

The Application of Management Information System in Internet of Things based on RFID Technology

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Abstract: Radio Frequency Identification (RFID) is a non-contact automatic identification technology; it is the use of radio frequency signal through space coupling non-contact transmission of information, and through the message reaches the target identification technology. The basic principle of RFID is the use of radio frequency signal and its spatial coupling, transmission characteristics, for still or moving in the identifying items of automatic recognition. RFID has the advantages of high precision, strong ability to adapt to the environment, strong interference resistance, and quick operation. This article elaborated the RFID technology based on management information system in Internet of things and discusses the RFID technology in the management system in the application of convenience, describes the system's entire work flow and management data analysis design. The paper presents the application of management information system in Internet of things based on RFID technology. *Copyright © 2013 IFSA.*

Keywords: Radio frequency identification (RFID), Management information system, Internet of things.

1. Introduction

The RFID tag is by a coupling element, chip and micro antenna, each tag with a unique electronic code, attached, used to identify the target object. Label into the reader scans a field later, receives the reader sends RF signals, by virtue of induction current obtain energy to send out a stored on the chip electronic code (passive tags), or sending signals of a given frequency (active tags).

Radio frequency identification (Radio Frequency Identification, RFID) is a non-contact automatic identification technology, it is the use of radio frequency signal through space coupling (alternating magnetic or electromagnetic fields) to realize the non-contact transmission of information, and through

the message reaches the target identification technology. RFID technology appeared in the early period of World War II in the British air force identification friend or foe system (Identification Friend and Foe, IFF). RFID technology since its inception, with its unique advantages, has been widely used in industrial automation, transportation control, logistics warehouse management and other fields. RFID technology will be introduced into the spare parts management system can satisfy the enterprise on the spare parts management normalization, automation, modern requirement, realize the visualization of the state of the spare parts, spare parts management more effectively for the normal work of the equipment service, but also can improve storage utilization.

In this paper, based on the RFID technology of spare parts management system designed to do some elaborate, discussed the RFID technology in spare parts management system application convenience, describes the system of whole process and data analysis in the design of spare parts management [1]. With the continuous development of RFID technology and the electronic label price gradually reduced, the technical aspects of the advantages and potential use value will change the face of spare parts management, spare parts management to bring new opportunities and challenges.

In the RFD system, when the electronic label is a passive tag, often require the base band coding in each of the two adjacent data bits with the jump features, the adjacent data has a jump code, can not only ensure the in successive "0" when the electronic tag energy supply, and is convenient for electronic label from the received code to extract the clock information risk. In the actual data transmission channel, because of the presence of interference, the data will be the error occurred during transmission, and then request channel coding can provide a measure of the ability to detect errors.

The working principle of RFID is reader in certain areas within the transmitting electromagnetic waves. The electronic label having a resonant circuit, when the label into the magnetic field induced current, can obtain energy, clock and instruction, and the useful data to backscatter modulated transmitted. Reader receives and decodes the labeled data, into the central information system data processing. Thus, the reader through the antenna can realize the non-contact electronic tag reading and recognition in the preservation of the data, to achieve the purpose of automatic object recognition.

RFID is radio frequency identification technology (Radio Frequency Identification) English abbreviations. Radio frequency identification technology is nineteen nineties started an automatic identification technology. RFID technology use radio frequency in the reader and tag between the non-contact two-way data transmission, to achieve the target identification and for the purpose of data exchange. In foreign countries, radio frequency identification technology has been widely used in industrial automation, business automation, transportation control management, asset management and other fields. The paper presents the application of management information system in Internet of things based on RFID technology.

2. The Research of RFID Technology

In general, the RFID system consists of 5 components, including a transmitter, receiver, a microprocessor, antenna, and label. Transmitter, receiver and a microprocessor is usually packaged together, and are collectively referred to as the reader (Reader), so the industry often RFID system will be divided into reader, antenna and tag three

components, the three components are generally available from different manufacturers. RFID source in radar technology, so the working principle and the radar is very similar to it [2]. The first reader via the antenna electrical signaling, label after receiving the signal transmitting internally stored identification information, reader and then received by the antenna and the identification tag information sent back to the last reader, then the recognition result is sent to the host.

