

Intelligent Management System of Vehicle Violation Based on Electronic License

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Abstract—Traditional vehicle management system is based on metal plate mainly identified by the video and image processing techniques which are low accuracy and less efficiency. However based on RFID technology, electronic license has the unique factory curing ID number and the vehicle physical binding, making it incomparable anti-counterfeiting. Here the design scheme of the whole system including database, detecting processing, and collision algorithm are discussed. Then the prototype of the proposed system is presented, and effectively solves the violation management and identification problem.

Keywords—RFID; electronic license; mobile internet electronic; intelligent management system

I. INTRODUCTION

Radio Frequency Identification (RFID) technology originated from the 1990s, went through three stages, electromagnetic induction or electromagnetic propagation mode, non-contact identification of the target tracking and two-way data communication of the new automatic identification technology[1].

With the increasing application of radio frequency identification technology, electronic identification is appeared in automatic vehicle identification [2]. It can be set for two-way communication path between the inlet passage of the reader device in order to achieve the purpose of the electric vehicle target identification and data exchange[3]. Electronic license system includes a database server, the card issuing terminals, terminal management, and display terminals, and is helpful for automatic plate detection by electronic vehicle license, identification, access control and information management, and other related functions[4]. Electronic license is stored in the vehicle identification database, which can only be accessed and operated by an authorized RFID readers[5]. The transport corridors set up monitoring station connected with a central server via WLAN and Police linked with PDA by network security professionals [6].

Toll and remote real-time monitoring, vehicle safety inspection and intelligent traffic management can help solve the car monitoring, and other functions to improve the traffic situation[7]. In this paper, this problem is primarily based.

II. DESIGN SYSTEM ANALYSES

Because vehicle has their own unique electronic identification, corresponding label system and database should be developed with vehicle electronic information management

to record basic information of all vehicles. RFID readers can be placed in each city traffic junctions to read the traffic data and transmit them to the central processor via ZigBee network. Processors can determine whether the vehicle is illegal or not by query the database of vehicle electronic information management. If a vehicle is illegal, the alarm equipment bounded together with readers would alarm the law enforcement officers nearby.

By corresponding algorithm design, this system monitor whether a vehicle entering the monitored area and whether it is violated. In the case of a car, it is gonging to generate the illegal recording, uploading them to the central control subsystem, gathering other illegal information, and providing a basis for illegal punishment.

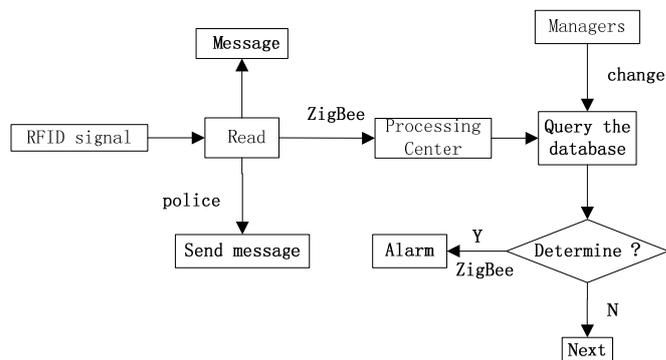


FIGURE I. SYSTEM SCHEME.

III. SYSTEM ANALYSIS AND DESIGN MODULES

A. Database Design

The system needs business process analysis tool to establish a database table for the system to save various data, as shown in Table 1.

TABLE I. BASIC SYSTEM TABLE.

Name	Explanation
U_Panel	User Control Panel
U_AddPanel	User additional control panel
U_Groups	User Groups
U_Users	User
U_UserAttr	User Properties
U_System	The basic properties of the system
U_LoginSet	User login settings
U_UseLogin	User login status table
U_UpFileSet	Upload file settings User Group
C_Unit	Vehicle personnel affiliations table
C_Chauffeur	Vehicles person table
C_CarInfo	Vehicle Information Sheet
C_Violation	Vehicle illegal information table
C_Accident	Vehicle Accident Information Sheet
C_YAuditing	Vehicles examined table

B. Detection Processing System

The handheld system terminals is used for transmitting the data from UHF RFID reader device by 51 processors, then the processors connected with the microcontroller and ZigBee wireless communication module can communicate with the processing center, as shown in Fig 2.

C. Red light Violation Monitoring

In this unit when the red light on, the readers installed in road intersection are used to judge whether a car in the monitoring area is illegal. If there is an illegal car, then it determine whether it is a normal driving, such as turn right; if it is not normal driving, the vehicle is recorded as an electronic tag ID number, and other relevant information is also collected, such as time, place, names and other road intersections. Finally, recorded electronic tag's ID number, and other illegal information will be precluding to the data collection center.

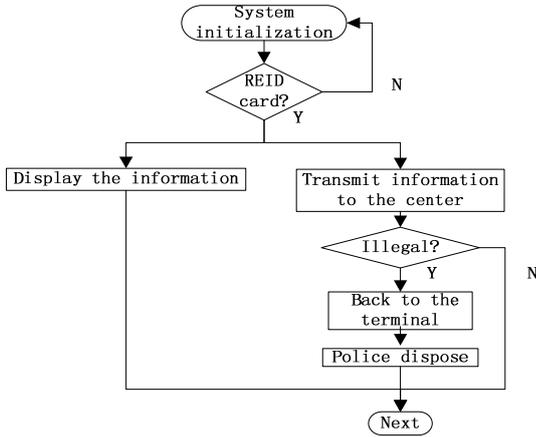


FIGURE II. FLOWCHART OF HANDHELD TERMINAL.

