

Intelligent Design of Electrical Training Room in Higher Vocational Colleges Based on Internet of Things Technology

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Abstract. According to the characteristics of higher vocational electrical training room management, considering the shortage of little application of Internet of things technology, for example, a intelligent management system in certain electric training rooms was designed and constructed in this paper. The system construction works include application platform construction, network architecture design, and installation perception layer. After a year of debugging and operation, it has achieved good results and accumulated experience for the design and construction of intelligent training center.

Keywords: Electrical training room, Intelligent management of Internet of things

Introduction

The existing problems and current situation of the training room management

Higher vocational colleges mainly cultivate application-oriented skills, so set a lot of practice in teaching arrangement operation courses, the different professional training room equipment management and teaching of workloads, to training room management and teaching work of the great challenges. There are several main problems:

(1) The equipment management problem

The work of equipment management is increasingly intensive. According to statistics, to meet the needs of a certain professional, it needs to be equipped with 5-8 professional training rooms, and the training equipment is varied and complicated, updated and upgraded quickly, and the management task is heavy. Currently training rooms management still adopt the way of the administrator of artificial, an administrator needs to almost ten training rooms management at the same time, up to now still use paper records, equipment fault occurs again after the repair, there is a low working efficiency, feedback time is long, the equipment maintenance schedule and other problems.

(2) The safety management problem

Safety is the first priority of work. First of all, the training of skilled talents can only be improved by strengthening practice. There are hundreds of students in a major, and the personal safety of students in actual training is often dependent on the repeated instructions of the teachers. Secondly, the operation of the practical training equipment will not stop, the long-term overload will be overworked, and if the operation data of the equipment cannot be monitored in real time, the alarm will be issued during abnormal times, which will cause unnecessary equipment damage. Thirdly, there are a large number of students in the training course. For small practical training equipment, the traditional management mode is distribution before class and collect again after class, there are bigger equipment loss hidden trouble.

(3) The teaching management problems

The teaching management mainly involves the training room and the course attendance two problems. The traditional way of arranging classes is to collect the report plan from each teaching unit before the beginning of each semester, which is arranged by the actual training department. But often appear by reason of teachers' teaching plans to change and the classes in the situation, need to adjust the training rooms teaching arrangement, the electrician electrical, lathe processing, such as the school

of engineering choose training rooms, the lesson is very difficult. Another problem of teaching management is the attendance of teachers and students. Traditional way is a teacher in training management office sign in before class, then shall be the responsibility of the teacher to student attendance and training management office spot check, this is for training the administrator increased workload, may also have the impact to the practice of teaching process.

In the view of this, this paper, taking the electric training room of a vocational college as an example, We used the Internet of things technology to design and construct an intelligent monitoring system. To achieve the following objectives:

(1) The system realizes the data collection and monitoring of the operation data of the training equipment; To realize the equipment failure warning and alarm, one-button repair and other functions; Implement the monitoring of the training room environment (temperature, humidity, brightness, ventilation condition, etc.).

(2) The system completes the electronic registration of the practical training equipment, intelligently manages, and facilitates the statistics and search of teaching assets.

(3) The system realizes electronic attendance and records through intelligent identification of student CARDS and teacher CARDS; Effectively prevent the loss of teaching equipment.

(4) The system realizes the visual management of the training room.

(5) Setting up a training room management platform to achieve the summary of data information and regular maintenance of equipment; Implementation of the training room in the open, open online, experimental data download and other functions.

The intelligent design of training room based on the technology of Internet of things

The Internet of things is more than ten years put forward a new technique concept, the idea is through all kinds of information sensing equipment items, which can identify a preset communication protocol, will object to connect to the Internet, information exchange and communication, to achieve intelligent identification, location, tracking, supervision, control and management of a kind of new technology.