Label use three methods for data storage: electrically erasable programmable read-only memory (EEPROM), ferroelectric random access memory (FRAM) and static random access memory (SRAM). General radio frequency identification system mainly uses EEPROM mode. The drawback was the writing process of power consumption is very large; the service life is generally 100000 times. There are also manufacturers adopt the mode of FRAM. FRAM write power consumption for EEPROM 1/100, EEPROM 1/1000 write time. FRAM belongs to the nonvolatile memory. However, FRAM due to production problems has not been widely used. SRAM fast write data, applied to a microwave system, but SRAM needs an auxiliary battery uninterrupted power supply, in order to save data.

RFID anti-collision algorithm for improving mine supplies and personnel tracking reliability is the key technology, the system uses the line for the link tag collision detection algorithm, this algorithm needs only in electronic tag configuration 1 8 bit register, 1 1 " 0 ", " 1 " random number generator and 2 4 a 1 counter and a small selection of addition and subtraction circuit can achieve up to 1048576 tag arbitration. The simulation results show that this algorithm produced collision probability is significantly smaller than the binary algorithm, at the same time through register high flexible setting, also effectively solves the problem of low density labeling patio-temporal transfer rate high, which further reduces the collision probability.

RFID system generally consists of 4 parts: electronic label (Tag): by coupling components and chips, attached to the object, identifies a target, each label is the only electronic coding (EPC); reader (Reader): read (sometimes also written) label information equipment, divided into handheld and stationary antenna; (Antenna): in a tag and a reader RF signal transmission between; data analysis, processing system, used for data analysis and processing [3]. RFID system in a specific application, according to the different application purposes and environment, system will be different. The working principle of RFID: when the label into the magnetic field, if it receives a reader to send special RF signal, can by virtue of induction current was obtained by the energy stored in the chip to send out the product information, namely passive tag (Passive Tag), or offer to send signals of a given frequency active tag or label (Active Tag), reader reads information and decoded, sent to the background of information

processing system for data processing, this completes the RFID system work process.

Radio frequency identification system structure and communication system of the basic model is similar, to meet the basic requirements of communication function. Read / write device and electronic label for data transmission between the form and the basic communication model of similar structures. Between reader and tag data transmission needs three major functional blocks. According to the reader to the electronic tag data transmission direction, is the reader (transmitter) in the signal coding (signal processing) and modulator (carrier circuit), the transmission medium (channel), and the electronic label (receiver) of the demodulator (loop carrier) and signal decoding (signal processing), as is shown by Equation 1.

$$\begin{cases} W_{\psi}^{H}(j, x_1, y_1) & |W_{\psi}^{H}(j, x_1, y_1)| \geq |W_{\psi}^{H}(j, x_2, y_2)| \\ W_{\psi}^{H}(j, x_2, y_2) & |W_{\psi}^{H}(j, x_1, y_1)| < |W_{\psi}^{H}(j, x_2, y_2)| \end{cases} \quad (1)$$

In the REID system, due to the use of the electronic label is often passive, passive tag, to reader in the process of communication to obtain their energy supply. In order to ensure the normal operation of the system, channel coding methods must guarantee cannot interrupt the reader on the electronic label energy supply [4]. In addition, as a guarantee reliable operation of the system need, must also be in the coding to provide data protection level check, code should provide the T function, and can according to the type of code changes to determine whether the error or electronic label conflict.

RFID technology without direct contact, without the need for optical visual, manual intervention is not required to complete the information input and processing, and convenient operation, and can be widely applied in production, logistics, transportation, transportation, medical, security, tracking, equipment and asset management needs for data collection and processing of field. RFID system mainly consists of three parts: a reader, tag and other peripheral equipment. And the traditional bar code recognition technology, it can be one-time read multiple tags, penetrating strong, can be repeatedly read and write data, memory capacity, easy miniaturization and a wide variety of shapes, environmental resistance characteristics in logistics and transportation industry, it is widely used, as is shown by Fig. 1.

RFID in the application of traffic industry is in charge of highway and intelligent traffic. Through the installed in the vehicle radio-frequency identification card, can make the automobile is automatically identified, in the vehicle with high speed through toll stations at the same time the completion of payment, greatly improving the speed and efficiency, so as to avoid congestion, solve the traffic bottleneck problem [5]. The system and vehicle information database, the payment information database connection, can also

automatically to passing vehicles implementation does not check for parking, with data center database control, can be in a few seconds check to vehicle arrears and irregularities, through the use of normalization, network science and technology means to maximize containment vehicle traffic fee evasion and illegal operation behavior.

