Design and Implementation of Position Integrated Management System Based on 3D GIS and Internet of Things

Sen Shen(✉), Dengjian Fang, Min Li, and Shengzhi Yuan

College of Ordnance Engineering, Naval University of Engineering, Wuhan 430000, China
shenmumumu@126.com

Abstract. In order to solve the problem of backward and low efficiency of missile position's operation and management. The integrated management system based on the 3D GIS platform was developed by using the technical advantages of 3D GIS and Internet of Things technology in data management, visualization and spatial analysis, combined with the needs of intelligent operation management of positions. The three-dimensional modeling data of the position and the data of various management systems are used comprehensively to realize the functions of position visualization monitoring, under the C/S, B/S mixed mode architecture. The operational level of position equipment has been improved, and the visualization and intelligent comprehensive management of positions have been realized.

Keywords: Missile position · GIS · Internet of Things · Integrated management system

1 Introduction

Missile position is an important guarantee for combat preparation, storage and maintenance of missile weapon system, which is of great strategic significance and has high maintenance requirements. Therefore, it is necessary to ensure that the missile position is in a good operation state in real time, and that no damage to core facilities and equipment can occur, resulting in major faults such as loss of power guarantee, environmental instability and safety control.

In recent years, intelligent building12, intelligent security 3 and equipment automation monitoring and other technologies have been rapidly developed, for the position of security and equipment monitoring has also been applied and developed, basically reached the design goal, improve the position safety management and operation level. However, it is also faced with problems such as the visualization of4 of total factor resources in the position, the lack of independent work of various subsystems, the lack of effective geographic information data support for system operation, the inability to carry out emergency command and auxiliary decision-making, and the low operation efficiency. Therefore, it is necessary to design a set of positions based on 3D GIS

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and Internet of things integrated management platform 56, realize the total elements of information visualization, combined with the existing position management system, realize the combination of geographic information data and site business, realize the total elements of visual monitoring, equipment guarantee all accurate control.

As an important tool, technology, and discipline for obtaining, organizing, analyzing, and managing geospatial data, geographic Information system (GIS) has received wide attention and rapid development in recent years due to its powerful data management, spatial analysis, and visual display function7.

3D GIS is widely used in forestry, water conservancy, national defense, transportation, urban norms and other fields. “Smart city” based on digital city, which fully combines the Internet of things, has been widely used in first-tier cities in China. Compared to 2D GIS, 3D GIS can better show the layout and composition of the interior buildings, rooms, pipes, blast doors, ventilation and air-conditioning systems, power supply and distribution systems, water supply and drainage systems. Through the above facilities and access to the Internet of things system equipment, 3D GIS can better achieve the intelligent and visual position.

Therefore, based on the powerful 2D/3D engine and rich interface services of 3D GIS platform, combined with the requirements of integrated position management, the research and application of the integrated position management system platform based on GIS platform was carried out to improve the level of automation and intelligence of the position.

2 System Design

2.1 Overall Functional Requirements

Through the analysis of the position support process, combining with the characteristics of equipment support and the status quo of the position, relying on the position support business, based on the platform function positioning, after fully investigating the position support needs, the function of the position comprehensive management platform is realized through more than 20 functional modules with three functions. Overall functional requirements of the system are shown in Fig. 1.

2.2 Overall Composition Structure

The construction content of GIS-based position integrated management system mainly includes five parts: 3D data collection and modeling8, integrated integrated management platform development, position security control subsystem, equipment support support subsystem and emergency plan deduction subsystem.

