Research on Internet of Things Technology and Its Application in Building Smart Communities

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Abstract. The Internet of Things technology is widely used in many industries and fields, including smart production and management, smart transportation and environmental protection, industrial monitoring and social security. Community construction is turning to smart communities. The construction of smart communities mainly uses network communication system facilities to realize the integrated networking of community residents and public facilities, to carry out information management of community residents, living and service facilities, and to improve the living environment by using modern technical measures. Aiming at the decentralization of IoT technology and smart community fusion products, an integrated information system platform needs to be built. In this article, the overall design framework of smart communities based on Internet of Things technologies is studied, and the smart community information management platform is divided into several main parts; Each part as Subsystem, discusses the basic functions of the subsystem, and finally realizes the intelligent construction of the smart community as a whole. We start work from the reality of the systematic construction of smart communities, combining with the latest Internet of Things technology, research and build a smart community information management platform with a unified architecture to achieve unified management and scheduling of smart community sub-products.

1. Introduction
The Internet of Things is referred to as IOT, which refers to the Internet connected between things, and its main meanings include flowing aspects. The Internet of Things contains similar usage functions as the Internet and enables interconnection between physical entities; Realize the network connection between the entity and the virtual object, and realize the effective control of the physical entity. We use global positioning system, radio frequency identification technology and laser scanners and other information acquisition equipment to achieve data collection, use communication networks or the Internet to complete information exchange, analyze data information and processing results, intelligently control objects. The Internet is the technical foundation and core of the Internet of Things. On the basis of the Internet, the Internet of Things further extends users and enables communication and information exchange between objects. The conditions for the objects to be controlled by the network include: CPU storage and control capabilities; Have a unique identification; It has a communication module capable of receiving and sending information; It can communicate according to the Internet of Things related protocols. The construction of smart communities mainly refers to the use of computer networks to achieve network connections to community services, property and security management, and public facilities management, to intelligently manage communities, and to create comfortable and safe living environments. Smart communities are the product of the development of Internet of Things technology. From a functional perspective, smart communities can provide information service management,
monitor public facilities, and make community management more secure; Provide information services to community residents in the form of multimedia; Intelligent management of community service facilities; Achieve information interaction between community and society.

2. Overall architecture design of smart community based on IoT technology

Utilize modern Internet of Things technology to build an intelligent integrated management platform for smart communities, to achieve centralized management of community security, public facilities, and intelligent parking charge management. Utilize radio frequency identification technology to realize the management of personnel inside and outside the community, and intelligent management of vehicles entering and leaving the community; We use RFID technology to realize intelligent management of parking spaces; In terms of security management, it implements intelligent video security functions, and the monitoring scope includes public areas, perimeters of electronic fences and other areas for security precautions to improve the security level of community management; In terms of electronic inspections, it implements intelligent periodic security inspections. The overall architecture design of a smart community is shown in Figure 1 below.

![Overall architecture design of smart community based on IoT technology](image_url)

Figure 1. Overall architecture design of smart community based on IoT technology

Build a smart community system and a comprehensive platform for smart communities, which mainly include six functional subsystems.

The intelligent community integrated platform is the external front-end of the entire platform, which serves as a system bus to connect various subsystems. The integrated platform only interacts with the information of each subsystem, and the subsystem interacts with the underlying hardware. When a system failure occurs, it can quickly locate and reduce the risk of string signals of multiple complex interfaces.

Fence subsystem. Deploy a hardware device far-infrared security terminal. When alarm information occurs, upload the alarm information to the electronic fence subsystem through the wireless network transmission mode. Using wireless network to transmit alarm information can save network resource costs and ensure network quality for data transmission; The wireless network transmission can establish a two-way connection session mechanism, and the system platform can send information such as de-alarm or pre-alarm to the electronic fence to achieve the integration of the Internet of Things technology.

- Video surveillance subsystem. The video information is transmitted to the intelligent community integrated platform through the network.
- Public facility monitoring subsystem. The application of radio frequency identification acquisition equipment to public facilities, collection of daily usage data of these facilities, and transfer to the intelligent community integrated platform.
- Electronic patrol subsystem.
- Parking management subsystem. Utilize radio frequency identification technology to realize intelligent management of community vehicles, including intelligent identification of internal vehicles and temporary vehicles outside the community, and intelligent management of parking information of internal vehicles.
• Intelligent access control subsystem. In multiple identification places in the smart community, radio frequency identification technology is used to achieve remote identification of identity information.

3. Design of Intelligent Access Control System for Internet of Things
The first line of defense for smart community security is community access control. The elevator at the entrance of the community accurately recognizes the information such as the number plate of the vehicle in and out, and locates the parking information. The system uses radio frequency technology to verify the access permissions of vehicles, and to achieve the safe management and control of community vehicles. Install a face recognition system at the entrance and exit gates to achieve face capture, face comparison, etc. of incoming and outgoing personnel, register the ID information of temporary visitors, verify the consistency of personal identification, improve personnel registration efficiency, and effectively control Take-out, express delivery, babysitter and other highly mobile personnel.

The second line of defense for smart community security is building access control. Building access control has a single identification object and high accuracy, and can accurately collect visitor data information. Effective combination of building access control and smart doorbell, supporting video communication or voice communication, can effectively achieve communication between visitors and residents.

The last line of defense for smart communities is IoT door locks. The new type of IoT lock is the device closest to the residents, which can directly collect the most accurate data, provide the interface for residents to integrate into the intelligent access control system, and maximize the safety of residents. The new IoT lock supports multiple unlocking methods, including remote unlocking of mobile phones, password unlocking, QR code unlocking, fingerprint unlocking, RFID card unlocking, etc. The positioning of the intelligent access control subsystem in the smart community is shown in Figure 2 below.

4. Design of Parking Management Subsystem Based on Internet of Things Technology
Utilize radio frequency identification technology and car tag technology to build an intelligent smart community parking management system. When the vehicle is near the gate, the passing vehicle is identified according to the vehicle sense tag. If the vehicle is legal, the vehicle is automatically allowed to park in. In this subsystem, the vehicle is fully identified and managed. Using radio frequency identification technology in parking management and connecting each parking space to the IoT system, community managers can clearly understand the current use of parking spaces, so as to rationally plan subsequent vehicles entering the community and reasonably allocate parking spaces.

The parking management subsystem based on the Internet of Things technology needs to complete the following functions.
• Real-time supervision.
• Proprietary parking management.
• Temporary vehicle entry and exit information management.
The smart community parking management route design is shown in Figure 3 below.

Figure 3. Smart community parking management route design

5. Conclusion
In recent years, the Internet of Things technology has been developing with each passing day. Finding a suitable entry point, the practical application of increasingly mature Internet of Things technology in real life. The smart community information management platform is divided into several main parts, each part as A subsystem discusses the basic functions of the subsystem, and finally realizes the intelligent construction of the smart community as a whole. Construct and form users' intuitive impressions of smart communities, and lay the foundation for the further promotion of subsequent smart community construction. During building an intelligent community information system, a variety of modern technologies need to be used, including multimedia communication technology, wireless network communication technology, radio frequency identification technology, radio frequency tag technology, and video surveillance technology. Through the unified management of the smart community platform, we can realize the standardization of smart communities and improve the informationization level of community security management, enhance the livability and safety of communities and improve the quality of community property services from all aspects.

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