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Multimedia Image Remote Transmission System in Smart City

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ABSTRACT

With the construction of intelligent city, multimedia technology has been applied to all aspects of society. Multimedia image remote transmission in smart cities extracts structured data such as people, cars, objects and behaviors from video image resources. Through association analysis and processing of large data platform, this paper focuses on the low utilization rate of video image resources and the inadequate performance of video image application, and put forward the corresponding construction requirements. The detailed design of information database and other modules of multimedia image remote transmission system in intelligent city is based on the design of each functional module, it realizes the networking, sharing and exchange of image resources, and multidimensional association and fusion of large image data. It realizes the functions of monitoring and early warning, situation judgment and visualization data display of multimedia image remote transmission system in smart city. The experimental results show that the effectiveness of system design and implementation.

KEYWORDS: Smart City, Multimedia Image, Remote Transmission, Remote Monitoring

I. INTRODUCTION

With the development of modern network communication technology, image acquisition instruments such as cameras have emerged. As the accuracy of the camera becomes higher and higher, the control device of the front-end device becomes more and more convenient. Image transmission has evolved into a more mature technology [1-3]. The transmission of images in an analog signal transmission environment primarily involves the laying of audio and video image transmission cables between the front end and the main control room. The power and control cables complete the transmission of control signals and audio and video image signals. And at the main control end, the multi-channel signal is switched through the audio-video image matrix, and finally the image is displayed on the screen. In order to better carry out urbanization construction, how to use multimedia image transmission technology, knowledge engineering and management methods to solve key problems in urban positioning, planning, construction, operation, management, maintenance and transformation [4]. In particular, issues such as energy conservation and environmental protection have become the focus of research in many governments and large technology companies. "Smart city" is proposed in this context.

Smart cities need intelligent video image monitoring systems to form the eyes of city managers, to effectively monitor road traffic, public places, and key areas, and to provide services and assistance for urban management and public life. Mainly based on regional deployment, the degree of networking is not high, and the sharing ability is not strong [5-8]. The degree of intelligence of video image monitoring is not high, mainly relying on human eye monitoring. There are not many video image monitoring services for the public. The digital video image monitoring system will effectively solve the difficulty of urban monitoring. The video image content can be shared remotely on the digital monitoring platform, so that the users in different departments, different regions and different levels can fully grasp the required video image information [9, 10] , greatly improve the utilization of monitoring resources and achieve better benefits. The increasingly mature digital video image compression coding technology and the continuous development of multimedia network transmission technology provide conditions for the

development of a truly multimedia remote monitoring system.

The network's multimedia remote monitoring system completely breaks the limitations of traditional analog monitoring systems. Kang S et al. listed public services as an important part of the top-level design of smart cities [11]. The comprehensive development of the future development of smart cities is carried out, and the basic framework for the realization of smart cities is constructed. Rahman M A and others point out that smart cities can provide quality services to citizens [12]. Its application involves various fields of social life, and explains in detail the methods of traffic accident signal assistance, intelligent medical examination, intelligent garbage management, etc., and shows the application effect in the future. Jena M et al. analyzed the significance of the wisdom layer in the face of urban development [13]. It shows that smart cities will provide another way through more neoliberal roadmaps, mining smart cities in the knowledge base and more realistic critiques to realize what understanding really means. Fang Z et al. analyzed smart cities from the perspective of electronic intelligent city information and communication and provided examples of implementation [14]. It also introduces the ecosystem of highly intelligent cities, key utilization technologies, the necessary architecture of the digital world, and the policy framework established by major cities [15]. And discussed this new ecosystem, bridging the business model of the physical and virtual world. From the local area to the metropolitan area to the wide area, from one city to another, the smart city multimedia image remote transmission system is used to completely get rid of the regional restrictions of the previous analog monitoring system. A thousand miles away can also complete the monitoring operations that were once completed at the monitoring site.

