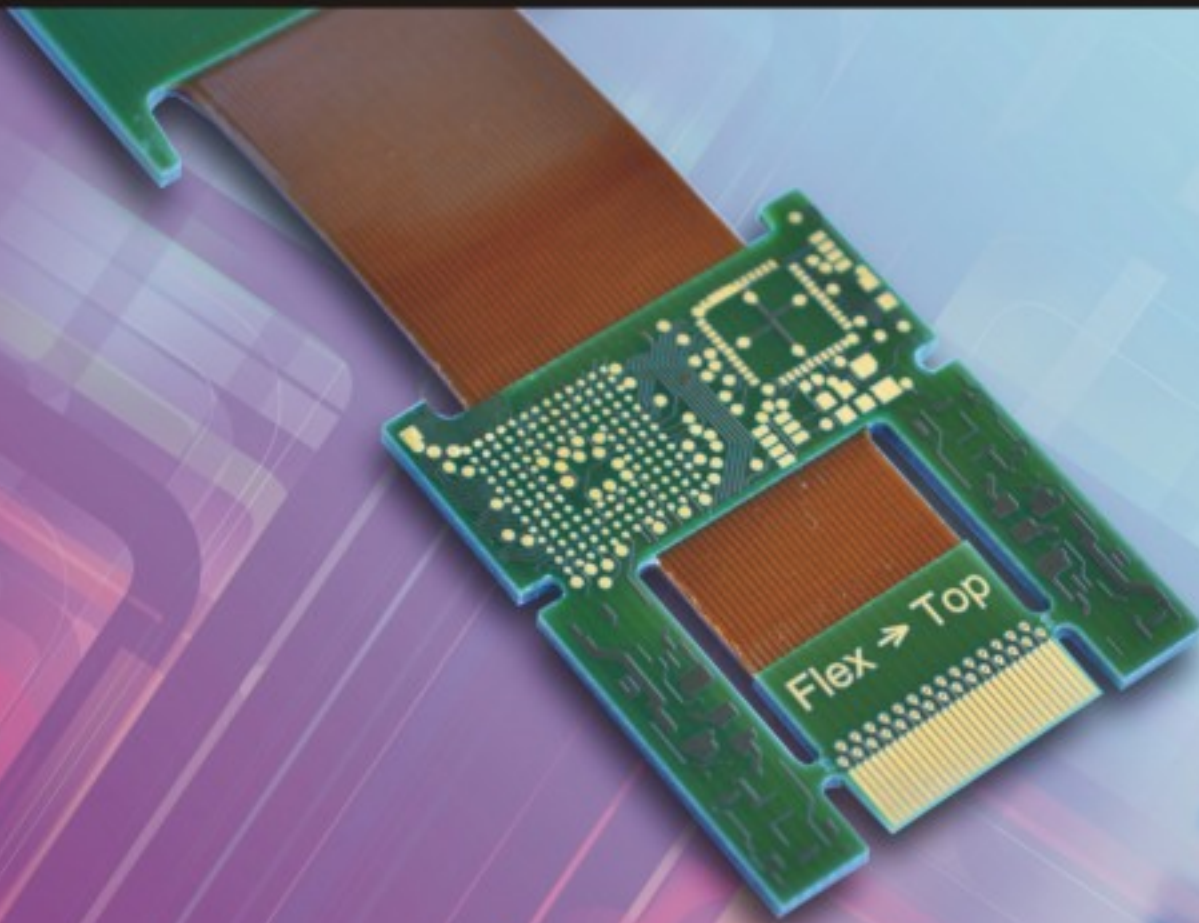


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Digital Sensors and Sensor Systems: Practical Design

Sergey Y. Yurish



Formats: printable pdf (Acrobat) and print (hardcover), 419 pages

ISBN: 978-84-616-0652-8,
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The goal of this book is to help the practitioners achieve the best metrological and technical performances of digital sensors and sensor systems at low cost, and significantly to reduce time-to-market. It should be also useful for students, lectures and professors to provide a solid background of the novel concepts and design approach.

