Road traffic security and maintenance system based on refined urban management

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Abstract. In the existing road maintenance and security data collection process, professionals have professional equipment to regularly collect and update, which is a large workload and time-consuming. Based on this, a smart mobile terminal and other equipment are used to improve data collection efficiency. It simplifies the spatial matching process of road auxiliary facilities on high-scoring images. This system improves the collection efficiency of road security and maintenance data through software development. At the same time, a multi-temporal high-scoring image database, roads and auxiliary facilities database are formed to form a complete set. The technical process and specifications of high-scoring images and road data collection, through the new data collection and management mode, effectively meet the processes and specifications of data production requirements of grass-roots workers, effectively reducing the high cost of manual data collection.

1. Background of the project
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With the rapid development of urban construction, the road network under management is getting larger and larger, and the amount of information on road and bridge maintenance is also increasing day by day. Road maintenance management has become an important task in the field of highway construction in China, and different degrees of damage to urban roads have been discovered in a timely manner. And to effectively repair them, it is beneficial to improve the economic and social benefits of urban roads. In the existing road maintenance and security data collection process, professionals have professional equipment to regularly collect and update, which has a large workload and takes a long time. Relying solely on government departments for spatial data collection and management is often time-consuming and labor-intensive, and it is also limited in terms of timeliness, breadth, and depth. Based on the above background, this work designs a set of high-scoring image data for road traffic safety Data acquisition, review and management system for guarantee, maintenance and care. The system includes the following three parts: (1) Data acquisition system: high-temporal high-scoring image data, data feedback from mobile smart terminals, and data import from existing systems (2) data application server: a series of operations such as caching, processing, storing, updating, and synchronizing the collected data; (3) data sharing Platform: storing data in real time to update the display, to provide a stable support for high data users.
2. Overall scheme design

This work is dedicated to building a road traffic security and maintenance system based on high-scoring remote sensing technology. A complete data collection system is designed. It starts from the three aspects of users, existing systems and satellite information, and realizes all aspects of road traffic data collection. Constructed a data application server, through the application integration of data collection terminals and high-scoring image data, judged and analyzed the approximate changes in roads and auxiliary facilities, and processed the data in real time and reported back; established a data sharing platform. Through integrated data sharing, users can quickly and easily understand traffic and road information, and provide users with stable high-scoring data support.

2.1. Data acquisition module design

In order to comprehensively collect road traffic data information, the three modes of data acquisition from high-scoring remote sensing image data, data feedback from smart terminals, and data import from existing systems are used to collect data:

2.1.1. High-score remote sensing image data acquisition

High-resolution remote sensing data can quickly provide reliable information on terrain, geomorphology, geological structure, and feature discrimination. It is targeted at highways with large influence, wide coverage, and heavy engineering, and can be a functional zoning map in highway planning applications. Production, geological survey, land occupation analysis, and construction drawing making provide basic, intuitive, and rich information. By collecting and summarizing the high-scoring data provided by the Hubei Center of the above high-scoring, as the high-scoring remote sensing image data of this system source.

![Figure 1. 1-2 2m image of Tianmen, Hubei.](image-url)

2.1.2. Data feedback from smart terminals

The intelligent terminal data acquisition system integrates GPS / BeiDou / Base Station positioning functions with functions such as taking pictures, photography, recording, and text input, allowing end users to integrate location, time, and other information when collecting road security and maintenance facility data. Data and locate it on high-scoring image data in real time, simplifying the manual position matching process in the past.

After the collection is completed, it is directly imported into the road security and maintenance facility management system through special data import software. During the data collection process, high-scoring image data and existing road maintenance and security data need to be browsed and queried at any time. In order to improve the operation efficiency of the data collection system and reduce network traffic, you can perform high-scoring image data and road facility data in the designated work area. Data cache.

With the support of rich high-scoring image data, the masses can browse at any time through smart terminals such as mobile phones City high-scoring image data, timely discovery of city changes, and
comparison, photographing, positioning, and uploading at any time, can greatly extend the reach of urban management, and is a useful exploration of the refined urban management model.

