

Study of Comprehensive Assessment of Traffic Safety and Decision-Making Support System Based on the Inter-Departmental Data Requirements

Yanhui Wang, Shuguang Tian, and Chenchen Zhang

Abstract—Due to the analysis and research of the current Traffic Safety Management, and the conduction of the public security department, transportation department conducted field research, we have already defined the traffic safety-related data needs of various departments, and put forward to build the comprehensive assessment of traffic safety and decision-making support system based on the inter-departmental data requirements, therefore take full advantage of the traffic safety information provided by all departments, and improve our road safety management and service level.

Index Terms—Inter-departmental, data requirements, traffic safety, comprehensive assessment and decision-making, system.

I. INTRODUCTION

The national traffic safety management is facing with the issue of scattered application systems, not fully integrated data resources, shortage of in-depth comprehensive analysis and application and so on, therefore results into the lack of effective means of support of macroeconomic policy-making and operational management in the traffic safety management field.

To solve the above problems, this article is based on the analysis of the typical department traffic safety-related data[1], then utilize the integrated traffic safety information resources, carry out the technological research of comprehensive analysis of the traffic safety information and traffic accident causes, state evaluation of traffic safety, tendentious analysis of traffic safety and so on, therefore propose to build an inter-departmental traffic safety assessment and decision-making support system, which includes regional traffic safety evaluation subsystem, an inter-departmental traffic safety decision support subsystem, some so forth. The system is fully integrated with inter-departmental traffic safety information resources, mining regularity content of the traffic safety which embedded in the traffic safety information resources, therefore take measures to reduce accidents, analyze the traffic safety tendency, finally, providing effective means of decision-making, thereby greatly enhancing the road safety management and service level.

II. ANALYSIS OF INTER-DEPARTMENTAL DATA REQUIREMENTS

“Department” refers specifically to the various types of agencies, units and enterprises sharing traffic safety-related information and providing the conditions and mechanisms. “inter-department” refers specifically to the traffic safety information from two or more different “departments”, or the share and service of traffic safety information cover two or more different “departments”.

Due to the field Research of many units from Guangxi, Guangdong, Jiangsu, Hebei, Liaoning, Tianjin, Shanxi and so on, and defined the service object of the system (Ministry of Public Security, Ministry of Transport and the general public) and inter-departmental data and functional requirements.

Through the in-depth analysis of research data, and from the information interaction level combined with the information deep use level, it could be estimated that the current road traffic management in China exists practical problems such as poor information, the mechanism is unknown and different, institutional and technological backwardness[2].

Based on the above, this study has summarized and analyzed of the data exchange needs within road management departments as follows:

III. FOUNDATION OF SYSTEM FUNCTIONAL FRAMEWORK

Based on the research of a number of departments, this article mainly summarized the systematic function from 8 aspects as followings:

A. Condition Assessment Of Road Traffic Safety

Through the analysis, extraction and fusion of the traffic safety status information associated with the transport infrastructure, means of transportation and transport organization process, tracking its evolutionary locus, thus realize dynamic assessment and situation analysis of regional traffic safety, and finally provide the multi-level data and scientific analysis for the traffic safety management.

B. State Prediction of Road Traffic Safety

By the analysis of continuous traffic security state assessment results on the same line or regional, the system may achieve the traffic safety tendencies forecast of the line or the region over a period of time in the future.

C. Evaluation of Road Traffic Safety Facilities

Through the establishment of the evaluation index system

Manuscript received July 30, 2012; revised September 2, 2012.

The authors are with School of Traffic and Transportation Beijing Jiaotong University Beijing, 100044, China (e-mail: zhxywyh@126.com, tsg880917@126.com, huanqinchenchen@126.com).

of the effect of road traffic safety facilities, the system could realize the evaluation of the safety effects of the existing road traffic safety facilities.