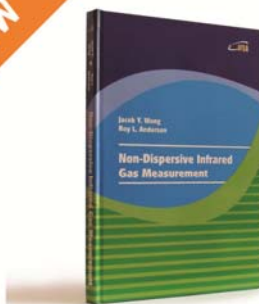
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- Easy-to-repeat experiments
- Practical orientation
- Dozens examples of various complete sensors and sensor systems for physical and chemical, electrical and non-electrical values
- Detailed description of technology driven and coming alternative to the ADC a frequency (time)-to-digital conversion

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NEW BOOK



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Jacob Y. Wong, Roy L. Anderson

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Research Algorithm on Building Intelligent Transportation System based on RFID Technology

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Abstract: Intelligent transportation system to all aspects of organic integration of human, vehicle, road and environment of the transport system, so that the operation of functional integration and intelligent vehicle, road. Intelligent transportation system (ITS) to improve the efficiency of traffic system by increasing the effective use and management of traffic information is mainly composed of information collection and input, output, control strategy, implementation of the subsystems of data transmission and communication subsystem. The RFID reader to wireless communication through the antenna and RFID tag can achieve a write operation on the tag identification codes and memory read data. The paper proposes research on building intelligent transportation system based on RFID technology. Experimental results show that ITS system can effectively improve the traffic situation, improve the utilization rate of the existing road resource and save social cost.

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Keywords: Radio frequency identification (RFID), Intelligent transportation system (ITS), Intelligent traffic.

1. Introduction

Intelligent transportation system (ITS) applied in the city traffic is mainly reflected in the microscopic traffic information collection, traffic control and guidance, to improve the efficiency of traffic system by increasing the effective use and management of traffic information, mainly by the information acquisition input, control, output strategy execution, between each subsystem data transmission and communication subsystem [1]. Information acquisition subsystem through the sensor acquisition vehicle and road information, strategy control subsystem according to the set target (such as the traffic volume, maximum or average waiting time shortest etc.) use computational methods (such as fuzzy control, genetic algorithm and so on) to calculate the best scheme, and outputs a control

signal to the execution subsystem (usually traffic the signal controller), to guide and control the passage of vehicles, to the preset target.

This technique is introduced into the vehicle dispatching system in intelligent; fully meet the distance without stopping, automatic interaction requirements. Vehicle information so will give the system by sending the tag technology, automatic identification authentication by the system, the control commands issued related. This ensures that the entire "car" and "car" are fully automated process, and the vehicle state information in real time to update the database, and fully guarantee the management departments of the vehicle information query.

RFID is Radio Frequency Identification abbreviation, namely, radio frequency identification, often referred to as the electronic chips or inductive

proximity card, induction card, contact less cards, electronic tags, electronic bar code etc. RFID is one of the key technologies of the Internet of things. A complete RFID system consists of Reader and Transponder of two parts. The working principle, the radio energy Reader launch a specific frequency to Transponder, is used to drive the Transponder circuit will send ID Code inside; the Reader will receive the ID Code. Special in Transponder and no battery, free access, free charge, so afraid of dirt, and the chip is the password for the world only, cannot copy, high safety, long service life.

With the rapid increase of social and economic development, city and accelerate the process of motor vehicles, city traffic problems become increasingly serious. City traffic congestion not only cause traffic accidents, vehicle delay increases, but also brings energy waste and environmental pollution, resulting in adverse social consequences is difficult to estimate. At present, the city traffic problem has become the bottleneck of the development of the global economy, is one of the global "urban diseases". Traffic control is intended to be in the administrative normative constraints were determined; the application of advanced techniques, using the appropriate mode of operation to ensure that public and private transportation has the best traffic conditions.

From the perspective of function, the RFID tag is divided into four kinds: read the label, label, label can be overridden with microprocessor and is equipped with a sensor tag. Structure and function of the most simple read-only tags, contain less information and cannot be changed; a rewritable tag integration capacity of tens of bytes into the tens of thousands of bytes of flash, label information can be modified or overridden, read-only and a rewritable RFID tags are mainly used in logistics system and production management system and baggage control system with microprocessor; label depending on the operating system and program storage built-in in read-only memory to work, the needs for security, many tags are all at the same time with encrypted circuit, now this kind of label is mainly used in a non-contact type IC card, both for electronic settlement, access control, can also be used to do membership card; some RFID tags include integration of sensor, temperature sensor and pressure sensor, at present this kind of label is mainly used for animal individual identification and tyre management. The paper proposes research on building intelligent transportation system based on RFID technology.

2. Design of City Intelligent Traffic Control System

Intelligent transportation system is a research field, involving wide comprehensive high-tech. Because of the limited space, this paper only from the point of city intelligent traffic control is discussed

with some improves city road safety measures, but not from the vehicle and passenger's angle to study [2]. To improve the overall level of intelligent transportation systems require the coordinated development of various industries, so as to promote the city traffic levels.

