Chapter 28
Design of Intelligent Transportation System Supported by New Generation Wireless Communication Technology

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ABSTRACT

The development of Intelligent Transportation System (ITS) will transition into a next level development of variously new requirements coupled with the new generation wireless communication technology. In this paper, the process-oriented structured system analysis is extended on the existing intelligent transportation architecture to establish an intelligent transportation system based on the new generation wireless communication technology, and further in-depth analysis will be performed to discuss the required additional capabilities of network, services and application support in the view of user, function, information, connection and communication. In order to comprehensively understand the technical characteristics and development of the new generation intelligent transportation system, it lays a foundation for implementation of the new generation ITS technology.

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INTRODUCTION

The intelligent transportation is vigorously and rapidly developing in China and remarkable results have been achieved in a wide array of applications such as electronic toll collection (ETC), road network monitoring system, traffic guidance system, traffic node monitoring system and travel service system. The coverage and technical means of these systems are also continuously improved. However, all these rapidly developing systems intend to solve certain prominent problems. The interconnection between systems, integration of multiple systems and application of shared platform have not been achieved yet, severely restricting the future development of intelligent transportation. The domestic and foreign scholars generally believe that based on existing road network scale, the transportation efficiency can only be improved by using the modern technology and communication technology. Currently, the scientific and technological level, development speed and development orientation of the new generation wireless communication will make a significant change in transportation service mode, transportation operation mode as well as structure and architecture of the intelligent transportation system (Wang, 2012a; Zhang, 2011; Wang, 2012b).

This study is mainly to establish an intelligent transportation system supported by the new generation wireless communication technology based on various public communication networks and dedicated transportation networks according to the requirements for intelligent transportation development. The study deeply analyzes and constructs the users, functions and components of the system. Information among subsystems and system communication interfaces to ensure that the new generation wireless communication technology develops under a unified architecture, establish a coordination relationship of human-vehicle-route-environment based on research of multiple key technologies and its implementation in the process of industrialization. This also builds an all-dimensional, stereoscopic and real-time integrated transportation network.

THEORY AND METHOD

Principle of Structured Method for ITS Architecture

There are two basic international methods for development of ITS architecture: structural analysis method and object-oriented analysis method (The National ITS Architecture, 2001). No method is superior to the other, and both of them have their own characteristics. The structural analysis method is simple, clear and relatively mature. A complete set of specifications and standards has been generated for the method. The process-oriented analysis thought for the structured method relatively accords with the thinking habit of people and tends to be easily understood and accepted. Therefore, the structural analysis method is adopted in the study of intelligent transportation system supported by the new generation wireless communication technology (Jiang & Yang, 1999; ITS America, 1994).

The basic ideas of structural analysis method can be summarized as analytical hierarchy, functional modularization and correlation. The core of the method is top-down layer-by-layer decomposition and abstraction. The analysis procedures consist of three stages: requirements analysis, system model and physical model. The process of system analysis and construction is progressively described in such three