In the modern city streets, in the community, in the bus, in the business building, there are all kinds of information screens, advertising screens, interactive screens, etc., and a large amount of information and advertisements are released, and people become aware of the city's running status, cultural trends, fashion consumption and other windows. Most of them are non-networked independent screens. The update of information is done manually, the workload is huge, and the information published and the needs of the audience are not well matched. The network-type digital media information publishing system can better realize real-time updating of information, and monitor the display content and working state of the screen in real time, and can timely adjust the display content according to different audiences, thereby greatly improving the efficiency and effect of information publishing. This paper focuses on the low utilization rate of video image resources and the lack of performance of video image applications, and puts forward corresponding construction requirements. Detailed design of the multimedia image remote transmission system information database and other modules in the smart city. Based on the design of each functional module, image resource networking, sharing, exchange, and image big data multi-dimensional association fusion are realized. Realize the functions of monitoring and early warning, situation research and judgment, and visual data display of multimedia image remote transmission system in smart city. The experimental results show the effectiveness of the system design and implementation.

II. PROPOSED METHOD

A. Zigbee Communication Protocol

The ZigBee protocol is a low-power, low-speed, low-complexity short-range wireless networking technology. It is characterized by simple protocol, strong networking capability, and is widely used in various IoT application scenarios due to its low power consumption characteristics. It is irreplaceable compared to complex Bluetooth technology and application-limited power carrier technology. Advantages, so this paper also uses it as a basic protocol for monitoring network communication between nodes. The ZigBee protocol is a technical standard developed by the ZigBee Alliance based on IEEE 802.15.4. The IEEE 802.15.4 related specification work is the responsibility of the IEEE Wireless Personal Area Network (PAN) Working Group, which specifies the physical layer (PHY) and media access control (MAC) layers of the ZigBee protocol. The network layer (NWK) and application layer (APL) of the ZigBee protocol are standardized by the ZigBee Alliance.

The protocol design follows the layering principle, and each layer of the service entity provides services to the upper layer through the service access point (SAP) as an interface. The top layer of the ZigBee protocol stack consists of the application framework, ZigBee Device Object (ZDO) and Application Support (APS) sublayers. The NWK layer's task is to complete network address and device routing processing, including starting the network, assigning network addresses, adding and removing network devices, routing information, requesting security, and performing route discovery. The MAC layer provides reliable communication between two adjacent nodes, as well as assembly and decomposition of data packets. The physical layer implements specific data transceiving work and provides related interfaces to the physical transmission medium. ZigBee routers can forward data in the network, and it also supports device association functions. ZigBee routing devices exist only in mesh or tree networks, while star networks do not support routing. The ZigBee terminal has the fewest functions, and can only implement direct data transmission and transmission, and cannot forward any data.

In addition, ZigBee devices have two types of addresses, one is a 64-bit MAC address, which is set when the device is shipped from the factory, and generally cannot be modified at will, and the other is a 16-bit short address for communication between devices in the actual network. . There are usually two random and distributed address

allocation mechanisms for network addresses. In distributed address allocation, the coordinator acts as the first device, its address is 0x0000, and 0xFFFF is used for network message broadcast, which is not allocated to any device. The network address occupies a total of 2 bytes of space, so it theoretically has 65536 assignable short addresses, but 0x0000 and 0xFFFF have special purposes, and other addresses can be used for address assignment of routers and terminal devices. In tree network address allocation, the allocation form is determined by the network structure, which depends on three sets of values: the maximum depth of the network (Lm), the number of children owned by each father device (Cm), and the child of item 2. Several of the devices are routers (Rm). Through these three values, the address interval Cskip(d) between the router sub-devices of a parent device can be calculated, as in equation (1).

$$Cskip(d)=\begin{cases}1+Cm(Lm-d-1), if \quad Rm=1\\ \dfrac{1+Cm-Rm-Cm\times Rm^{Lm-d-1}}{1-Rm}, if .Rm\geq 1\end{cases} \qquad (1)$$

Equation (1) is used to calculate the address interval between each sub-router under the same parent device. The terminal address is calculated differently from the routing device, and its calculation formula is as shown in equation (2).

$$A_n = A_{parent} + Cskip(d)\times R_m + n \qquad (2)$$

B. Multimedia Image Transmission

Multimedia image transmission technology refers to the use of computers to comprehensively process various media information to establish logical connections and integrate them into the system. A technology that enables users to interact with computers in a variety of ways in a timely manner is also known as computer multimedia image transmission technology. Nowadays, multimedia image transmission technology will penetrate into all fields related to information. And the communication technology will be pushed to a new era of all-round communication, changing people's life, learning and working methods. Today's society is developing in the direction of "multimedia society". In multimedia multimedia image transmission technology, the media mainly refers to the use of computers to digitize various media information. They are integrated into the graphical interface to enable computers to display different media. This approach has dramatically changed the way we access information.