The management card issuing, determine the classification authority, to prevent managers cheating. Any a management card holders operating were to operate the registration card. On the export duty, operation registration after you can go to the management fees, the export of all charges are automatically added to the attendant and stored in a computer database name. The attendant holding operation card restricted, can not enter the software menu item is higher in the system, so the record of computer data cannot interfere; upper management card can be checked at any time, or print a duty or for any period of time and the whole parking work record. This fundamentally put an end to the parking fees and the loss of financial statistical errors, and the system automatically, put an end to the human vehicle, fighter car caused economic losses.

The solution is to use modern computer network technology, a new generation of broadband integrated service access network system, a new generation of optical transmission system is the main technology and multimedia information compression, decompression technology to realize the digital image monitoring system, is a comprehensive solution set of monitoring system of expressway communication system, system, charging system three major electromechanical system as a whole the. Surveillance video, audio, alarm, control signal can be transmitted to each node of network and at the same time, the use of highway communication network in different places at the same time monitoring, remote control one or some place, and has a moving image detection, reporting to the alarm information, and the remote command function.

The highway toll station and along the way (the outfield, tunnel) video, audio, and low speed data service access to the ZKON control over remote multi-service access unit, into the Ethernet signal unified, direct access to the optical fiber network, monitoring signal freeways can access to the same optical fiber network, provided by the local access unit optical network terminal. Give the ZTE ZXA10 MSAN narrow band integrated services access network, based on the integrated services access network (access communication system) highway along the monitoring information transmission to the monitoring center. Center the control signal through the A-MSTP optical transmission system (the convergence layer communication system) uploaded to the monitoring center, as is shown by the following equation:

$$MEAN = \sum_{i=0}^{M-1} \sum_{j=0}^{N-1} F(x, y) / (M \times N) \quad (1)$$

From the functional characteristics, intelligent traffic signal lamp system should have the time fixed mode, time setting mode, time, site induction mode remote control mode, the remote control mode signal control mode; you can set the date, time setting, time setting, the induction parameter setting, cycle time, phase difference and the green signal ratio parameters; can be self-inspection system, the green conflict testing, lamp fault detection, line fault detection; has strong input/output function, can realize different phase modulation on intersection control output and detection function [3]. In addition, the system provides a friendly man-machine interface, users can set and control signal through a manual switch, keyboard or remote control.

Signal lamp remote communication control can be realized using current loop signal transmission mode. The remote communication control circuit is simple, low cost, strong anti-interference ability. It is composed of current loop transmission serial shift of 3 kinds of signal - data of D, CLK, STR clock latches, traffic lights will be converted to serial information controller for parallel output, to achieve accurate position control, signal lamp different can take parallel connection, in such a line, load capacity output to control more than a dozen lights, can satisfy the needs of various traffic junctions, as is shown by equation2.

$$\Sigma_{\varepsilon(k)} = \text{diag}[\sigma_{\varepsilon_1(k)}^2, \sigma_{\varepsilon_2(k)}^2, \dots, \sigma_{\varepsilon_q(k)}^2] \quad (2)$$

The management of the local signal system and signal system are with local area network (LAN) for two-way communication. The local signal control end of the data to be processed information through the Web Service application program interface to the system good package control terminal area lights, work finished by the latter, the final result is returned to the local signal. Web Service technology makes full use of computing ability of area lights system control unit, reduce the local signal processor overhead lights, makes the system more stable and easier to maintain, as is shown by Fig. 1.

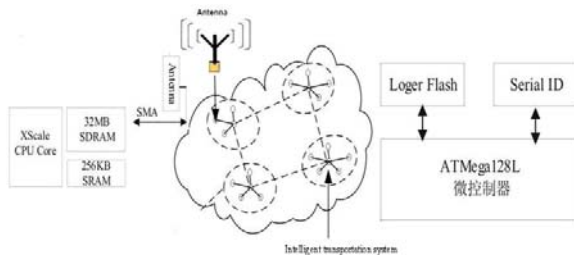


Fig. 1. The design of city intelligent traffic control system.

Development of intelligent traffic signal lamp system can effectively improve the traffic situation; improve the utilization rate of the existing road resource, save social cost [4]. The system is based on

AT91RM9200 processor, centered on application, the embedded operating system, the design has the advantages of low cost, simple operation, easy expansion, information sharing degree is high, the flexibility, has a very good reference value and practical value.

