Mobile Learning

Mobile learning means that learners obtain learning resources through wireless and mobile devices (such as mobile phones, PDAs with wireless communication modules, etc.) and wireless communication networks at any time and anywhere they need to learn, communicate with others and learn. Mobile learning is developed on the basis of digital learning. It is an extension of digital learning. It is different from general learning. Mobile learning is the product of the combination of mobile computing technology and digital learning. It brings learners a new feeling of learning anytime and anywhere. It is an indispensable learning mode in the future [5]. Mobile learning is nothing new, because in traditional learning, printed textbooks can also well support learners to learn anytime and anywhere. It can be said that textbooks have become a tool to support mobile learning long ago, and mobile learning has always been around us. Mobile learning organically combines mobile communication, network technology and education. Compared with wired online learning, mobile learning has more characteristics, as shown in Fig. 3:

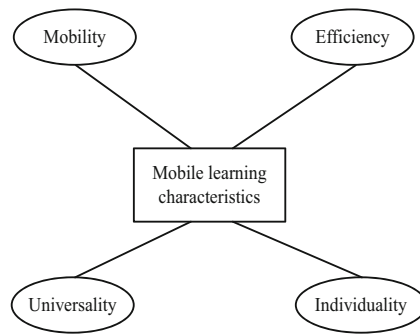


Fig. 3. Features of mobile learning

As can be seen from Fig. 3, mobile learning has the characteristics of mobility, efficiency, universality, personalization and so on. It can be seen that as a new thing and new concept, mobile learning must be distinguished from traditional learning, otherwise it will lose its significance. Mobile Internet brings information exchange and service means of “anytime, anywhere and everywhere”. Information flows due to people’s flow. People can not rely on geographical restrictions, so as to realize the real dream of transmitting information anytime and anywhere. In addition to all the characteristics of digital learning, mobile learning also has its unique characteristics, that is, learners are no longer limited to the computer desk, and can learn for different purposes and different ways freely and anytime, anywhere. Using mobile Internet technology, learners can not only rely on computers to surf the Internet, but also use small and portable mobile terminals such as mobile phones, PDAs and smart phones to surf the Internet. In particular, the development and application of 3G technology can realize instant Internet access and always online, which makes information acquisition more convenient and information processing more real-time and efficient. The learning environment is mobile, and teachers, researchers, technicians and students are mobile. From its implementation mode, the technical basis of mobile learning is mobile computing technology and Internet technology, that is, mobile Internet technology. So far, in many countries, especially China, the number of mobile phone users far exceeds the number of wired Internet users. Through mobile Internet, mobile phone users who do not understand computers can easily obtain and process online information. The implementation tool is a miniaturized mobile terminal device. The equipment realized by mobile learning mainly has the following characteristics: portability, that is, the equipment is small in shape, light in weight and easy to carry; No linearity, that is, the equipment does not need to be connected; Mobility means that users can also use it well in mobile. This has greatly broadened the scope of education and will have a great driving force for lifelong education, democratization of education and personalized learning. Mobile learning is the product of the organic combination of mobile communication, network technology and modern education. It is the specific application of mobile communication technology in education. It represents a new direction of modern educational technology. Based on this, complete the steps of identifying mobile learning types.

3.2 Cloud Architecture Extracts Intelligent Education Features

The research on learning platform under the background of cloud architecture is more conducive to meet the personalized learning needs of user groups. Using “Cloud Architecture” technology to analyze learners’ learning behavior, study learners’ e-learning, and continuously deepen the research and application of cloud architecture can bring greater development space for the construction of mobile intelligent education system [6, 7]. The concept of “intelligent education”, that is, the data mining application driven by knowledge support in the field of education, takes this opportunity to expect the application research in this field to flourish and integrate into the educational research method system. The new generation of information technologies, such as cloud computing, Internet of Things, cloud architecture, etc., continue to penetrate into the field of education and further promote the informatization of education. Because the data transmission between different networks, especially between mobile networks is no longer the same as the traditional Internet, data traffic is a more sensitive parameter. Mobile Internet requires fast data transmission and traffic saving. Therefore, the requirements for data transmission format are higher, and the traditional format needs to be optimized. The data stream transmission process is defined as:

$$l = \frac{(1 - \phi)^2}{H} \times \varepsilon \quad (1)$$

In formula (1), ϕ represents the access speed of the TCP protocol, H represents the total amount of data sent, and ε represents the response message. Specifically, the current stage of intelligent education refers to the use of information technology by educational technicians on the premise of fully understanding the educational situation, based on the existing and collected data in the educational process. The contradiction between the explosive growth of information and the slow improvement of human information literacy is prominent, and the ability of scholars with different information literacy to acquire, identify, and process information is significantly different, resulting in an information gap. Summarize data according to a certain purpose, use appropriate tools for data processing, establish models and analyze data through data mining technology, and transmit the found model content to educators or learners to assist them in educational research, decision-making or learning, and these models can be further deployed in various learning systems or educational management systems. The expression formula of transportation information flow in the system is:

$$P = \sum (s - \eta)^{-1} \quad (2)$$

In formula (2), s represents the data transmission amount, and η represents the input coefficient. Recommend learning activities that adapt to the learner’s cognitive style, provide them with self-adaptive, personalized education services and the process of intelligent push, and provide directional tracking services for learners in the whole process of learning on the platform, and provide learners with learning context information and interests. Information such as hobbies and cognitive behaviors are captured in real time. Mobile education and training is based on behaviorism. The teaching design principles of behaviorism include: prescribed goals, frequent inspection, small steps and low

error rate, self-paced, explicit response and immediate feedback. Suitable learning types are: Learn facts, define concepts, provide explanations, emulate processes, and solve problems. Provide intelligent management for educators or intelligent guidance, personalized learning and other services for learners. Intelligent education introduces data mining technology into the field of education, which belongs to quantitative research, but it should also comply with the general principles of general education research methods. Using artificial intelligence technology to mine association rules, accurately predict and understand learners' learning needs, and then carry out push service. Quantitative research and qualitative research complement each other. On the other hand, not all problems are energy in the current level of educational development, and they will still be so in the future. Therefore, intelligent education is a knowledge driven data mining application in the field of education, and this definition is appropriate. In mobile learning, the mobile learning is the first mock exam. Because mobile devices are portable, learners can make full use of the scattered time. These characteristics of mobile learning are especially suitable for testing and practice. Based on the above description, the steps of extracting intelligent education features are completed.

3.3 Building a Course Resource Management Model

The teaching process of intelligent education is a process of knowledge and information dissemination, which covers all the elements and contents of the above three communication theories. This process consists of selecting each basic component of the teaching process-the sum of tasks, contents, methods, means, forms, etc. The teacher course management function is mainly provided for teachers to set up their own online courses. Teachers can customize their own course summary and outline, and edit the chapter information under each course. The content that teachers need to customize in this chapter includes two types: courseware and standardized test questions. When the teaching objectives are determined, we should pay attention to the selection of communication information and the scheme design of information communication, including the connection between subject information, establish a reasonable information structure (including learners' specific conditions, learning conditions, arranging learning information, etc.), find out the key points and pay attention to coordination, so as to improve the acceptability of information. Therefore, use the cloud to preprocess the service resources: calculate the distance from the service resources to the user's location, and include this example in the distance characteristic. The idle resource characteristic is expressed as 1. The service status value is sent from the terminal. The service quality and efficiency are calculated by formula 2. Then match the weight of the service policy and resource scheduling, and the weight is expressed as:

$$t_m = \begin{bmatrix} t_{11} & t_{12} & t_{13} & t_{14} & t_{15} \\ t_{21} & t_{22} & t_{23} & t_{24} & t_{25} \\ t_{31} & t_{32} & t_{33} & t_{34} & t_{35} \\ t_{41} & t_{42} & t_{43} & t_{44} & t_{45} \\ t_{51} & t_{52} & t_{53} & t_{54} & t_{55} \end{bmatrix} \quad (3)$$