The development of multimedia image transmission technology has greatly changed the daily application of computers. It has transformed the old office instruments and proprietary tools into the most common daily tools in modern society. A large number of them are used for military command and training, public information consultation, commercial advertising and even family life and entertainment. Multimedia multimedia image transmission technology is a technology that utilizes multimedia information system to process and synthetically utilize multimedia information. Usually refers to the computer system can process images, data and other information, while multimedia computers can also comprehensively process video images, sound, animation and other information. It opens a new chapter in application. Multimedia has the following characteristics, including diversity of media, diversity of data formats, diversity of input/output devices and diversity of service methods. Interactivity refers to the whole process in which users can interfere with multimedia information processing and autonomous control, production and utilization. Integration includes integration of more than two types of data, integration of media information, integration of communication methods and presentation modes, and integration of hardware and software systems. The integration of current mode, software and hardware system.

Digital image and digital video image information are important components of multimedia information, and their data rank first in the amount of multimedia information. Therefore, the compression and coding technology of digital image and video image information has become one of the key technologies of multimedia image transmission. A large amount of data imposes a huge burden on the storage, access, processing and transmission of computers on communication lines. Redundant information can be used to compress it in various ways. Various coding techniques and related international standards have been developed in this multimedia image transmission technology. Using the high-speed running speed of the computer to process all kinds of information received can make up for the deficiency of intelligence in an interactive way. The next step we need to further develop is to continuously improve the intelligence of computers. Only by increasing the application of computers can we meet the needs of social development. Let the whole society develop at a high speed. Because some universities and research institutes are now constantly researching to adapt to the development of society and people's needs. The development of intelligence has greatly lightened the burden of human strength, which accords with the whole situation.

III. SMART CITY MULTIMEDIA IMAGE REMOTE TRANSMISSION SYSTEM REQUIREMENTS

C. Overall Design Ideas

When designing an open design system, fully consider the decoupling of hardware and software, the decoupling of applications and data, and adopt the industry's mainstream hardware platform, operating system platform, database platform and standard protocols to ensure infrastructure, data, algorithms, applications, etc. The opening of the capabilities of each layer. When designing the system, fully consider the feasibility and convenience of upgrading and expansion, and ensure that the system can be expanded as needed. Support for new types of IoT devices can be accessed and managed by adding drivers. The cluster architecture is adopted to support the flexible expansion of

computing and storage resources without interrupting services. Using algorithm orchestration technology, multiple single function algorithms are combined as needed to form new algorithm functions, and the expansion of algorithm capabilities is realized. When designing the system, fully consider the hardware and software equipment that meets the performance and functional requirements into the new architecture, and maximize the protection of the user's original investment. Support the integrated utilization of users' existing networking platforms through networked sharing services. Unified management of the user's existing storage resources is supported through a unified resource management scheduling platform. Through the multimedia transmission platform, it supports data management services such as registration management of user's existing business data.

D. Overall Architecture Design

The overall architecture of the smart city multimedia image remote transmission system mainly includes computing storage resource pool, video image information base, IoT sensing platform, image network sharing platform, and video image integrated application platform. The remote transmission of multimedia images in smart cities relies on the Internet of Things to integrate video image monitoring resources distributed in government functions, social areas, and the Internet, and to share, analyze, and manage the aggregated video image monitoring resources for various comprehensive applications. Industry applications provide multi-dimensional sensory data. The overall system architecture is shown in Figure 1.