When the vehicle in/out guard antenna communication area, antenna in microwave communication and electronic identification card for bidirectional data exchange, relevant information from the electronic vehicle card reads vehicle, related information in the driver card read driver, automatic recognition of electronic vehicle card and driver card, and judging the car card legitimacy is effective and the driver card, check the lane control computer display and the electronic card and driver card driver license plate number and one corresponding information; lane control computer automatically through the information on time, the vehicle and the driver of the stored in the database, lane control computer according to the read data following judgment and processing.

In the traffic information collection, terminal nodes can be used non-contact magnetic sensor to collect and sensing area of vehicle speed, vehicle distance information. When the monitoring range of vehicles entering the sensor, important information terminal nodes through the magnetic sensor to collect the running speed of vehicles, and send that information to the next node timing wake up. When a node induction to the vehicle, with the vehicle driving time between two sensor nodes estimate, we can estimate the average speed of the vehicle. A plurality of terminal nodes will each collection and initial processing of information by the sink node convergence to the gateway node, data fusion, get traffic and road vehicles, vehicle velocity and other information, so as to provide a communication signal control road * input information is accurate. Through the installation of temperature and humidity, light intensity, gas detection sensor etc. to the terminal node, also can detect road condition, visibility, vehicle exhaust pollution, as is shown by equation3 [5].

$$f(t) = f_L(t) + w_L(t) + \dots + w_{M2}(t) + w_{M1}(t) = f_L(t) + \sum_{i=L}^{M1} w_i(t) \quad (3)$$

Need to transform the existing traffic signal controller to implement bus priority function in intelligent transportation system. By adding sensors and other auxiliary equipment, traffic signal controller can estimate the bus arrived at the intersection of time (travel time), calculate the vehicle to give priority at intersections need (can choose the number of passengers as priority), then select the priority of appropriate control strategies, by adjusting the green signal ratio priority release public transport vehicles.

Wireless sensor networks have excellent characteristics; can provide an effective means for

intelligent transportation systems of information collection and monitoring of vehicles in each direction of the intersection, according to the monitoring results, improved simplified, improved signal control algorithm to improve traffic efficiency. The wireless sensor network can be applied to the execution of the control subsystem and the subsystem is in the boot subsystem. For example, the technology can be applied to improve the signal controller, achieve bus priority function of the intelligent transportation system.

In the design of ITS wireless sensor networks, network nodes according to different functions, need to separately design. The terminal node, the sink node and gateway node software function as shown in Fig. 3. The terminal nodes equipped with different sensors for motor vehicle information acquisition and road information acquisition [6]. Its functions are in accordance with the reduced function device (RFD, Reduced Function Device) standards to achieve. Terminal node and sink node in the star type network, at a fixed point in time from sleep wake up and sink node active communication. Routing information is given to the father (convergence) coordinator with the routing node and network and router, lower power consumption and software node implementation complexity. The sink node is extended terminal node software function, realize the expansion of the network and the message routing function, allowing access to network more key nodes.

Terminal node and sink node design typical, the Atmel 8 RISC low power ATMegal1281V MCU as the system control core. It is using 512 KB AT45DB041D as the external program memory. Support ZigBee protocol RF module using Atmel AT86RF230, RF power reaches 3 dBm, the extended interface outdoor transmission distance up to 300 meters above the node can be connected to the analog input, digital I/O, I2C, SPI and UART interface, the interface to make it easy to connect with the sensor and other peripherals, such as external luminosity, temperature, pressure, acoustic, magnetic and acceleration sensor, as is shown by table1.

Table 1. Terminal node and sink node design of ITS.

| Field | ITS | Tag | RFID | Default |
|-----------|--------------|-----|-------|---------|
| UserID | int | NO | PK | 78 |
| UserName | Varchar(50) | NO | 0.5 | 99 |
| RealName | Varchar(50) | NO | 0.6 | 20 |
| Password | Varchar(255) | YES | 0.41 | (NULL) |
| Address | Varchar(200) | YES | 0.221 | (NULL) |
| Phone | Varchar(20) | YES | 0.885 | (NULL) |
| Mobile | Varchar(20) | YES | 0.362 | (NULL) |
| Email | Varchar(200) | YES | 0.01 | (NULL) |
| CreatDate | datetime | YES | 0.23 | (NULL) |
| Status | bit | YES | IDS | (NULL) |
| RoleID | int | NO | PK | 0 |
| Remark | text | YES | NOS | (NULL) |

In the design of the system, will be separated from the data acquisition system and business process strictly, ensure the stability of the system [7]. The data acquisition system and it is only in the vehicle "go out" or "door" are activated when the state information of electronic tag and it is sent to the system of vehicle, and it is automatically record the vehicle information database. While the business process in the car, car application, application and request sequence, the basic business data obtained directly from the database, not involved with electronic label on the front vehicle communication, thus fully avoid the communication business, cause system instability.