2.3 System Application Deployment Mode

The overall logic architecture of the position 3D integrated management system takes the open 3D space database construction as the application core, and the server-side application is deployed according to the mode of B/S architecture9. The server side

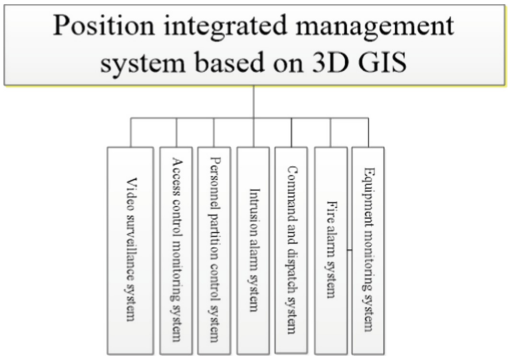

Fig. 1. Overall functional requirements of the system

mainly consists of security gateway, application server, data server, disk array and related network equipment (such as switches, standard cabinets, UPS, etc.). The application server and data server adopt a dual-machine thermal backup system to improve the system reliability.

According to the functional needs, the customer service terminal realizes the access control by majors and positions through role-based authority control. The integrated situation of the position integrated management system is displayed on the large screen monitor to provide an accurate comprehensive situation display for the position operation and management.

3 System Integration Scheme Design

3.1 Position Security Monitoring Management System Integration

The existing business information system of the position mainly includes: video surveillance system, access control surveillance system, personnel zoning control system, intrusion alarm system, command and dispatch system, fire alarm system, equipment monitoring system, radiation monitoring and critical alarm system. By developing the corresponding web service interface, the position integrated management system integrates the position business information system, implements the situation display in two-dimensional and three-dimensional scenes, and constitutes the position security monitoring and management sub-system of the position integrated management platform.

1) Video surveillance system integration

The position integrated management system platform obtains the video flow data of the hard disk video recorder through the video web control, so as to realize the video surveillance, video switching, video playback and cloud head control. The functions of real-time video surveillance, cloud head control and video playback can be realized in 2-D and 3-D scenes.

2) Access control monitoring system integration

The position integrated management system calls the access control system by integrating the intermediate key through access control monitoring. The working principle of access control monitoring integration intermediate key is as follows: first, access control controller and access control database access obtain door switch status display, remote door opening, access records, and then second developed into a web service to provide the position integrated management system platform.

3) Personnel partition control system integration

The position integrated management system realizes the call of the personnel partition control system through the personnel partition control. The working principle of the middle key is as follows: first, access the system database through the secondary development of the SDK system, obtain the partition access records, and other data, and then develop into a web service to provide the position integrated management system platform.

4) Intrusion alarm system integration

The position integrated management system calls the intrusion alarm system through the intrusion alarm integration intermediate key. The working principle is as follows: first, through access to the SDK secondary development of the intrusion alarm alarm host, obtain the host status, alarm records, control deployment and other operations, and then develop into a web service to provide the position integrated management system platform.

5) Command and dispatch system

The system uses program-controlled telephone access equipment to connect the digital program-controlled scheduling host to the position LAN system, and pager and control the terminal telephone equipment through the communication network integration module. The position integrated management platform obtains data by calling the web service interface provided by the digital program control scheduling host, so as to realize the command and scheduling of the whole position.

6) Fire alarm system

Position integrated management system through the fire alarm integrated intermediate key to realize the fire alarm system call. The working principle is as follows: first, after secondary development of the fire alarm system API, access to the fire alarm host, obtain the alarm records, and then secondary development into web services to provide the position integrated management system platform.

7) Equipment monitoring system

The position integrated management system realizes the call to the equipment monitoring system through the equipment monitoring integrated middle key. The working principle is as follows: Firstly, the OPC Client is connected to the device monitoring system server to obtain the device monitoring system data, and then it is developed into a web service and provided to the position integrated management system platform.

Fig. 2. 2D-3D situation integration

4 Application and Implementation

4.1 Situation Integration

Two-dimensional situation integration can effectively display the whole site from the macro scale, and the integration of three-dimensional scene can reproduce the position from a more realistic micro perspective. By constructing a complete 3D model library, build for all equipment and facilities in the position [10]; provide the import function of the model and edit the position and orientation in the 3D scene; and determine the specific location of interest and guide route, which can be located quickly in the specific application. Combining the needs of later 3D model management, provide layered display and management functions for certain data switch display; the system provides standard space analysis tools for distance, area, horizon analysis and visual analysis based on 3D scene; and supports Oculus stereo helmet for emerging wearable equipment technology, providing a more real immersive experience.