The architecture of electrical training room system based on IoT technology

In order to meet the above requirements, We adopts the standard three-layer architecture as the system structure. The components used in each layer are used in general technical standards and molding equipment. Its basic design framework is shown in figure 1:

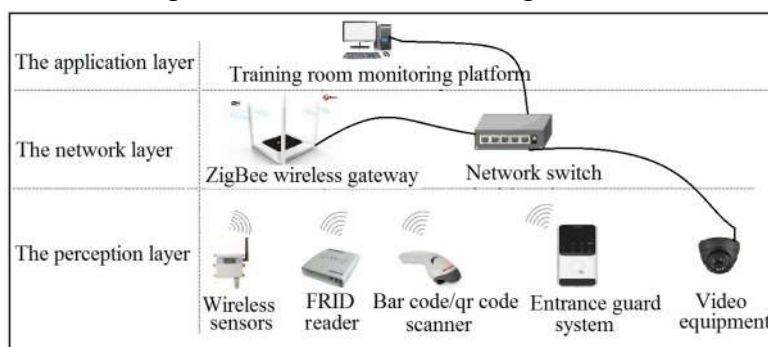


Figure 1 The architecture of electrical training room system

The perception layer

The sensing layer consists of sensors, FRID card reader, scanner, access control system and video system. Among them,

The sensor collects the temperature, current and other signals of the electrical equipment during operation, so as to facilitate the layout, mainly use the wireless sensor with ZigBee communication module.

The FRID card reader and scanner are mainly used to detect the active or passive electronic tags of various training devices, so that the training equipment can be counted and searched by administrators or teachers.

The access control system can be used to detect the students' campus CARDS (FRID CARDS) and conduct electronic examination, which can effectively prevent the accident of the equipment in the training room.

Video monitoring system mainly consists of camera and hard disk recorder, complete the visual management of the training room, and implement video storage and playback function.

The network layer

The network layer is mainly composed of ZigBee wireless gateways and network switches.

ZigBee wireless gateway is used to receive and summarize the data collected by each sensor and convert it to analog to Ethernet.

The network switch is mainly used to receive the signal of the video detection system and transmit it to the application layer.

The application layer

The application layer consists of various PC terminal software. The main function is to aggregate all kinds of data to realize remote processing and supervision. The experimental data are collected and recorded and uploaded to the campus web server for easy access by teachers and students.

The hardware design

At present, many manufacturers can provide mature products. Here, we mainly discuss the hardware design of two parts: current sensor and ZigBee gateway.

The selection of current sensor

The Current sensor We using the production BA05 - AI/I (V) series which is instrument in Xi'an electronics group,, the sensor can choose RS - 485 digital interface, using the standard MODBUS protocol, can be easily connected to switch, have mature communication protocol.

The design of ZigBee Ethernet gateway

We choose the ZigBee Ethernet gateway who is based on CC2530 chip plus ESP8226 wireless WiFi function design. As shown in figure (2).

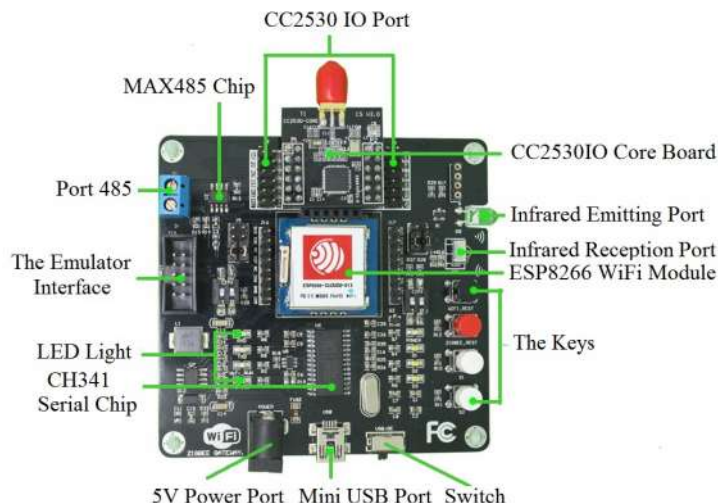


Figure (2) The ZigBee Ethernet gateway module

This gateway supports the ZigBee protocol stack, supports WiFi AP+STA coexistence mode, and accepts AT command control. Enable ZigBee network and Ethernet \ Internet to communicate.