Regional traffic signal control objects all intersection traffic signal in the city or a region. With computer technology, optimization methods, automatic control and vehicle detection technology development, studied to be coordinated together integrated within an urban area or a local district of intersection traffic signal control, so that the vehicles in the area through some of the intersection when the total loss arising min. In this control mode, the traffic signal real-time traffic data transmitted through the communication network to the host computer, the host computer changes in the road network traffic in real-time, at a certain time step away from being performed continuously adjust timing scheme. The host computer simultaneously controls multiple intersections in an urban area, to achieve harmonization in the area of the intersection between the management to improve the operating efficiency of the road network.

Control of single intersection is one of the most basic control modes. The control parameters of isolated intersection point of control is the signal cycle and green ratio, the control objective is generally the vehicle delay and the capacity of the intersection. Because the equipment control is simple, investment province, convenient maintenance, is still a widely used signal control mode. Technically, it is divided into off-line control and online control point two forms. The former uses signal timing technology, and it is still the other control method with the base; the latter is traffic responsive control or vehicle actuated control, which is based on the actual distribution of intersection of each individual flow, reasonable distribution of green time to each phase, so as to satisfy the traffic demand.

Dedicated wireless sensor network node design in intelligent transportation systems need to be considered as follows: node low-power design. Terminal nodes are battery (available solar battery) power supply; node costs to be low. During the deployment of massive traffic information collection node cost will be a key project. Data processing and storage is capacity of the node. Some nodes need for high-speed information acquisition and the running recognition algorithms, and so it is necessary data processing capability. Also need to be considered in a

limited space within the store programs, data, and the support code online update function.

Includes maintenance, and it is repair, inspection and other routine maintenance. Just a comprehensive record is of the vehicle-related data. Record vehicle mileage, fuel costs and vehicle maintenance costs consumed. These raw data records, the system will automatically statistical analysis of the time of vehicle maintenance and annual inspection, early warning and in accordance with the set ensure vehicles get timely maintenance.

City of the traffic trunk bear the traffic load is very heavy, ensures the traffic on the improvement of a region or city traffic often plays a vital role in. In the city traffic network, sometimes intersection are located very close to the intersection, between two adjacent distance is usually not sufficient to enable a squad of traffic evacuation in finite time. Single intersection are respectively arranged single intersection signal control, vehicle frequently encountered when red light, stop, the poor, and serious environmental pollution. In order to reduce parking in all vehicles in the intersection number, especially when the main vehicle relatively smooth, control scheme between adjacent intersections should adopt the strategy of coordinated control. Method the initial coordination of signal timing is based on the concept of green, adjacent intersection signal control in the same period, main line phase green open time staggered in a certain time, the intersection of route to the main line in the certain degree of traffic.

Traffic system is a complex structure, many factors affect the very randomness of the system, the use of mathematical methods to solve the traffic problem is very difficult, the established models are often too complex and hard to solve, but also difficult to use one or several models to summarize the diversity of the traffic flow system. Transportation systems, on the other hand, is a dynamic time-varying systems, traffic management and control of real-time requirements are very high. Therefore, starting from the actual situation, based on the mathematical description of the traffic management control methods can not meet the requirements of online real-time control, poor operability. And artificial intelligence methods to draw the human method of solving the problem of knowledge representation, reasoning and learning to solve complex problems, pure mathematics to describe combined with knowledge or knowledge of the mathematical model to describe the transport system into. Gradually adapt to the environment, ability to learn, to continuously improve the management and control effect.

3. The Research of Radio Frequency Identification Technology

RFID radio frequency identification is a kind of automatic recognition technology of non-contact, RF

signal through its automatic target recognition and access to relevant data, identify the work without human intervention, it can work in various environments [8]. RFID technology can identify the moving objects and can also identify multiple tags; the operation is fast and convenient. The short distance radio frequency products are oil, dust pollution and other harsh environment, can replace the barcode in such an environment, such as tracking objects in the factory assembly line. Long distance radio frequency products used for transportation and it is recognition distance of up to tens of meters, such as automatic charging or identifying vehicles etc.