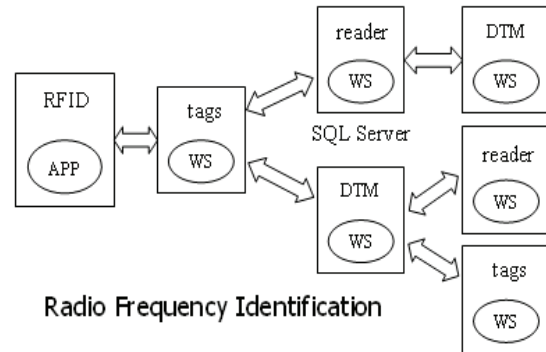


Fig. 1. The RFID system mainly consists of three parts architecture.

RFID technology conveniently help warehouse operators and retailers realize the cargo information storage, then the existing cellular mobile network based on the implantation of RFID applications, through the mobile terminal equipment with RFID technology realization of goods information to read, security, payment and other functions are also carriers of potential application market. NTTDoCoMo 2004 metaphase begins to launch in Japan using the technology of RFID Fe? Lica mobile wallet business, this business will be RFID technology with PDC and FOMA technology integration, support Felica operations (2 generation mobile phone and mobile phone containing 3 generation FOMA mobile phone has built-in RFID chip), in addition to paying function, businesses can through the use of read from a memory card and mobile phone chip FeliCa information and replaced according to the needs of information to the reader, to Felica users of electronic currency and customer integration and special services, as is shown by Equation 2.

$$\begin{aligned} X_r &= A_{k-1}^r (A_k X_k + D_k) + D_{k-1}^r \\ &= (A_{k-1}^r A_k) X_k + A_{k-1}^r D_k + D_{k-1}^r \end{aligned} \quad (2)$$

RFID substation management assets are include outdoor equipment, an indoor two equipment and tools. Usually the outdoor environment is relatively poor, to label the industrial strength is also put forward higher requirements (such as high temperature resistance, waterproof), here XCTF-5044 is selected as the electronic label [6]. Indoor assets according to their type and material, adopts two kinds of labels, namely XCTF-5041 and XCTF-5042A.

Tags: association environment using a XCRF-510 type of card sender, serial connected PC computer, USB connection zebra 888-TT printer print assets (assets, including basic information of new asset number, location), asset tag 3.

When the handset application procedure to perform PULL operations (data received from the data server), SQL Server CE IIS SQL Server client agent through to the CE server agent sends a HTTP request, and then SQL Server CE server proxy connection SQL Server and perform the client SQL request. After the data is returned to the SQL Server is CE client agent, and it is the final copy to the SQL Server CE database. This can make Pocket PC equipment to track any data update.

When the RFID technology and each object (document, borrow, computer, communication equipment) to establish binding relationship, with a new document registration, automatic inventory and positioning, automatic guided, automatic identification, automatic tracking, copy and destruction of control, fast inquiry and statistic functions such as alarm, document security management system it was built up [7]. Each function is as follows: the new document registration: each new document in storage will be taped an RFID tag, label and system through the corresponding document binding operation, i.e. when later when scanning a document label system will automatically search the document all the relevant information, as is shown by Equation 3.

$$\begin{aligned}
 & \prod_{k=0}^{j-2} G_{i,L}(2^k f) \\
 &= \prod_{k=0}^{j-2} H_{1,L}(1/2 - 2^k f) \\
 &= \prod_{k=0}^{j-2} [2 \sin^L(\frac{\pi}{2} - 2^k \pi f) \sum_{l=0}^{L/2-1} \binom{L/2-1+l}{l} \cos^{2l}(\frac{\pi}{2} - 2^k \pi f)] \quad (3) \\
 &= \prod_{k=0}^{j-2} [2 \cos^L(2^k \pi f) \sum_{l=0}^{L/2-1} \binom{L/2-1+l}{l} \sin^{2l}(2^k \pi f)] \\
 &= h_j(\pi f)
 \end{aligned}$$

The basic principle of RFID is the use of radio frequency signal and its spatial coupling, transmission characteristics, for still or moving in the identifying items of automatic identification. A basic RFID system is composed of RFID smart labels, RFID reader and Middleware in three parts. RFID smart labels by the chip and antenna, each label is assigned a unique electronic label code. The reader will host read or write command is transmitted to the electronic tag, and then from the host to the electronic tag data encryption, electronic tag data returned to the host. Middleware mainly completes the data storage and management, the tag is read write control.

