Research and Design of Smart Campus Security System based on Internet of Things

Youliang Huang[1,#], Yan Tang[1], Fengying Guo[1], Xing Zhai[1], ShuZhen Li[1]
(Information center, Beijing University of Chinese Medicine, China)

ABSTRACT: *The campus security problems in today's era has become a hot topic, the campus comprehensive security situation is facing new problems and challenges. With the development of the Internet of things(IOT) technology, more and more widely used, the IOT applied to campus security has become an effective program. On the basis of IOT, the safe campus has brought new opportunities for the development of colleges and universities. In this paper, the concept and characteristics of the IOT and the safe campus are preliminarily analyzed, and then the application of IOT in campus security is discussed.*
Keywords : Smart campus, Internet of Things, Security system

I. INTRODUCTION

Internet of things (the Internet of things), 1999 at the Massachusetts Institute and University of technology has been put forward for the first time [1], can be understood as a simple things connected to the Internet, the definition is refers to the RFID, infrared sensors, global positioning system (GPS, laser scanners and other information sensing equipment, according to the agreement, the anything connected to the Internet, realize the information interaction of a network, be called after the third wave of the computer, the Internet world information industry development.

IOT are widely used in intelligent transportation, environmental protection, public safety, safe home, intelligent fire, industrial monitoring, food traceability and other fields. In recent years, with the development of sensor and network technology and the improvement of the production process, the Internet of things has been more and more familiar with the field and application. In the field of education, Internet of things technology can make the teaching and management of schools [2], become more human and wisdom. And extent of the construction of the digital campus [3-5] is also a measure of a school's academic level, management level, and professional skills ability to an important index to more prominent the core competitiveness of the school, digital campus has become a kind of development trend of campus management. It provides convenience for the teachers and students to work, study and daily life, and improve the teaching ability and level of the whole school. The construction of digital school must to digital information and network as the basis, make full use of the advantages and characteristics of Internet of things technology, building covering teaching, scientific research, management, technical services, service life of module of digital campus based management platform. Application of Internet of things technology in campus security system [6], will effectively promote the construction of "safe campus". Internet of things the article emphasizes the ITF is through various information sensing equipment will be the real world objects mutually interconnected to form network, which all items have digital, network-based identification, to facilitate the identification, management and sharing. This article from the understanding of the connotation and characteristics of the Internet of things, based on the status quo of the study of things, to explore the role of Internet of things in power, to ensure the safety of campus and other aspects of the role.

The rest of the article is structured as follows: Section 2 provides a description of the research process. Section 3 describes the structure model of IOT in the construction of safe campus. Section 4 presents the application of IOT in the smart campus security system. Section 5 summarizes the paper and provides some conclusions.

II. RELATED WORK

Campus security [7] is to the intelligent field development, and on this basis to achieve the computer platform, network wireless. The future of campus security system mainly to the direction of the development of intelligent. With the popularity of computer image processing and biometric technology, and the use of the construction of the corresponding database, students can not bring ID card, admission ticket will be able to enter the examination room. Networking technology development since, with the use of a large number of various types

of sensors, camera function can be achieved effectively locked tracking, on the change of the regional action conversion data, feedback the information to a processing terminal, the terminal of data analysis combined with image processing to restore the picture. This process is mainly for "change the alarm", that is, when the environment changes, the automatic alarm system. This system can realize pre control of fire, flood, if supplemented by special sensors, it is possible to monitor the changes in gas and other harmful gases. Intelligent technology is a necessary way to save human cost of security, in the future, the development of intelligence, instead of human intelligence, will not only monitor the field, will be prepared to complete the emergency response plan to automatically solve the problem.

The future of campus security system will be more and more to visualization. Traditional security alarm system, mostly through the computer or mobile phone to receive messages or e-mail notification, but the specific circumstances of what kind of situation users can not know. To security system presents the integrated and intelligent diversified development is not only as security defense and sensor applications will be for the security to provide new alarm platform, but also a high-definition camera IP are integrated together, and ultimately the formation of "all kinds of alarm and IP Camera + platform access" intelligent system architecture. With the improvement of bandwidth now, as well as the popularity of smart mobile terminals, users have been able to grasp the situation through the tablet PC or mobile phones, computers. The new direction of development, will also help to better realize the emergency treatment, such as the public security department to be able to better control the scene of unexpected events through remote tools.