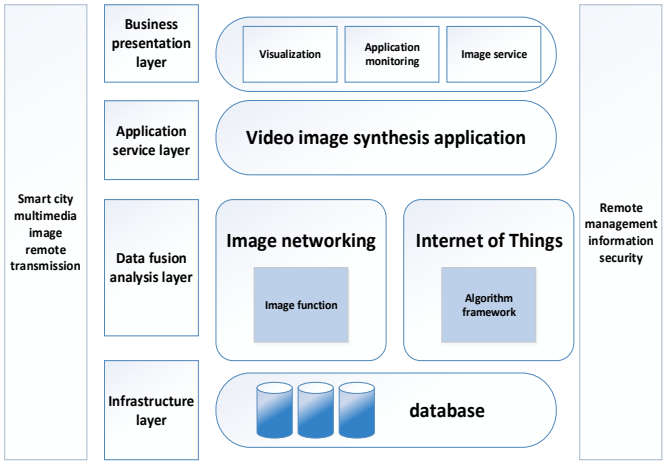

Figure 1. Overall architecture of a smart city multimedia image remote transmission system

The infrastructure layer infrastructure layer includes multiple resource pools such as computing, storage, and network to implement CPU cloudization, GPU pooling, and storage resource cloudization. And on-demand distribution and flexibility. By merging, de-duplicating, cleaning, and integrating the original sensing data, video image parsing data, business import data, and running log data, the potential relationship network between entities is further established, and the hidden tags of the entities are mined, and finally the basic library and the theme library are formed. . At the same time, lay a solid foundation for resource sharing and data sharing.

Data Fusion Analysis Layer The data fusion analysis layer mainly includes an image network sharing platform and an object-aware sensing platform. The image network sharing platform will be distributed in the image and video image resources of various government departments, social areas and the Internet. Through the platform/device docking method, the video image resources will be integrated, and the image resources will be shared through rights management and user management. The purpose of the exchange. The image network sharing platform provides video image resources for the object-aware platform and the video image integrated application platform.

IV. RESEARCH AND DESIGN OF MULTIMEDIA IMAGE REMOTE TRANSMISSION SYSTEM IN SMART CITY

Urban planning is the prediction and guidance for the future development of the city. The key point of smart city planning is to combine the economic, geographical, population, traffic history and current mass information of urban development, multimedia video signal encoding and decoding. The video image signal collected by the camera needs to be encoded, and encoded by the encoding chip according to the format required for transmission. The video image signals from other terminals also need to be decoded and then displayed on the display of the terminal. Communication function between the terminal and the control unit. The terminal and the control unit must, for example, accept the control signal sent by the other party and respond under certain protocols.

The service layer of the smart city multimedia image remote transmission platform includes the hardware platform and the software platform structure, shielding the difference, realizing the platform independence of the upper layer application, and improving the compatibility of the system. The platform service layer includes access services for encoding device access, storage device access and decoding devices, and provides services such as image on-demand services and media gateway services. The platform application layer is responsible for the creation, distribution, and management of permissions for image resources. Smooth docking and assignment of image resources. The platform application layer provides image preview and image resource management functions. The presentation layer provides customers with a variety of operational clients to meet the diverse operational experience of their customers. In the smart city multimedia image remote transmission system platform, the image network sharing platform mainly includes a social surface resource integration platform and a public security image networking platform.

A. Remote Monitoring Of Urban Traffic Operations

The smart city center system relies on the video networking sharing platform, the video image application platform, and the IoT sensing platform to connect the original and newly created video resources according to the unified standard, and realize the integration, sharing and exchange of video resources. Construct a visual urban operational status system that allows city managers to quickly and efficiently grasp the city's physical characteristics. At the same time, the city's comprehensive operational situation is shared with various departments to help them use video data more effectively. The realization functions of the smart city multimedia image remote transmission system system mainly include operation display and monitoring early warning, visual emergency command, video Huimin and so on. The implementation is shown in Figure 2.

The real-time situation of road traffic in urban operation is comprehensively displayed, and the traffic situation and congestion situation in urban area are displayed through the video and monitoring data provided by the road monitoring system. Monitor the operation status and passenger flow trend of ground bus, rail transit, taxi, bicycle, water bus, inter-provincial passenger transport, railway passenger flow, airport passenger flow, high-speed passenger flow, parking lot and so on, and realize classified early warning, timely grasp the operation status of various traffic industries and changes in transport situation, so as to provide different transport services. Coordination and command between modes provide support, and also provide security for traffic safety risk management and timely detection of incidents.