4.2 Control Guarantee

The existing business information system of the position mainly includes: video surveillance system, access control monitoring system, personnel zoning management and control system, intrusion alarm system, command and dispatch system, fire alarm system, and equipment monitoring system. By developing the corresponding web service interface, the intelligent management and control platform integrates the position business information system, implements the situation display in 2-D and 3-D scenes, and constitutes the security management and control subsystem of the intelligent management and control platform.

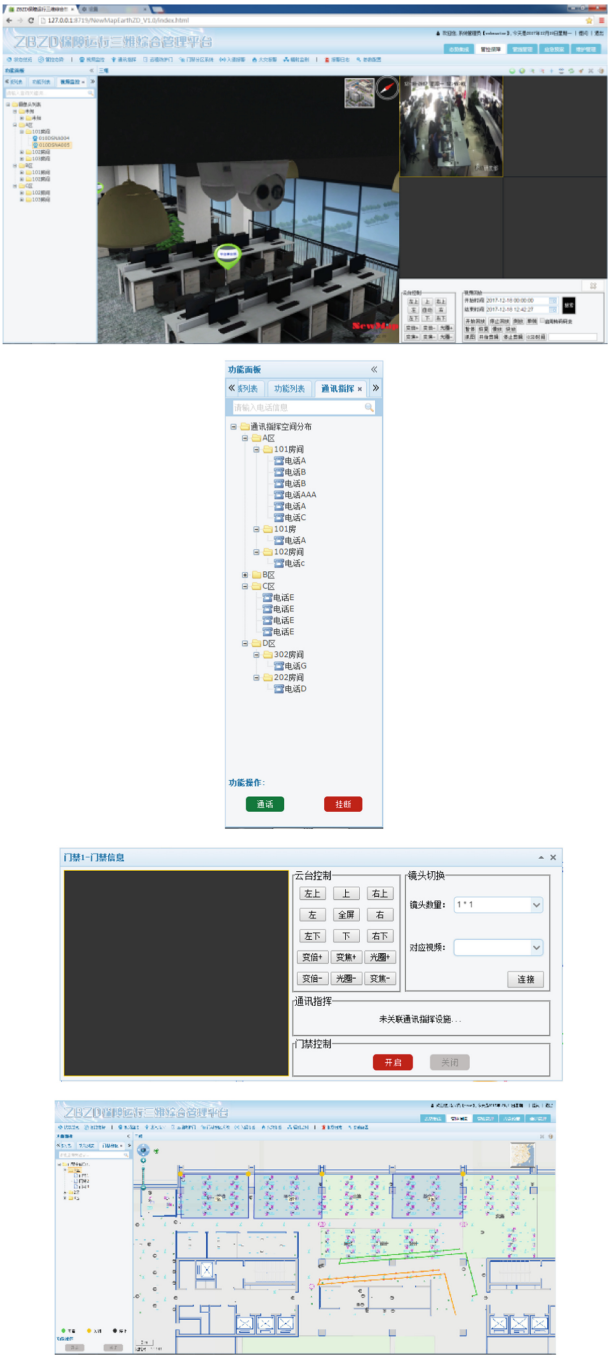

Fig. 3. Security control system

5 Conclusion

Combined with the integrated management requirements of missile position, by making full use of the powerful geographic information data processing capability of the 3D GIS platform, the paper developed an integrated management system based on 3D GIS platform and the Internet of things. The deployment mode combining C/S and B/S is adopted to carry out targeted data collection, fusion and display research, and realize the business situation integration based on the position geographic accurate data. It provides support for position visualization and intelligent comprehensive management and improves the level of position operation support.

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