III. THE STRUCTURE MODEL OF IOT IN THE CONSTRUCTION OF SAFE CAMPUS

The goal of the system
The overall goal of the construction of the system is using digital means especially networking technology, through sensors and RFID, QR code, such as sensor technology and wireless communication technology of campus environment, including the classroom of equipment and assets and resources such as books, teaching resources, activities, including teaching, management, service, office and etc. all the aspects and links of integrated management. In hardware, network infrastructure using wisdom campus information platform software, efficient and convenient way to achieve the school teaching, management and service activities in the whole process, so as to achieve to improve school teaching quality, service level and management level, to promote the realization of the purpose of school running tenet. To achieve a peace, intelligence, environmental protection, energy saving smart campus.

The function of the system
The smart campus security system Should include user management, rights management, configuration management, fault management, log management and other functions. Support for various video equipment, resources, equipment running status monitoring and maintenance, through the software to the parameter of the system equipment configuration, user registration, certification, delete and assign permissions management, and other functions. The system should have the function of log management, which can record the time and the main operation of the operator through the operation log, and support the function of log information query and report making. Data management: all types of devices across the board, the version, the number, number of focus on the database; Monitoring function: all of the monitoring points across the board can be real-time image calls through the network, to provide a reference for the leadership of emergency command and decision-making scheduling; Management functions: on the full range of all monitoring system network element equipment operation of monitoring and management, real-time display of all kinds of equipment operation data and alarm information. Alarm management: record and display equipment, system and communication part of the alarm, and record the alarm processing, can be exported; Control function: PTZ control and relay output node control for all monitoring nodes in the whole line; Data storage: support video storage and central backup, with a variety of automatic, manual storage.

The architecture of the system
Internet of things technology to the network as the core, to the core, to achieve the purpose of service[8]. Therefore, the Internet of things can be divided into 3 levels: perception layer, transport layer and application layer. Which sensing layer is the use of RFID, two-dimensional code, GPS, camera, sensor networks, etc. perception, capture means the object information collection and acquisition; and information perception of calculation and control, through the access device to the information resources sharing and interaction. The access layer is mainly responsible for the perception layer and the mobile communication network, wireless access network and other existing network connectivity, and is responsible for the remote control task assigned to the sensing node, the perception of data sent to the remote application. Application layer is the interface between the user and the

Internet of things, to provide specific services for the user, based on the dynamic data obtained from the underlying collection of data resources, through the application of various Internet of things to achieve the control of the Internet of things.

Key technology

The IOT technology is not independent, it is a combination of interdisciplinary technology, including computer, communication, electronics, material engineering and other multi-disciplinary technology integration. (1) RFID and EPC (electronic code) technology [9]

In Internet of things through the EPC code and RFID tag stores and norms of interoperability of information, through a wireless data communication network to their automatic acquisition to the central information system, realize the goods identification. (2) sensing and control technology [10] In the Internet of things, sensing and control technology is about obtaining information from natural sources, and processing, transformation and identification of. (3) wireless network technology [11]Wireless network is a global voice and data network for users to establish a long distance wireless connection.(4) networking technology [12]

Networking technology of distributed nodes in a certain range of automatic composition of a network, to increase the collection points of access to information channels, in the range of the nodes to collect the information can be unified processing and transmission, or after the mutual connection between nodes, negotiation each part of the information transmission.(5) artificial intelligence technology [13]Artificial intelligence is to simulate human thinking process and intelligent behavior (such as learning, reasoning, thinking, planning, etc.) through the computer technology, so as to realize the computer automatic processing.

IV. THE APPLICATION OF IOT IN THE SMART CAMPUS SECURITY SYSTEM

At present, the high degree of freedom of students in Colleges and universities is the biggest drawback of campus management, but also the reasons for the occurrence of many dangerous events. IOT references for keeping track of students learning situation, hazardous area management service and the school health service. Can also be used for auxiliary management student collective field activities in a safe. Students can through the wearing of intelligent positioning watch, teachers can real-time understanding of the student position. When the area beyond the set will receive alarm message. In the campus network management platform. Through the radio frequency identification, image recognition, GPS, wireless sensor technology, and combined with the daily video surveillance system. Changes in the overall perception of the campus environment, people and objects, such as access control, health monitoring, instrument control electricity, monitor and control of water, electricity, classroom lighting control, street energy-saving monitoring, disaster monitoring and ecological monitoring. To build a green, energy saving and environmental protection intelligent campus, for students to create a comfortable and healthy learning environment.