The RFID system at least comprises electronic tag and reader. The two are parts. Electronic tag is the data carrier frequency identification system; RFID is composed of the tag antenna and the tag chip. According to the electronic tag power supply mode, the electronic tags can be divided into active electronic label (Active tag), passive electronic tags (Passive tag) and semi-passive tag (Semi passive tag). Active electronic label is arranged in the battery, passive RFID tag has no built-in battery, semi-passive tag (Semi passive tag) depend in part on the battery.

Electronic product code is the development of the global product code, can identify the target sight. Electronic product code is not just a wireless bar code, it contains a series of data and information, such as origin, date code and other key information, the information stored by the label on a small silicon,, reader and computer networking, producers and retailers can know the exact product and inventory information, as it is shown in equation 4:

$$I = tr(P(k | k - 1)) - tr(P(k | k)) \quad (4)$$

Originally in the field of technology, transponder refers to the ability to transmit information reply information electronic module, in recent years, due to the rapid development of radio frequency technology, transponder with words and new meanings, also called smart tag or label. A smart tag exactly is a kind of innovation of RFID tags, composed of sticky labels and ultra-thin RFID tag. The smart tag radio frequency technology and flexible label printing to combine the advantages of smart tags, read write function can be repeatedly programming, coding rule follows the label first when making. Electronic label on the basis of different frequencies can be divided into low frequency electronic tags, high frequency electronic tags, and UHF tag and microwave electronic label. According to the different forms of packaging can be divided into credit card label, label, paper label, linear, circular glass tube label and special shaped tags.

Intelligent vehicle management system designed for large-scale fleet management needs, the system interface is simple and intuitive, easy to operate, flexible definition of field; each vehicle a full range of management units for statistical analysis, the

control of the management role. Support dynamically add unlimited department to meet the needs of multi-pectoral, to ensure that everyone involved can complete information included in the scope of the management of the system; administrative rights and the implementation of the three officers, the application, the audit, permission to send a car is set up independently. Fully meet the actual needs of management.

RFID classification of second important aspect is whether to also read the labels. In this case, if there are more than two tags at the same time will be readable range leading to read error.

In this with collision avoidance (collision) RFID system function, in order to read a label, adjusted several times repeated reading times batch retrieval. So, once read of a certain number of tags, all tags are read until the speed is different, the more the number of tags once read, read the time required to complete the longer than the time needed for calculation. Realization of anti – collision function is substituted for RFID graphics code necessary conditions in the field of logistics. For example, in the supermarket, commodity is packed in a shopping cart for valuation. In order to realize this valuation method, collision resistance function must be complete [9]. On the other hand, using the RFID system in the electronic money and personal authentication, identification of several tags at the same time was the main reason for the occurrence of errors, as it is shown in equation 5:

$$(R^n)^k u^{(0)} = \sum_{i=1}^N \alpha_i \lambda_i^{nk} e_i + \sum_{i=N+1}^M \alpha_i \lambda_i^{nk} e_i \quad (5)$$

Different frequencies have different characteristics, so their use is of every hue. For example, the low frequency tags cheaper than UHF tags, saving energy, strong penetration of scrap metal objects; they are most suitable for water with high content of objects, such as fruit. For example, is the administration of the import and the warehouse inventory, the reader can be installed in the door on the wharf cargo import? If the request is management to specific customer products, the reader should not only install in the door, also should be installed on the truck. If the demand is the control of the retail shelf, fixed or hand-held device could be used to facilitate the automatic warehouse, recording and counting.

Retail analyst at Sanford C. Bernstein estimates that, through the use of RFID, Wal-Mart annual savings of \$ 8.35 billion, most of which do not need artificial view purchase barcode and save labor costs. Although some analysts believe that the \$ 8 billion of this figure is too optimistic, but there is no doubt, RFID helps to solve the problem of the retail industry's two largest: the merchandise out of stock and loss (loss due to theft and supply chain to be disturbed), and now single theft of a Wal-Mart one year loss of almost \$ 2,000,000,000 a legitimate business turnover reached this figure in the ranking

of the 1,000 largest enterprises in the United States, ranked 694. The agency estimates that this RFID technology to help reduce theft and inventory levels by 25 %.