B. Intelligent Monitoring of Urban Tourist Scenic Spots

The analysis of tourist interest points captures the real-time face photos of tourists at the entrances and exits of various scenic spots, and records the tourists'playing time. According to the time of two snapshots, the time and interest of tourists in different age groups, gender and time were calculated. Through front-end perception equipment, collected information, through the analysis and mining of the back-end object-linked perception platform, visitors'gender, clothing color and other data can be extracted. Through the analysis of age groups, if more children come, scenic spots can develop parent-child tours, increase entertainment facilities and so on. If there are more elderly people, we can increase the relevant medical security measures. The image remote monitoring platform of tourist attractions is shown in Figure 3.

Through the front-end passenger flow, the face capture machine can carry out statistical analysis of the visitor number, maximum peak value, possession quantity and visitor behavior of the entire scenic spot and each tourist node, so as to understand the real-time statistics of the tourists in the scenic spot, and to carry out the number of scenic spots in the future for many days. It is predicted to do a good job of diversion and diversion of tourists in scenic spots in a timely manner. It can analyze the structure of the vehicle and extract not only the license plate, but also the brand name, sub-brand, body color and other contents of the vehicle. Through the statistical analysis of traffic flow, it is used to determine whether it is necessary to add parking lots or add parking facilities. Through the analysis of the source of the vehicle, it is used to judge whether the scenic spot needs to increase the corresponding living facilities such as hotels and restaurants. Through the statistical analysis of the vehicle brand, it is used to judge the purchasing power of the tourists, and it is convenient to adjust the commodity reserve in time.

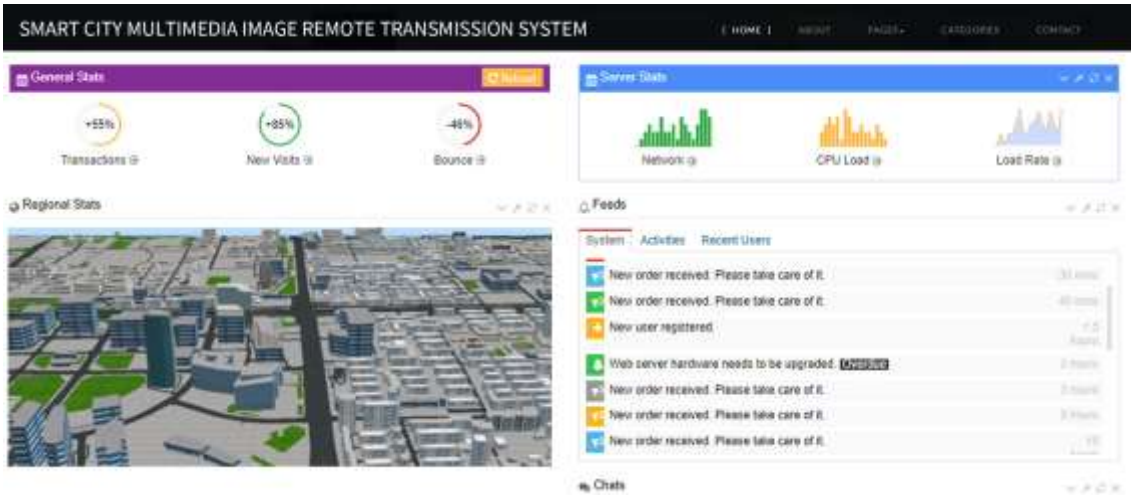

Figure 2. Urban road condition image monitoring

Figure 3. Schematic diagram of intelligent remote monitoring of urban tourist attractions

C. Application Evaluation of Multimedia Image Remote Transmission System in Smart City

Since the multimedia image remote transmission service in the smart city involves a wide range of fields, it follows a certain design idea in the performance evaluation of the multimedia image remote transmission service in the smart city. Firstly, the performance evaluation index system of multimedia image remote transmission service in smart city is selected, and the data is collected according to the constructed index system. Since the collected raw data is different due to different indicators, it is necessary to process the original data to standardize it. . The selection of fuzzy comprehensive evaluation model fully considers the characteristics of the multimedia image remote transmission service in smart city and the characteristics of the data. In the evaluation process, the fuzzy relation matrix is first constructed. Secondly, the core of the whole process determines the fuzzy weight. In this process, the first usage, then the entropy is introduced to correct, and the advantages of subjective and objective analysis are fully utilized to avoid the influence of subjective randomness on the evaluation results. Finally, combined with the concept of fuzzy mathematics, the comprehensive scores of each city are calculated, and the results are analyzed to provide countermeasures for the construction of multimedia image remote transmission services in smart cities. In accordance with the standards for the construction and management of the comprehensive management center, the integration of the comprehensive information network, the public security smart city multimedia image remote transmission network, the comprehensive treatment network, and the intelligent hotline information center integrated by the people's hotline will be completed. The weight evaluation of each indicator is shown in Figure 4.