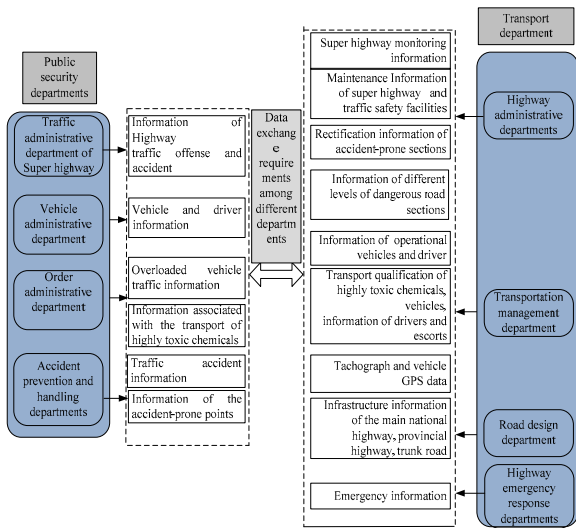


Fig. 1. Data exchange needs among road traffic management department

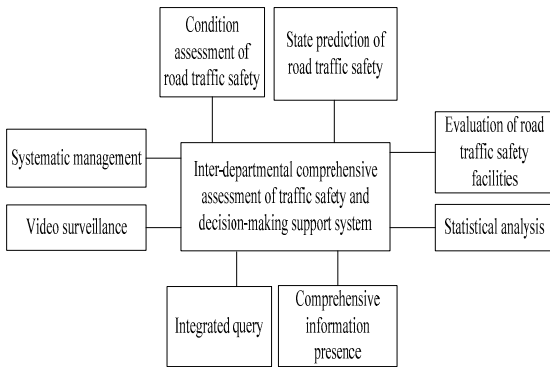


Fig. 2. System functional requirements

D. Comprehensive Information Presence

By utilizing the information display technology, the system could display the comprehensive information, such as road area and line information, security state assessment results, road safety facilities and their effects, traffic control information, traffic information, accident information, service information and so on.

E. Integrated Query

The system can provide users with real-time and historical information query of transport vehicle information, accident information.

F. Statistical Analysis

Based on the road traffic safety data collection and presentation, the system should make a further statistics and analysis of these data to achieve deep-seated use, therefore provide convincing data to support the management of traffic safety.

G. Video Surveillance

The system can call external video interface and achieve real-time video surveillance capabilities for road transport.

H. Systematic Management

The systems can achieve on their own fast, efficient management.

IV. SYSTEM RESEARCH AND DEVELOPMENT TECHNOLOGY ROADMAP SYSTEMATIC FRAMEWORK

A. System Development Targets

In terms of design, based on the integration and integration of the typical department of traffic safety-related data, the inter-departmental traffic safety assessment and decision-making support systems take advantage of the traffic safety information resources, carry out traffic safety visualization and expression of temporal and spatial match, tendentious statistical analysis of traffic safety, the study of safety evaluation of technical research facilities and effect of technical means, the model of state assessment of road safety and evaluation of road safety measures and effect of technical means, thus provide the foundation for accident classification and comprehensive prevention, decision support for government departments to provide safe management.

In terms of application, take inter-departmental traffic safety assessment and decision-making support system as the platform, characterized by inter-departmental information sharing, regard comprehensive analysis show as the core, relying on computer technology, network and communication technologies, GIS and other means; follow the principle of function block, information to be consolidated, integration. On the basis of the data needs from public security departments and transportation departments, the research should take all the information from the social sources, the Ministry of Public Security sources, and the transport sector sources into account, to complete and deal with the functionality demonstrated by the integration and analysis[3].

B. System Research and Development Technology Roadmap

The development of inter-departmental traffic safety assessment and decision-making support systems mainly use the B/S mode, combined with geographic information systems to achieve the perfect combination of spatial data and attribute data, eventually achieve the bidirectional operation of maps to attributes and attributes to maps. From the technical architecture angle, using the most advanced technologies such as AJAX, FLEX, combined with Java technology, Spring, Struts, the Hibernate and Oracle 10g and other technologies[4].