Basic operation mode of radio frequency identification system is divided into full duplex (Full Duplex) and half duplex (Half Duplex) system and timing (SEQ) system. Half duplex that tag and reader can be two-way transfer of information, but the information is transmitted to a direction at the same time only. In full-duplex and half-duplex system, response is sent out in RFID tag reader sends out electromagnetic field or electromagnetic case. As compared with the signal of the RF tag reader itself, the signal is very weak in the receiving antenna, so you must use the appropriate method to transmission, the signal difference between signal and reader tag from the. In practice, the data transmission from the RFID tag to reader of people generally use the load reflection modulation technology will tag data is loaded into the reflection echo especially for passive RFID system, as it is shown in equation 6:

$$P_{j-1}f = P_j f + Q_j f = \sum_k c_k^j \phi_{jk} + \sum_k d_k^j \psi_{jk} \quad (6)$$

In order to store data, mainly use three kinds of methods: EEPROM, FRAM, SRAM [10]. The radio frequency identification system in general, the use of electrically erasable programmable read-only memory is the main method. However, the disadvantages of using this approach are: power consumption in the process of writing, life is usually written 100000 times. Recently, some manufacturers use ferroelectric random access memory. And electrically erasable programmable read-only memory, writing power ferroelectric random access memory consumption is reduced 100 times, even 1000 times less time to write. However, ferroelectric random access memory because of production problems has not been widely applied. FRAM belongs to the non-volatile memory class.

The signal is the core of the entire system. It consists of a plug-in board, LCD screen, control panel, lighting driver board, switching power supply, button panels of five kinds of functional modules and power distribution board, wiring terminal block. The system selects the 32-bit embedded RISC processor based on ARM core AT91RM9200 as a signal of the machine control panel processor, to meet the requirements of the signal intelligent signal system as the collection and processing of traffic data communication network as well as regional the coordination control platform.

This stage is the key stage of growth of RFID middleware. Because of the powerful RFID application, Pilot Project Wal Mart and the United States Department of defense and other key users have RFID technology planning and import, prompted the development of the international companies continue to focus on RFID market.

Development of RFID Middleware in this stage not only has basic data collection, filtering and other functions, but also to meet the enterprise many-to-many (Devices-to-Applications) connection demand, and with the platform of management and maintenance functions.

4. Building Intelligent Transportation System Based on RFID Technology

Aimed at the need of high-grade communities, enterprises, government departments on the intelligent parking lot, design intelligent parking management system [11]. RFID technology, computer network technology, the application of the voice system scheme of things that technology, short-range microwave communication technology, digital image processing technology and automatic control technology, in order to realize the automatic vehicle identification and information management, improve the efficiency of the vehicle traffic and safety, and statistics of vehicle access data, to facilitate the management of staff scheduling, reduce labor intensity of managers, effectively prevent the loopholes of charges.

Signal control system, the intersection level signal control given by the control of the decision-making based on the traffic flow information connected sections agent intersection signal timing. Intersection level signal control the Road * through-flow of information and the signal timing pass control of the layer region, while the upper area control feedback control commands, applied research on a particular region of a control area of the intersection in a direction of urban traffic network congestion regional control by the control command is given and adjust their the intersection signal with the other on the same road section to achieve as soon as possible to ease crowding, reduce the regional overall delay time purposes. Passed between regional control traffic flow information of the region, a region crowded intersection, regulatory regions adjacent area signal timing to guide traffic dispersed to relieve congestion and roadside information signs or traffic radio signals to guide traffic diversion.

Radio frequency identification RFID (Radio Frequency Identification), commonly known as electronic tags, it is a non-contact automatic identification technology, work process without manual intervention by the RF signal automatic target recognition and access to relevant data, can be used in a variety of harsh environments.

In the structure of wireless sensor networks, the sink node is installed on both sides of the road to form a self-organizing multi-hop mesh based on Mesh network architecture, the sink node traffic information dedicated terminal sensor node and each adjacent collection consists of a star network communications, the final data will be gathered to the gateway node. The gateway node can be used as a

module is installed in the traffic signal controller, through a proprietary network signal controller, sending data will be collected to the VTS center for further processing [12]. In a wireless sensor network deployment, the sink node can transport facilities installed at the roadside column, bar and so on, gateway nodes can be integrated to the intersection traffic signal controller inside, special terminal sensor node can fill in the road or installed on the side of the road, the movement of vehicles on the road can also install node dynamic sensor to sensor networks, as it is shown in equation 7:

$$W_{\psi} f(a, b) = \frac{1}{\sqrt{a}} \int_{-\infty}^{+\infty} f(t) \psi\left(\frac{t-b}{a}\right) dt \quad (7)$$