V. CONCLUSION

IOT in the campus security applications are now facing many difficulties and challenges. Mainly includes: privacy issue, address problem, cost problem, scale problem and system maintenance [14]. A lot information collection and exchange equipment are used in the Internet of things, people according to the RFID tags to monitor and related items, but for goods for scanning and locating and tracking of the subject is not the owner of the goods, which is bound to involve personal privacy tort issues, state machine dense and confidentiality of business there are the risk of leakage. Each item needs to be addressed in the Internet of things, which requires an address. Things need more IP address, IPv4 resource is about to run out, it requires Ipv6 to support. Although IPv6 technology has matured, the standard is developed, some network infrastructure and core equipment have started supporting the use of its, but in the specific implementation, due to the economic interest relationship, in the current haven't popularized, the rain is at a stage with IPv4 coexist and excessive. School as a non - profit nature of public utilities, education institutions, funding is relatively scarce, the lack of funds to control the school campus security work. Campus security system costs are high, whether the security system needs to be carefully decided. Scale is the cost of chips and other components required for the current production of things is higher, if the cost of all items are implanted in the high cost of identification, how to effectively solve this problem is a serious challenge. After the completion of the construction of campus security system, many schools have ignored the problems of security system operation and maintenance, resulting in a lot of equipment failure is not timely feedback and maintenance.

With the development of sensor technology, in-depth application of the IOT technology, IOT for our production, life, work will have an increasing impact on the IOT in the school will be further. In this paper, we first introduce the concept of the IOT, and then, the existence of safe campus, and in perceptual system application of Internet technology, communication system and recognition system analysis, summed up the feasibility of Internet technology in the campus safety and usage, effective way to help the construction of safe campus. Taking into

account the Internet of things technology does not have a wide range of applications, security, security, scalability and practicality of the campus security system needs to be further strengthened. Hope that the campus security design based on Internet of things can bring more progress in the future of campus security, promote the progress of the cause of campus security.

[1]. REFERENCES

[2]. Scuotto, V., Ferraris, A. and Bresciani, S. Internet of Things. Business Process Management Journal, 22, 2 2016), 357-367.

[3]. Yan, D. H. The Application of the Internet of Things in Digital Campus. Modern Educational Technology, 2011).

[4]. Kang, H. Y. Design and Realization of Internet of Things Based on Embedded System Used in Intelligent Campus. International Journal of Advancements in Computing Technology, 3, 11 2011), 291-298.

[5]. Li, L. The application of Campus RFID card based on Internet of things. Electronic Test2015).

[6]. Nie, Y. Idea about Internet of Things' Application in Campus. Mechanical Engineering & Automation2012).

[7]. Nichols, D. Creating a Safe Campus. A Guide for College and University Administrators. College Buildings, 39, 2 1997), 222-223.

[8]. Jiang, M. New Campus Construction for a Harmonious and Safe Campus of Universities. China Public Security2016).

[9]. Kim, S. and Na, W. Safe Data Transmission Architecture Based on Cloud for Internet of Things. WIRELESS PERS COMMUN, 86, 1 2016), 287-300.

[10]. Bohn, M., Nitschko, H. and Schaffrath, K. Chip module for an RFID system2016).

[11]. Seedhouse, P. Applying Digital Sensor Technology: A Problem-Solving Approach. Applied Linguistics, 37, 1 2016), 7-32.

[12]. Wireless technology. BRIT DENT J2005).

[13]. Yin, H., Long, B. F. and Wang, N. Z. Power Line Carrier-Based Networking Technology of the Internet of Things. Advanced Materials Research, 516-5172012), 1414-1418.

[14]. Polak, S. and Mendyk, A. Artificial intelligence technology as a tool for initial GDM screening. EXPERT SYST APPL, 26, 4 2004), 455-460.

[15]. Roman, R., Zhou, J. and Lopez, J. On the features and challenges of security and privacy in distributed internet of things. COMPUT NETW, 57, 10 2013), 2266-2279.