D. Monitoring Illegal Parking

Illegal parking phenomenon often occurs in the city, which is one of the important causes of urban traffic congestion. The basic principle is to monitor illegal parking is that the reader is reasonably set to monitor in the prohibit parking area defined by traffic management departments.

E. Collision Algorithm Descriptions

The system uses a binary searching algorithm, the tag reader in the work area continues to be divided into P subsets (P> 1), and then a subset of the same division is continuously divided into a subset of the more or fewer within the tag number to achieve a successful identification tag reader, until the number of tags within a subset of 1. When the tag is read being completed within a certain subset, the reader will search back using other waiting to read the label. This can be seen as a process of tag grouping by all labels according to the grouping scheme from the root to leaf nodes and processing diversion layer by layer. Only all leaf node labels are searched, can the process be successfully read out.

Performance analysis of algorithms:

To find a separated tab is required to repeat from relatively large number of labels. The average search depends on the number of readers within scope of the total number of tags which is identified as n:

$$I = \log_2 n + 1 \quad (1)$$

In the N pending identification tags, average recognition algorithm requires a label search. Obviously, the identification tag within the read range will be reduced to number of completed tag, and total required search cable time BS of identification N is:

$$I_{BS} = (\log_2 n + 1) + [\log_2(n-1) + 1] + \dots + (\log_2 2 + 1) + (\log_2 1 + 1) = n + \log_2(N)$$

$$B_{BS} = I_{BS} * k = (n + \log_2(n!)) * k \quad (2)$$

Because each request is passed to the tag reader by instruction, its argument is the length of the entire sequence number, so the binary bits to be transmitted to the reader is kth in the total number of searching algorithm and the product serial number length is labeled as:

$$L_{BS} = I_{BS} * k = (n + \log_2(n!)) * k \quad (3)$$

IV. SYSTEM TEST

Firstly, each modules of the system are all tested respectively, and it turned out that all modules were normal. The exchanging information test between the different modules is showed as normal data transfer speed, with rapid response to electronic license. The login interface is shown in Fig 3.

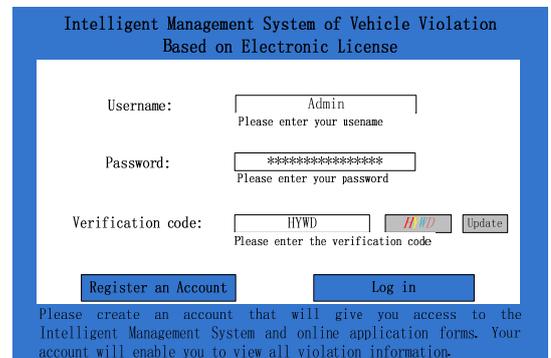


FIGURE III. SYSTEM LOGIN INTERFACE.

The Table 2 shows the test results of system database, where primarily record information of vehicle owners includes vehicle violation information.

TABLE II. DATABASE TEST TABLE.

Test Module	Test function	Test Results
User Login	User login, authentication code updates, user duplicate login	Good
User Control Panel Management	Add module control node, modify the module node, set the module node, the mobile module nodes, remove the module node	Good
User Group Management	Adding user groups, modify user	Good
User group permission settings	Add, modify, save the user module operating authority	Good
Manage Users	Add users, change user, delete user, disable and enable the user to lock and unlock the user	Good
Unit Management	Modify the unit, delete unit, disable and enable the unit to lock and unlock the unit	Good
Personnel management	Add personnel, modify personnel, personnel delete, disable and enable staff to lock and unlock the staff	Good

By vehicle registration database, the system can display basic information of the owners to identify the fake cards, deck, theft, illegal operations. Therefore achieved automatic vehicle identification can provide an illegal vehicle blacklist and the vehicle identification authenticity, preventing the vehicle from counterfeiting, scrapping tax evasion and other phenomena, and combating with car thefts, car snatching, decks and other criminal activities. The figure 4 shows the integrated test of owner information.

In the system test, the entire system works well, demonstrating the system design stability and the usability of intelligent management system of vehicle violation.

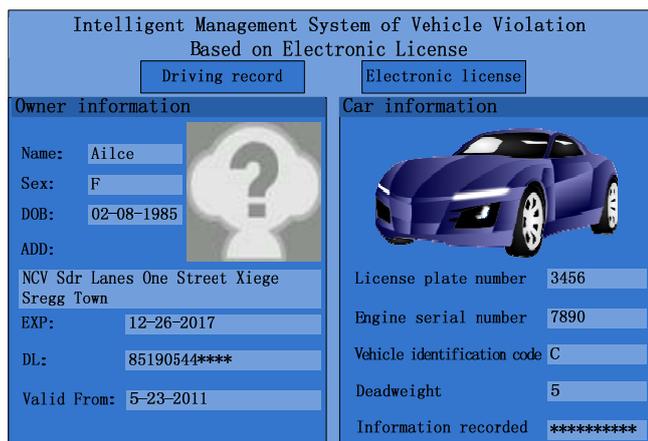


FIGURE IV. INTEGRATED TEST.

V. SUMMARY

The electronic license management system identify illegal vehicles based a variety of sensors and a given unique ID number of vehicle, and can analyze current vehicle in real-time collection and display the information at any place. Different from traditional metallic plate, the embedded terminal platform facilitate the transport sector to grasp and analyze vehicle information, integrating the intelligent control and human control into an intelligent vehicle management system.

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