The introduction of the RFID technology is intelligent vehicle management system. Deployed in every car radio frequency identification card, the main function of radio frequency identification card is stored as a vehicle information, vehicle electronic identity card, and it has the world's unique ID number, do not copy, change characteristics, high security. The radio frequency identification card reference will create the vehicle and the vehicle management system for the timely communication platform. Work process is as follows:

1) When the vehicle is ready to go when the car, radio frequency identification card the vehicle information automatically to the vehicle management system computer sends, check whether the vehicle has been effective car license:

A. if the vehicle has access to car license, control brake open, can not stop the vehicle. At the same time the system will detect the car has "go out" information, and set up the car in the database for the "out" state;

B if the vehicle is not get car license, control brake off, sound and light warning system.

2) When the vehicle returns, radio frequency identification vehicle card the vehicle information automatically to the vehicle management system to send, vehicle management system to judge whether the car to the car.

- (1) length = 0;
- (2) for i = max order down to 1 do{ //max order
- (3)FP[++ length] = item (i);
- (4) output FP and its support S T (k1 , ..., km).count [i]/ n;
- (5) build S T (k1 , ..., km, i) based on S T (k1 , ... , km);
- (6) for each candidate c ∈ Ct
- (7) c.count++;
- (8) }
- (9) Lk={c ∈ Ck|c.count ≥ min_sup}
- (10) }
- (11) return L=∪kLk;

Database server: Intel Pentium fourth above 2.5 GB frequency chip, more than 1 G of memory, 50 Mb hard disk IBM compatible machine or

professional server (such as image, according to save the picture time required to different space, traffic flow 6000/ day, need a day to save the image space of about 240 M). And the installation of Microsoft Windows 2000 Server operating system and Microsoft SQL Server 2008 database system. Network system using the 40/700 Base-T star network topology structure, the main device for 20/400 Mb Fast Ethernet data exchange, such as the import and export from the management office is far (800 meters) can be used for fiber optic transceivers connect.

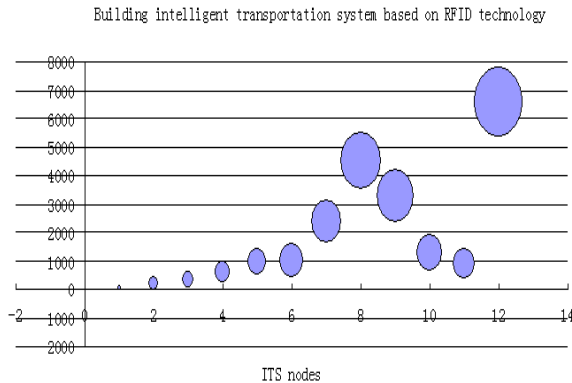


Fig. 2. Comparison results of building intelligent transportation system based on RFID technology.

This paper presents a traffic signal lamp with the distributed characteristics of the design of the control system; it uses the RFID technology to improve the accuracy of traffic information collection, using current loop long-distance transmission, and application of artificial intelligence theory to make the system more adaptive and scalable. For the convenience of the man-machine interface operation, AT91RM9200 built-in LCD (liquid crystal display) controller, the automatic generation of LCD drive control signal, can be directly connected to the LCD. The keyboard module expansion of a 4×4 keyboard matrix by ZLG7290B, ZLG7290B is connected through IIC serial bus and processor.

Automatically identify computer automatic timing, billing, special card, monthly card, temporary card artificial receive cash, fast and efficient service, computer monitors and charges POS screen display parking time and fees receivable, card balance or valid, fee transparency high, ballot boxes display prompts guide the households use the car park, and extended his greetings to civilized language, comfortable households mood, you can attract more users and improve efficiency in the use.

6. Conclusions

According to the current traffic situation in China and the problems that a major role in the economic development and the city traffic control in the

process, and puts forward the important aim of the development of intelligent transportation system and practical significance. Intelligent transportation system is a research field, involving wide comprehensive high-tech. This paper introduces the classification and design of intelligent traffic system, traffic control system based on multi-agent City. The paper proposes research on building intelligent transportation system based on RFID technology. Intelligent control is not only the control traffic signal control, but the entire transportation system, intelligent transportation system. Intelligent transportation system is the highest level of traffic control, it is the advanced information technology, data communication technology, sensor technology, automatic control theory, operations research, artificial intelligence and computer and network and a series of new and high technology used in the transportation of each subsystem, so as to establish a large scale, full play role of the real-time, accurate, efficient transportation management system.

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