2.1.3. Data Import of Existing System The new system needs to support and simplify the daily routine of road traffic security facilities and roads on the basis of routine display, query, measurement, import and export of business data, viewing of historical data, and editing of specific business data on vector and images. The maintenance data is entered and updated, and data can be exchanged with the original two systems to form a complement. At the same time, in order to facilitate user maintenance and management and security requirements, the new system needs to support both stand-alone and networked operation modes. The new system can quickly and flexibly exchange data with these two systems without changing the use of the existing system, which effectively meets the users' actual work needs, so the user is easy to accept, and the resistance to promotion and use is small.

2.2. Data Application Server Design

This system uses a self-developed GIS engine, VQGIS, to complete the development of road security and maintenance management systems. VQGIS is a cross-platform GIS software based on QT architecture, which can run on multiple platforms such as Windows and Linux, supporting most the spatial data source can be flexibly loaded with required function plug-ins as required, and the system runs efficiently.

In addition to being able to import the space exchange data of the existing system, the road security and maintenance system is also responsible for importing the data collected by the intelligent terminal into this system, and automatically performs location matching, editing, querying, analysis, comparison and data on the high-scoring image data. Synchronized, and can be aggregated and reported to meet the requirements of superior departments for road collection data.

![Figure 2. Overall architecture of the data application server.](image)

In the key areas of the road, through the 3D modeling and display module embedded in vqgis, 3D modeling and measurement of the road are performed, and the conditions of the road and ancillary facilities are displayed intuitively in the 3D real environment, and specific requirements of measurement and communication can be performed. Visual analysis and cross-sectional analysis meet the road traffic planning requirements of small and medium-sized cities and counties.

The standard services such as OGC provided by the software in this project can publish high-scoring image data and road collection data to related departments as a service. In addition to storing high-scoring image data in the form of files, it also uses the image pyramid in the database. It is stored in a format to meet the purpose of quick access and cache data extraction based on spatial range. Through the comparison of multi-temporal high-scoring image data, you can judge and analyze the approximate degree of change of roads and auxiliary facilities in management, combined with road traffic conditions. And other information, you can formulate a reasonable and scientific work plan for the content, scope and frequency of data collection and update, reducing the blindness of data collection and update.
2.3. Data Application Server Design
The road traffic security and maintenance system based on high-scoring remote sensing technology uses a visual design based on GIS (Geographic Information System) to provide government departments and users with a global, intuitive, and real-time information display method, which integrates city high-scoring image data and real-time road condition information. User photo uploading, government release of road maintenance news, personal center and other functions. The data sharing platform provides information services and decision support for government departments in road traffic, public safety and other fields, and forms a set of data that effectively meets the needs of grass-roots workers. The processes and specifications required for production; it also provides users with real-time road conditions information, while mobilizing users’ enthusiasm for participating in refined urban management.

3. Organization of the Text
This project is a gis system based on high-scoring image data collection of data collection, data processing, data aggregation and sharing. It involves not many types of spatial data, simple business processes, urgent user needs and a certain gis application foundation. User base, high-scoring image data support, technology implementation and application promotion are all highly feasible.

(1) Users have a good application foundation and system improvement requirements (2) Powerful high-scoring image data acquisition and production capabilities (3) The technology used has the characteristics of high development efficiency, simple, mature and reliable.

4. Conclusion
With the support of high-scoring data, individual users are involved in the process. The professional department completes the collection and update of the main data, and the individual users supplement and improve it in a timely manner. The professional department then refines and mines to form a wide coverage. Various forms of data sets provide new ideas for future spatial data collection and application. Realize road data collection systems based on mobile smart terminals based on high-scoring image data; high-scoring image database based on multi-temporal and road security and maintenance facilities Construction of database; showing the distribution of roads and ancillary facilities with the support of high-scoring images, and the ability to carry out specific measurement, pass-through analysis, and cross-section analysis to meet the requirements of road traffic planning for small and medium-sized cities and counties; for road security and maintenance facilities The database builds a universal data service. It improves the efficiency of data collection and simplifies the spatial matching process of road auxiliary facilities on high-scoring images.

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