In formula (3), t represents a service resource scheduling strategy, and m represents the scheduling strategy proposed by the user. The first to fifth columns are service

quality priority, closest distance priority, driving efficiency priority, taxi service status priority, and overall priority. According to the user's service needs, the matching value is obtained by directly multiplying the resources and the n column of the weight matrix. In this system, teachers first set up their own courses and edit the relevant materials of the courses, such as course overview, course offering period, chapters corresponding to the courses, courseware under the chapters, and standardized test questions. After editing, they choose to publish the courses. The learner's control of learning activities refers to the ability to complete learning tasks according to their actual needs and abilities, to self-check and correct their own learning activities, and to successfully complete learning tasks. Evaluating the teaching effect with effect standard and time standard is also a very important part in the dissemination of modern intelligent education. The representations, units, and data of the five characteristics of resources are not uniform, such as idle state, distance, state, efficiency, and evaluation. It is necessary to normalize each resource so that the resource characteristics can be used for subsequent calculations. The five characteristics of the resource are normalized respectively, and the normalization formula of the idle state is:

$$G = \frac{\max(q) - cur(q_0)}{\max(\delta) - \min(\delta_0)} \quad (4)$$

In formula (4), q represents the number of service resources, q_0 represents the characteristics of service resources, δ represents the distance of service resources, and δ_0 represents the distance of service resources from the user's location [8–10]. The purpose of evaluation is to judge whether the effect disseminated and obtained conforms to the maximum benefit. The module designs interfaces with different functions for students and teachers. The functions that students can use include: asking questions, viewing their own questions, viewing the 10 questions with the most visits, querying questions according to keywords, deleting their own questions, and viewing the existing questions in this chapter. The functions that teachers can use include: answering questions, viewing and correcting answers, deleting users, etc. The scheduling of service resources is divided into polling scheduling, distance first, idle first, quality of service first and other scheduling algorithms. This paper will form a feature first scheduling algorithm through the comprehensive use of these algorithms. The specific idea of the algorithm is as follows: the feature first scheduling algorithm first quantifies the characteristics of service resources. Through the statistics of the existing historical evaluation information, the favorable information ratio is obtained. When the evaluation information is only good and bad evaluation results, the favorable value is 1, otherwise the value is 0. Set the existing N evaluation information Y_n , the score of each evaluation information is g , and the range of evaluation score is $0 \sim a$, then the normalization formula of evaluation information is expressed as follows:

$$g = \frac{Y_n}{N} \times \sum (a - n)^2 \quad (5)$$

After the teacher publishes the course, students can log in to the system to query the optional course information, and view the course overview and course outline. If students intend to select the course, they can select the course to be reviewed by the opening teacher. The characteristic values are used to represent the service resources,

and the service resources with different characteristics are normalized, so that the service resources can participate in the calculation. The expert group scores the different needs and importance of each feature of the service resources in the application processing, and obtains the resource feature weight under different user needs. The matching degree of resources is obtained by the product of weight and quantified resource characteristics, and polling scheduling is carried out according to the matching degree from high to low. After receiving the student's course selection application, the teacher can view the basic personal information and previous learning of the student. If the teacher agrees that the students choose their own course, the topic selection is successful, and the students can start learning the course. Analyze and evaluate whether the time and amount are optimized, etc. Find out the causes according to the evaluation results, take corresponding measures, and make corrections and improvements.