A complete logistics information system including distribution, warehousing, transportation, settlement and administration are mutually independent and interrelated systems, these subsystems respectively realize intelligent logistics distribution, warehouse management, transportation

management, automated clearing, and logistics enterprise resource management system. RFID technology introduction and give full play to the rapid, real-time, accurate acquisition and processing of information good functional properties, makes the enterprise can timely, accurately grasp the entire supply chain business flow, logistics, information flow and capital flow and change, make at the same time on the supply chain business process and flow more coherent, improve on the whole supply chain economic benefits.

3. The Development of Internet of Things based on RFID Technology

Modern warehouse management features include: the traditional warehousing management, cross transfer / merge in transit, value-added service process, return of goods, quality assurance and dynamic customer service. WMS in accordance with the operation of the business rules and algorithms of information, resources, behavior, inventory and distribution operations management, to maximize meet throughput and accuracy requirements. Warehouse management system (WMS) system through a data exchange and integration platform of electronic business affairs, electronic media, and logistics enterprises in the planning and scheduling and the main system connected by the main system, issued a receipt and order of the original data. At the same time through wireless network, mobile terminal, the bar code system and the electronic tag data communication (RFID), information technology and the warehouse workers operating connection. On the interaction of instruction, communication, and it is feedback information and update the database, at the same time, required to generate electronic labels and documents.

RFID middleware system is: whole system operation to support the platform, with the functions of data acquisition, filtering, sorting, packing and forwarding functions [8]. Application package: includes receiving, storage, picking, loading, inventory, warehousing, forklift to locate / scheduling multiple process packages. The process can be flexibly customized rooms, as new functional package. Process packet support is labels and no label in two cases, WMS system with the function of packet seamless connection. Data exchange platform: as more functional package while running support platform, but also with the simulation system, management information system and ERP system and external system connection and data exchange platform, as is shown by Equation 4.

$$\left\{ \begin{aligned}
 w_{j,\min}^{\xi}(m,n) &= \frac{1}{2} - \frac{1}{2} \left[\frac{1 - M_{j,AB}^{\xi}(m,n)}{1 - T} \right] \\
 w_{j,\max}^{\xi}(m,n) &= 1 - w_{j,\min}^{\xi}(m,n)
 \end{aligned} \right. \quad (4)$$

Passive tag because no internal power supply equipment is also known as passive tag. Passive tags within the integrated circuit by receiving the electromagnetic wave emitted by the reader to drive send data to the reader [9]. Passive tag communication frequency can be either high frequency (HF) or ultra high frequency (UHF). The first generation of passive tags using high frequency communication, and it is the communication band for 13.56 MHz. The communication distance is short; the longest only reaches about 1 m, mainly used for access control and contactless payment. The second generation of passive tags using UHF Communication, the communication frequency is 860 ~ 960MHz. The communication distance is longer, up to 3 ~ 5m, and supports multiple identification tags, i.e. between the readers can accurately identify a number of labels. To date, the second generation of passive tag is the most widely used RFID standard, mainly used for industrial automation, asset management, cargo monitoring, personal identification and access control and other fields, as is shown by Equation 5.

$$\sigma_{\Omega}^2 = \frac{1}{A_{\Omega}} \iint_{(x,y) \in \Omega} [(I(x,y) - \bar{I}_{\Omega})]^2 dx dy \quad (5)$$

RFID reader to achieve long-range read-write function lies in the antenna design, through the study of RFID antenna working principles and performance parameters, put forward a kind of effective antenna design optimized solutions, so that the reader has a longer read distance and higher energy utilization rate. Proved by the experiment RFID is reader with optimized RF antenna and it enables the read and write up to a distance of 30 cm.

Radio frequency identification RFID (Radio Frequency Identification) is a method of using radio frequency communications to achieve the non-contact automatic identification technology. It uses radio frequency signal space coupling transfer non contact information, and through the information of object recognition. RFID passive (no power supply card) and free access to two major problems, target recognition, target recognition, the utility model has the advantages of strong adaptability, can penetrate non-metallic materials, huge amount of data storage, strong anti interference capability. The reader can not meet the application requirements, therefore, need a long range reader with remote antenna, realize long distance horizontal or vertical direction of read and write requests [10]. This paper gives a distance RFID reader antenna design, using radio frequency label special reader RI-R6C-001A, the device for antenna impedance is 50 Ohms, frequency of 13.56 MHz, so the use of die has the advantages of simple process, low cost PCB loop antenna.