The design of software

The software involved in this system mainly includes Zigbee wireless sensor network and application software design of the training room management platform.

The ZigBee network

ZigBee network we use function strong mesh type, it can be implemented among sensor nodes communicate with each other, can also through the way of "jump" to communicate, have a certain self-organization, self-healing function, even if one node fails, also does not affect the transfer function of the other nodes.

The design of training rooms management platform application software

The management platform system of the training room is divided into three levels: the bottom layer consists of servers and databases, which are mainly responsible for the storage and reading of data. The network layer is mainly composed of FRID card reader, qr code/barcode scanning, and entrance guard system of communication protocol, main effect is to identify the identity of the cardholder, confirm whether door open, complete attendance and equipment abnormal carry etc. Function. The human-computer interaction layer adopts Web page mode to facilitate the login of PC and mobile terminal.

The training room management platform consists of three parts: practical training equipment management, practical teaching management and daily management. The main contents involved are shown in figure (3) :

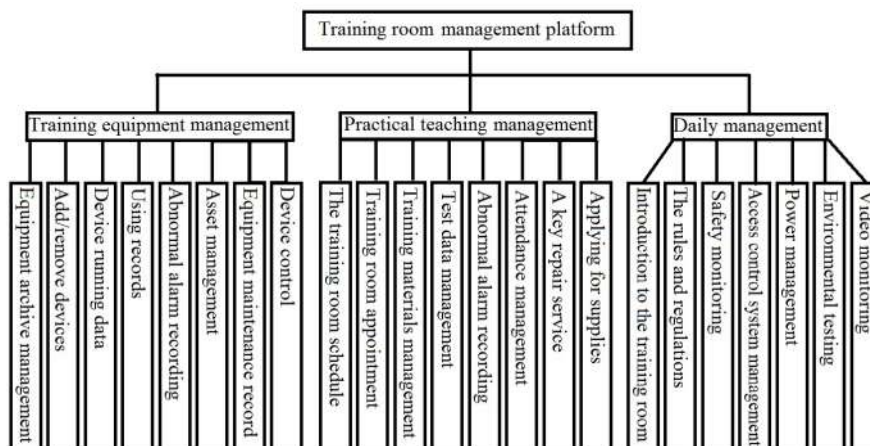


Figure (3) The electric training rooms management platform application system architecture

The training equipment management is mainly responsible for regular work record of training equipment, equipment of electronic registration, operation data records, use and asset verification, maintenance, power control, and other functions; The practical teaching management is mainly responsible for the deployment of the training room, the management of experimental data and attendance management, etc. Daily management is mainly responsible for security management, access control and video monitoring and other functions.

The implementation status and summary of the platform

After two semesters of construction, commissioning and operation, the management platform has been perfected and well received. It is mainly reflected in the following aspects:

(1) This system significantly alleviated the work intensity of the training room administrator. The operation of the platform reduces the daily work strength of the administrator and improves the working efficiency.

(2) The platform enhanced the utilization and safety of the equipment. Open the classroom plan of the training room, open the online booking function, convenient teachers to arrange the actual training time, improve the utilization of the equipment; Through the operation monitoring of the equipment, the successful early warning of two abnormal high-load operation events prevented the expansion of the situation and reduced the losses for the college.

(3) This system improved the efficiency of teaching management. The application of intelligent access control system enables teachers to exempt from daily roll call and statistic work and realize electronic attendance. Teachers only need to adjust the number of attendance of students. Students can log on to the platform, download experimental data, and facilitate the development of experimental teaching.

Conclusion:

This article in view of the current problems existing in the daily management of electric practicing

rooms, application of Internet of things technology, build the training rooms intelligent management platform, integrated optimization training rooms of teaching resources, improve the utilization rate and safety of the equipment, to achieve the electronic office.

With the development of the concept of "smart campus", the intelligent construction of the training center is the trend. The construction and management of intelligent training center involve a lot of problems, and the design planning, construction implementation and daily management technical requirements are also higher. It is expected that the design, construction and operation of this training room will be helpful to the construction of intelligent training base of the college.

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