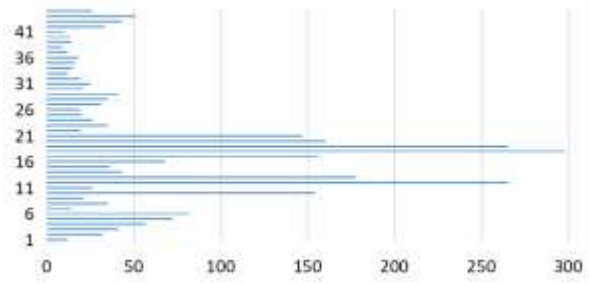

Figure 4. Evaluation of various indicators

D. Countermeasures For The Construction And Development Of Multimedia Image Remote Transmission Service In Smart Cities

Heavy coverage and light sharing is one of the outstanding problems in the construction of smart cities. Smart city information infrastructure is the underlying foundation for providing multimedia image remote transmission services in smart cities. Only by strengthening the construction of information infrastructure can we better integrate smart city information. . Improving the intelligence city information infrastructure service capabilities is mainly reflected in both hardware and software. In the process of building a smart city, hardware configurations of the same standard specifications should be selected as much as possible, mainly the construction of network infrastructure, servers, sensors, and autonomous terminals. The construction of smart infrastructure needs to focus on integrated use, and hardware devices have unified interconnection standards. Increase the integration foundation, avoid redundant construction, and provide quality services. We will vigorously promote the construction of cable broadband and wireless networks, encourage major network operators to expand the coverage of urban networks, and build a unified communication network to achieve the goal, accelerate the promotion of triple play, and achieve network interconnection. Smart cities generate massive amounts of data, and the sources of data vary. The nature and structure of data vary. Different data types have different forms of data storage. Therefore, in order to enable information fusion and sharing in smart cities, different storage is

required. Formal data is converted into a unified form, especially the unification and standardization of interfaces, data sources, and code management to provide a unified data interface between departments of different cities, realizing real-time access to data from different sources, making different cities and different Institutions and departments can conveniently access information and process information in a unified way, improve the level of multimedia image remote transmission services in smart cities, enable interconnection between cities, realize multi-source information fusion and sharing, reduce resource waste, and provide multimedia images in smart cities. The remote transport service provides the data foundation. Finally, the integrated management platform for multimedia image remote transmission services in smart cities develops a unified open access interface between citizens, governments, and developers. It can access platform services with multiple terminal channels, and developers can efficiently maintain and update information. Etc. Government managers effectively understand the needs of citizens, formulate management strategies, and truly realize the three-way interaction between government and enterprises, and carry out standardized treatment.

V. CONCLUSIONS

The smart city multimedia image remote transmission system is based on Internet technology, Internet of Things technology, satellite positioning technology and various sensor technologies, and realizes remote management and automatic management of urban transportation, tourism and other networks. As a carrier of the sensor information collection function, the monitoring node realizes the collection task of various environmental information, and realizes the function expansion of the existing monitoring and control system. The hardware part includes the design and manufacture of ZigBee technology and microcontroller chip, sensor module and fault detection module. The software part includes the design and implementation of the database, the implementation of the detection function and control flow, and the implementation of the management function module and the interaction module.

Smart city multimedia image remote transmission as the city's "eyes", providing a rich image resource for the city, image network sharing platform and cloud storage to achieve a large number of smart city multimedia image remote transmission access and storage; The platform extracts structured data from image resources, realizes intelligent collection, recognition and analysis of people, vehicles, objects, density and behavior information, enhances monitoring image value and big data retrieval efficiency, and integrates image data with informatized data.

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