System research and development technology roadmap are as follows:

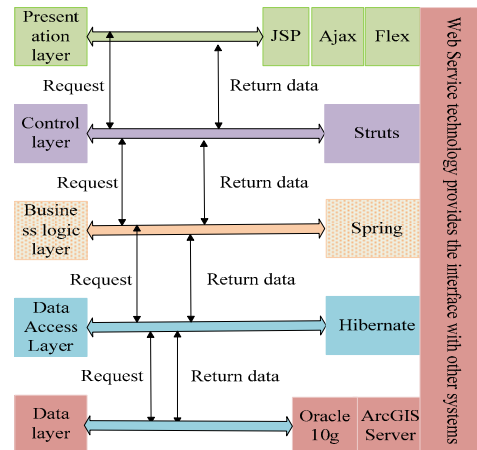


Fig. 3. Systematic technology roadmap

C. System Logical Structure

The logical structure of the system is as following:

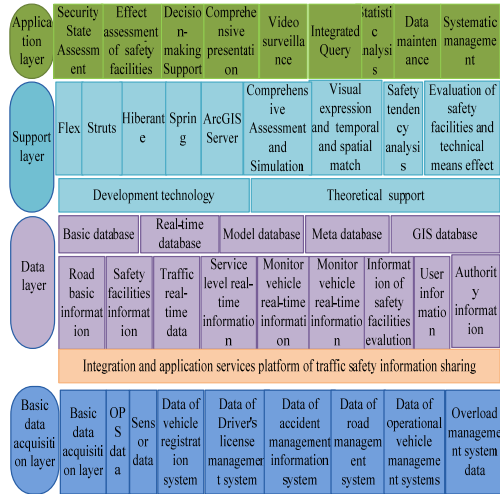


Fig. 4. System logical structure

1) Basic data acquisition layer

The data are mainly from GPS data, monitoring data collected from sensor network which includes various sensors and the information of existing systems from the public security department and the transport sector.

2) Integration and application services platform of traffic safety information sharing

Based on the data collected as above, the platform would filter, integrate and convert these data, and organize them in a way that the system could handle with, eventually import these data into the databases of the system data layer.

3) Data layer

Each database in the data layer is responsible for storing the data associated with the inter-departmental traffic safety assessment and decision-making support, and provides support for the latter part of data mining.

4) Support layer

Supported by the traffic safety comprehensive assessment and simulation, visualization expression and temporal and spatial match, the supporting layer, analysis of traffic accidents cause and traffic safety tendency, evaluation of safety facilities and technical means effect, the support layer integrates various kinds of development technologies, such as Flex, Struts, Hibernate, Spring,

ArcGIS Server and so on, hence obtain the information fusion and integration of the monitoring data, and complete critical business logic implementation of the system.

5) Application layer

The application layer mainly implements the application in different fields, such as traffic safety status assessment, evaluation of the safety facilities effect, inter-departmental traffic safety decision-making support, composite display of a variety of data, video surveillance, integrated query, statistical analysis, data maintenance and system management and some so forth.

V. CONCLUSION

Relying on the national road traffic safety science and technology action plan, this study has put forward the comprehensive assessment of traffic safety and decision-making support system based on the inter-departmental data requirements after practical investigation and acquaintance of the need of the inter-department data exchange. Guided by the systematic research technology roadmap, with the understanding of systematic research and development goals, overall functional demands and logical structures and so on, ultimately achieve the development of the whole system.

ACKNOWLEDGMENT

This work was supported by grants from the National Key Technology R&D Program in the 11th Five year Plan —Traffic Safety Information Integration, Analysis, Building Technology and Application of the Platform || (NO.2009BAG13A01)

REFERENCES

- [1] P. Metal, eds. "The world report on road traffic injury prevention[R].Geneva," *World Health Organization*, 2004.
- [2] Z. Chenchen, W. Yanhui, J. Limin, "Evaluation method of regional traffic safety condition based on the inter-department information," *Chinese security science journal*, 2010, vol. 10, pp. 152-158
- [3] S. Xuming, "Research of Super Highway traffic safety evaluation system based on the inter-department information," Beijing jiao tong university master's thesis, 2011.
- [4] L. Shubin, L. Yong, X. Zhaoxia, Z. Xiaobo, H. Dahe, D. Wenxiu. "The urban traffic control system design and development based on the prediction," *Logistics technology*, vol. 12, 2009.