Research and Design of Intelligent Classroom

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ABSTRACT

With the rapid development and application of wireless network technology and cloud processing technology, it has been a hot issue to research and design an intelligent environment for human life. Education is one of the most important parts of human life, and intelligent classroom related to education is one of the spots, this paper first analyzes its necessity and importance, and second describe its key elements in the composition of intelligent classroom, and presents its concept of design, its structure of physical and software, and finally introduces in detail about how to make use of big data and cloud processing to meet intelligent classroom’s demands.

KEYWORDS

Intelligent Classroom, Physical Architecture, Software Architecture, Big Data, Cloud Processing

INTRODUCTION

IBM first put forward the concept of "smart earth" in 2008. With the rapid development of Internet of things technology and cloud computing technology, the word "wisdom" has generated some new concepts, such as smart city, smart transportation, smart community, smart home, smart campus, intelligent classroom and so on [1]. The global intelligent classroom market will grow at 31.25% CAGR from 2013 to 2018 [2].

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Intelligent classroom is the inevitable outcome of the available advanced computing, network and data communication technology. As a new form of education and modern teaching means, intelligent classroom has brought challenges and opportunities for the education. Intelligent classroom not only has advanced hardware, but also have intelligent software; intelligent classroom must include the following:

It can provide the appropriate environment and equipment in order to support the teaching behavior, and realize the interactive application and display of a variety of terminal equipment in the teaching activity site, and record the teaching process.

It can make timely feedback to students’ learning results, and provide intelligent personalized learning programs for different students.

It can help teachers complete the evaluation of students preferably, including attendance record, testing and grading, etc.

It can be able to change students’ learning behavior and learning habits in order to emphasize active learning attitude, and change teachers’ teaching behaviors in order to advance teachers’ course consciousness.

DESIGN OF INTELLIGENT CLASSROOM

Intelligent classroom is first a classroom, and then the classroom has the intelligent characteristic. Classroom is a place of teaching and learning, and it is a directly physical expression of learning environment. An excellent learning environment should be an external environment affect the learner positively, and it can promote learners’ meaning construction and his ability development. That is to say, intelligent classroom is not only a physical space, but also a very significant learning environment can not only help the learner study learning problems and solve learning problems, but also help the teacher change the teaching methods and teaching mode, and reduce the workload of evaluation to student.

According to construction and development of domestic and foreign intelligent classroom, intelligent classroom should have physical architecture, software architecture.

Design Models of Physical Architecture

The design of intelligent classroom must be intellectualized.

Physical architecture includes intelligent interactive display equipment, ID authentication device and intelligent recording and video conferencing equipment.

INTELLIGENT INTERACTIVE DISPLAY EQUIPMENT

Intelligent interactive display equipment includes interactive intelligent whiteboard, interactive smart tablet, virtual reality technology equipment.

Interactive electronic whiteboard
The interactive intelligent whiteboard is mainly installed on the teacher's desk and every student’s desk, teachers can use all kinds of teaching materials and the application software at any time for teaching. Students can also perform this operation for learning, who can also use a stylus or finger to operation learning interface in order to question, answer and share learning achievement.

Interactive smart tablet

Interactive smart tablet is produced with the rapid development of large screen display technology and touch screen control technology. It integrates large screen display, positioning, signal transmission, multimedia, gesture sensing, voice sensing and other technologies [3]. Interactive smart tablet can realize seamless splicing technology with large screen, not only can achieve the best writing effect without brightness influence, but also can realize remote multi party visual interaction.

Virtual reality technology equipment

With the rapid development of virtual reality technology, 3D interactive projection equipment and 3D TV equipment have also been manufactured, and they can be used in the construction and teaching of intelligent classroom, which can better realize the interaction of teaching, so as to attract learners' learning.

ID AUTHENTICATION DEVICE

ID authentication device mainly includes RFID tags, RFID interrogator and wireless access system.

Before teachers and students with respective identification card entered into the classroom, firstly they must across the area of ID authentication area. Once different information is identified correctly, wireless access system based network will start different services for teachers or students.

INTELLIGENT RECORDING AND VIDEO CONFERENCING EQUIPMENT

Intelligent recording and video conferencing equipment is an important tool to realize real classroom recording, it includes image recognition device, voice tracking device and mouse click tracking device. The device can not only record the class teaching activities, but also upload recorded video to the cloud platform through the EEGKS.

Design Elements of Software Architecture

Intelligence classroom is an information-based classroom, which must have information collection, information transmission, information processing and information display from environment of wireless network. The procedure of information collection mainly completes through RFID and identity recognition technology, and which of information transmission chiefly finishes through EEG (Electroencephalogram) docking knowledge system, and which of information processing operates through cloud process and big data, and its results of real-time
display (information display) are presented based on UI technology with a transparent medium.