When the content of network service provided by the operator, then we can make full use of the network layer authentication results without the need for business layer authentication; when the content of

network services provided by third parties from the network operator to obtain secret key safety parameters, it can initiate independent business certification without considering network layer authentication; or when the service is sensitive to business such as financial services, general service provider will not trust the network layer security level, and the use of higher levels of security protection, this time on the need to do business layer certification; and when the business is business as usual, such as temperature acquisition business, service provider network authentication is sufficient, then no longer need business layer of the certification [11].

This paper presents the RFID security communication protocol based on traditional challenge response framework, the Hash function for the label chip computational power requirements are low, compared to the current actual condition and the cost control target. At the same time, the agreement of the framework is backwards compatible with public key cryptography system characteristics, when the next label chip performance can support some public key cryptographic algorithm, can easily be changed to Hash function algorithm of public key cipher, and the protocol implementation steps, just do a little change can be it, as is shown by Fig. 2.

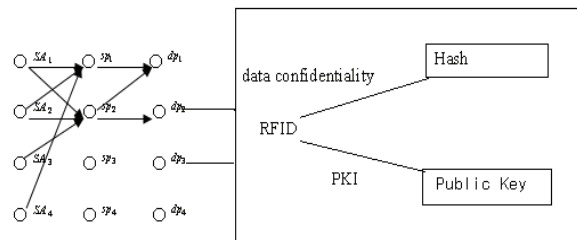


Fig. 2. The design of RFID security communication protocol system.

RFID system is the most main security risk is "data confidentiality". Apparently, no security mechanism of RFID tags will be in proximity to the reader leakage label content and some sensitive information. Due to the lack of support for point-to-point encryption and PKI key exchange function, in the RFID system application process, the attacker has many opportunities for RFID can get the data on the label. RFID system in another security risk is "location privacy" [12]. As the personal articles trademark may leak personal identity, personal articles RFID tags may also be leakage of personal identity, the reader can track carrying series RFID label personal safety. In addition, the attacker can also make use of bogus label instead of actual objects to deceive the owner, make it mistakenly believe that the goods were still on the shelf. An attacker may also by tampering with RFID label data, using low-cost goods label replacing high-priced goods label, in order to obtain illegal benefits.

Wireless radio frequency identification technology application is extensive, but it has noticeable problems -- Safety mechanism. There is no reliable security mechanism; it can not effectively protect the RFID tags in the data information [13]. At present, the security of RFID has become the important factor of RFID widely used. According to the RFID's main security attacks can be simply divided into active and passive attacks against 2 kinds of. Active attack mainly includes: (1) obtained from the RFID tag entities, by means of reverse engineering, the RFID tag remodeling complex attack; (2) through the software, the use of the microprocessor is connected with 13 universal communication, by scanning the RFID tag and reader's response to inquire, seeking security, encryption algorithm and their implementation of weakness, then delete the RFID label content or tampering can override the RFID label content in the attack; (3) through the interference of radio channel, obstruction or other means, to cause abnormal application environment, make legal processor generates a fault, the denial of service attacks.

$$W_X = \begin{bmatrix} G_{N-1} \\ G_{N-2}H_{N-1} \\ G_{N-3}H_{N-2}H_{N-1} \\ \vdots \\ G_L H_{L+1} H_{L+2} \cdots H_{N-1} \\ H_L H_{L+1} \cdots H_{N-1} \end{bmatrix} \quad (6)$$

RFID system by providing each a product to provide separate identity and history, thereby providing a detailed and has a unique view of the supply chain, realize goods tracking and supply chain transparent [14]. The RFID system is not the central computer to record each tray or goods location, it can be clearly informed of pallet boxes and even individual goods to their location, identification, storage and transportation history, destination, validity and other useful information. RFID system for supply chain in the practical goods such detailed data, and the goods and complete identity is established between the physical contacts, the user can easily access the completely reliable information goods.

Set the transmitter power is equivalent, using low frequency RFID, academic admirer gained a lot of received power, but the label size than the general effect of the extensive application of the market; if the use of microwave solution to realize RFID, despite the label will become smaller, but the path loss is bigger, the shorter wavelength, the received power is quite small, great influence on the reading distance. Considering the frequency of UHF, RFID will have a wavelength of moderate, far field coupling, tag, low attenuation, small space work relatively distant advantages, coupled with the IC

smart card technologies continue to mature, and TAG prices will continue to fall, more widely used to lay necessary foundation [15]. So UHF band RFID technology will serve the whole world become the fact that does not dispute.