4 Experimental Studies

4.1 Set up the Experimental Environment

The details of the client's development environment are as follows: Development platform: Eclipse for Android Developers; Android development plug-in: ADT C Android Development Tools. Development running environment: jdk1.8.0_60, Google Android SDK 1.16.0.0. Relational database: SQLite open source framework: Spring for Android; development language: Java, XML. The server side uses Jersey, Hibernate, Spring RELEASE and other third-party open source frameworks. Among them, Jersey is mainly responsible for the development of the resource layer, such as: registering resources, parsing and encapsulating transmission data formats, defining resource interfaces, and sending resource responses to the outside world. For the back-end server, the performance test is to consider and evaluate the time to respond to the request. Normally, the response time should be guaranteed to be within 3 s, which is generally acceptable to users. Client 1 configuration: OS: Windows 7, CPU: Intel E1260 1.8 GHz, RAM: 2G, resolution 480 * 320. Client 2 configuration: OS: Windows 7, CPU: Intel E1260 1.8 GHz, RAM: 2G, resolution 480 * 320. Client 3 configuration: OS: Android 2.1, CPU: ARM Cortex A8 800 MHz, RAM: 512M, resolution: 480 * 800. For the mobile client, the performance is mainly reflected in the smoothness of the screen when using the system functions. To investigate the reasons, it is necessary to consider the CPU usage (not too high, the system will be busy for a long time), and the memory usage (not too large, otherwise it will be blocked by the system). Optimized to kill the process) and GPU situation (drawing time should not be too long, otherwise it will cause frame drop and other situations that affect the picture display quality). Experimental tests were carried out in the above-mentioned experimental environment.

4.2 Experimental Results

The experiment selects the NFC-based mobile intelligent education system, the deep learning-based mobile intelligent education system, and the mobile intelligent education system designed this time for experimental tests, respectively testing the CPU usage of

Table 1. CPU usage when file size is 200 kB (%)

Number of experiments	NFC-based mobile intelligent education system	Deep learning mobile intelligent education system	The mobile intelligent education system in the text
10	4.315	4.115	1.669
20	3.667	3.648	1.267
30	4.102	4.206	1.088
40	3.589	3.776	1.758
50	4.065	4.335	1.599
60	3.114	4.007	1.623
70	4.056	3.458	1.544
80	3.746	3.866	1.729
90	4.213	4.064	1.663
100	3.558	4.213	1.728

the three systems when downloading files of different sizes. The experimental results are shown in Table 1, 2, 3, 4, 5 and 6:

It can be seen from Table 1 that the average CPU occupancy rates of the mobile intelligent education system and the other two systems are 1.567%, 3.843% and 3.967% respectively.

Table 2. CPU utilization when file size is 500 kB (%)

Number of experiments	NFC-based mobile intelligent education system	Deep learning mobile intelligent education system	The mobile intelligent education system in the text
10	12.316	13.645	7.845
20	11.504	12.866	8.121
30	12.114	11.593	7.688
40	13.124	12.848	8.236
50	11.669	11.606	7.694
60	12.347	13.010	8.203
70	11.984	12.347	7.885
80	12.030	11.595	8.126
90	11.685	12.063	7.859
100	12.331	11.245	8.203

It can be seen from Table 2 that the average CPU usage of the mobile intelligent education system and the other two systems are 7.986%, 11.998%, and 12.282%, respectively.

Table 3. CPU occupancy rate of 1 GB file (%)

Number of experiments	NFC-based mobile intelligent education system	Deep learning mobile intelligent education system	The mobile intelligent education system in the text
10	26.454	24.772	17.645
20	28.313	25.908	15.325
30	25.319	24.331	14.616
40	27.441	25.499	13.822
50	24.088	23.561	15.227
60	25.616	27.202	14.399
70	24.337	26.144	13.283
80	25.189	27.229	14.211
90	24.177	28.313	15.699
100	25.006	26.125	13.224

It can be seen from Table 3 that the average CPU usage of the mobile intelligent education system and the other two systems are: 14.745%, 25.594%, and 25.908%, respectively.

Table 4. CPU occupancy rate when file size is 1.5 GB (%)

Number of experiments	NFC-based mobile intelligent education system	Deep learning mobile intelligent education system	The mobile intelligent education system in the text
10	36.512	35.461	19.848
20	35.418	35.219	20.166
30	33.991	36.511	18.553
40	35.574	37.818	19.006
50	35.210	36.559	20.117
60	36.914	35.267	20.031
70	35.206	34.299	19.848
80	36.228	35.218	20.615

(continued)

Table 4. (continued)

Number of experiments	NFC-based mobile intelligent education system	Deep learning mobile intelligent education system	The mobile intelligent education system in the text
90	35.209	36.915	21.535
100	36.778	38.220	22.160

It can be seen from Table 4 that the average CPU usage of the mobile intelligent education system and the other two systems are: 20.188%, 35.704%, and 36.149%, respectively.