RFID AND IDENTITY RECOGNIZATION TECHNOLOGY

RFID is a kind of wireless communication technology, and it can identify special target (teachers, students) and read and write related data by radio signals. The application software system is stored in the cloud, which includes IRM, teachers’ module, and students’ module. IRM mainly judge validity of identity; teachers’ module mainly receives instructions from teachers’ terminal and satisfies teachers’ requirements by performing some set of actions; students’ module mainly receives instructions from students’ terminal and satisfies students’ requirements by performing some set of actions.

EEG DOCKING KNOWLEDGE SYSTEM

EEG docking knowledge system (EEGKS) is a remote controlling system, is used in the intelligent classroom. The thing of EEGKS is knowledge system. The sender of EEG may be teachers, may be students. When they can’t solve a certain problem, they will use the knowledge system, and get the need under the support of cloud process and big data.

VIRTUAL REALITY TECHNOLOGY

VR is used in the intelligent classroom, it mainly processes those results from interaction and other results. How to display them in a transparent medium is a critical and difficult technology. At present, VR technology with transparent medium uses three-dimensional imaging technology [4].

CLOUD PROCESSING AND BIG DATA

Big data and cloud process is closely integrated, and they are for data storage and services process, and must take up lots of storage and computing resources. The most fundamental challenge for Big Data application is to explore the large volumes of data and extract useful information or knowledge for future actions [5]. The big data of the intelligent classroom is mainly from learning activities of the student. Those results from learning activities processed by the software system are finally submitted to the teacher, and then the teacher will take different teaching methods to assist the student with his learning according to those results analyzed. At the end of the course, the system will automatically customize the personalized learning program for the student.
THE PRINCIPLE OF INTELLIGENT CLASSROOM

Big Data of Intelligent Classroom

According to the definition of Wikipedia, big data refers to a series of data sets can’t be collected, managed and processed by the software used usually in limited time. It is not a selected data, and it is the combination of the data.

The detailed characteristics about big data of intelligent classroom are as follows:

Firstly, it records students’ learning effect through testing, exercise and other learning operation, which reflect variety and volume of big data;

Secondly, it can combine a complete big data through students’ answering in order to solve a problem perfectly, which reflect value of big data;

Finally, learning activities of the student processed by the software system are formed a big data, which reflect volume of big data.

Those big data finally submitted will be analyzed to guide the students’ further study and provide different student personalized learning program.

Cloud Processing of Intelligent Classroom

Cloud from cloud processing is actually the internet. Some data been stored in PC and some software been installed in PC has been stored in the cloud now. Operating software and application existed in cloud is like operating your personal computer.

The detailed operations about cloud processing of intelligence classroom as follows:

Firstly, the curriculum materials of teachers are stored in the cloud;
Secondly, the notebook, assignment and other exercise of student are stored in the cloud;
Finally, online learning system and EEGKS are stored in the cloud.

The Realization of Intelligent Classroom

The realization of intelligence classroom based on the big data and cloud processing includes two parts: one is online learning system, the other is EEGKS. The online learning system is to build students’ personalized learning situation, and the learner can select the core learning materials to study according to his learning backgrounds, preference, interests and talents; EEGKS includes Electroencephalogram, sensor and knowledge system, and the knowledge system is mainly used to find the solution in the internet.

ABOUT EEG

EEG is a signal of brain wave, which is a sort of bioelectricity phenomenon arising from some information transmitted in the form of electrodes between
neurons in the brain. EEG can be gathered by electrodes placed on the scalp. When the docking knowledge system doesn’t start automatically after transmitting EEG, the user will start it by correct parameters input, which need match the values of the table.

ABOUT CLOUD COMPUTING

The docking knowledge system is stored in the cloud. After it received multiple data sent by different EEG from sensors (each data is marked specified tag according to different transmitting terminal), it can classify the data received and dock the knowledge table and mine data.

ABOUT BIG DATA

The big data in the intelligent class must be comprehensive, accurate and valuable.

The big data of the knowledge system can mine the curriculum’s characteristics, utilization, global application and so on; the statistical analysis of the students’ learning, and make personalized learning program for every student; feedback student’s question and provide an effective learning program for other learners; provide a perfect teacher scoring system, which can record students' learning status in real time, and help the teacher to analyze students’ learning behavior objectively.

CONCLUSIONS

The design of intelligent classroom must make full use of modern science technology, which can foster students’ learning interest and creativity. The paper introduces technical elements and the consistent of software system in detail, but if intelligent classroom can become a real intelligent classroom, there are many problems need to be solved, such as the speed of big data mining, the timeliness of docking knowledge system with EEG remotely and the fluency of VR technology with transparent medium.

REFERENCES