Table 5. CPU occupancy rate of 2 GB file (%)

Number of experiments	NFC-based mobile intelligent education system	Deep learning mobile intelligent education system	The mobile intelligent education system in the text
10	47.151	46.554	29.616
20	44.369	45.031	31.005
30	45.915	44.518	32.147
40	42.612	46.906	32.066
50	46.303	44.677	31.548
60	45.918	45.223	29.288
70	46.991	46.208	31.599
80	48.205	47.566	31.206
90	49.778	48.312	31.588
100	51.007	49.522	29.008

It can be seen from Table 5 that the average CPU usage of the mobile intelligent education system and the other two systems are: 30.907%, 46.825%, and 46.452%, respectively.

It can be seen from Table 6 that the average CPU usage of the mobile intelligent education system and the other two systems are: 45.615%, 54.748%, and 55.163%, respectively.

Table 6. CPU occupancy rate when file is 3 GB (%)

Number of experiments	NFC-based mobile intelligent education system	Deep learning mobile intelligent education system	The mobile intelligent education system in the text
10	59.164	57.618	45.616
20	52.161	56.339	44.395
30	51.649	55.184	46.218
40	53.227	54.226	45.319
50	55.869	56.319	46.548
60	54.313	54.218	44.613
70	55.279	55.339	46.948
80	54.287	56.208	45.649
90	56.319	52.391	46.227
100	55.214	53.787	44.612

5 Conclusion

At this stage, there are many intelligent education features, and the current mobile intelligent education system uses relatively backward education feature extraction technology, which leads to the fuzzy extracted education features and excessive CPU utilization during the system operation. In order to solve this problem, we take the intelligent education features under the support of the cloud architecture, and design a mobile intelligent education system based on the cloud architecture to improve the intelligence of the education system. The experimental results show that the CPU utilization of the system is low, indicating that the mobile intelligent education system with cloud architecture has better performance. The system meets the needs of people to query information anytime and anywhere in the teaching process. It not only enriches the teaching means, but also improves the teaching efficiency. It is an extension of the current intelligent education and the development direction of the future network education. In the future, the document import and synchronization functions of the system need to be continuously improved.

References

1. TLi, T.: Theoretical construction and implementation strategies of mobile intelligent terminals empowering community education. *Adult Educ.* (3), 25–29 (2020)
2. Jing, C., Zhi, J.: Experience design of intelligent education system based on the big data. *Packag. Eng.* **41**(2), 21–27 (2020)
3. Yu, S., Chen, F.: Construction of smart education service ecosystem. *E-educ. Res.* **42**(6), 5–13, 19 (2021)
4. Li, Q.: Design of network distance education system based on ASP under the background of Mu class. *Mod. Electron. Technol.* **44**(6), 72–76 (2021)

5. Wang, P., Wang, C., Zhu, X.: Design and application of educational artificial intelligence system based on automation method. *China Educ. Technol.* **15**(6), 7–15 (2020)
6. Yan, Y., Xie, H., Liu, G., et al.: Researching on nuclear-biological-chemical situation awareness system based on cloud architecture. *Fire Control Command Control* **44**(1), 131–134 (2019)
7. Zhu, S., Guo, Y.: Emerging engineering education reform under the background of intelligent education: framework design and implementation approaches. *Res. High. Educ. Eng.* (6), 155–161 (2019)
8. Luo, Z.P., Jiang, Y.C., Hu, Z.J.: Cloud computing virtual resource enhanced multipoint secure transmission simulation. *Comput. Simul.* **38**(1), 158–161, 166 (2021)
9. Che, J.X., Wei, W.W., Zhang, H.R., et al.: Research and design of blockchain technology applied to education system. *Mod. Electron. Technol.* **43**(10), 92–96 (2020)
10. Hui, S.: Design and implementation of web-based remote multimedia teaching management system. *Int. Educ. Forum* **2**(6), 31–35 (2020)