In this paper, through the analysis of zero if architecture UHF RFID reader digital receiver design in the performance bottleneck, a clear impact on the receiving performance of the noise interference, DC offset and decoding problems causes and solutions. From the base band digital signal processing perspective, in the over-sampled filter processing basis, given the DC offset correction and associated decoding solution methods. After testing, reader can read about 10m stable furthest distance labels, and adaptive antenna and the change of environment, reading effect than the common market of products is more stable and reliable [16]. Proved to improve the reader role distance is design requirements.

UHF RFID reader and tag is adopted between the backward scattering principle complete the communication, according to the current main frequency of UHF air interface standard ISO / IEC 18000-6C, label in the passive state with the same frequency half-duplex communication. Basic communication process is, read / writes device using amplitude shift keying (ASK) etc. the modulated carrier, at a specific frequency channel will send information to one or more tags. After the reader still need to launch the CW carrier, within the specified time to wait for the tag response.

RFID tag can be used as the ship loading and unloading, daily tally homework paper document substitute. Loading and unloading the tallyman tally will work directly in the field data and the electronic card relationship via a hand-held terminal to production management system. Foreman field using a hand-held, according to the real-time tally data, keep track of shipping schedule [17]. Dispatch and command center through graphical ship operation command system, real-time grasp the shipping schedule, timely adjustment of mechanical, human resource planning, improve the production efficiency. Vehicles such as the installation of vehicle terminal also can be installed through the card reader direct reading electronic card, connected to the production management system, acquiring scheduling instruction, a variety of production, as is shown by Fig. 3.

Vehicle electronic license plate to hold RFID, into the cargo operation, yard, warehouse tallyman with port networked RFID handheld terminal reads the electronic license plate information, and production management system called tally information than verification, access to the corresponding information of goods and storage instructions, for receipt of goods operation, and cargo handling operations the results to production management system and write electronic license plate [18]. For some still need paper documents (such as the need to master, and it is owner signature confirmation) production, and it is by a tally clerk with a portable wireless Bluetooth

printer paper certificate signature retained. End of job of the vehicle, by tally clerk by RFID handheld terminal for electronic license plate to allow the port information.

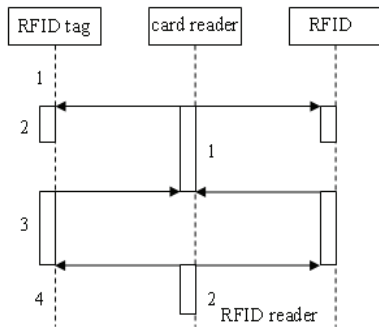


Fig. 3. System RFID reader and tag structure.

Automatic recognition technology based on RFID warehouse management system, WMS system and RFID middleware system supporting platform, by receiving, storage, picking, loading, inventory, warehousing, and forklift to locate / scheduling multiple process packets, wherein each package can run independently or can be smoothly connected to form a complete system. The hardware system, the RFID tag: according to different application requirements, using high frequency and ultra high frequency products. Divided into the pallet label, label, and label single goods warehouse location.

Traditional express industry is different, RFID technology can voluntarily reported to his master courier deliveries, largely increasing the transparency of the express delivery business [19]. In the express business mode of RFID electronic label affixed to the cargo, packing, trays, containers, transport vehicles and other different packaging hierarchy, so for either a batch or individual management of logistics products during transportation route information is very convenient. In the express business model should make full use of RFID technology of video transmission, mass literacy, information storage capacity and other advantages, as is shown by Equation 7.

$$\begin{aligned}
 z_1^k &= \{z(1), z(2), \dots, z(k)\} \\
 &= \{Z(1), Z(2), \dots, Z(m-1); z((m-1)M+1), \dots, z((m-1)M+s)\} \\
 &= \{Z_1^m; z(m,1), z(m,2), \dots, z(m,s)\}
 \end{aligned}
 \quad (7)$$

RFID as a replacement of identification technology, developed in Europe and the United States have shown a high degree of professional and popular trends, has in the logistics, material management, industrial automation and service industry application prospect. With enterprises in the development of information technology, RFID also had great progress. In addition to the third party

logistics enterprises, more and more manufacturing enterprise RFID application in supply chain management, inventory management, distribution and other related product flow of each link, can greatly improve the level of logistics information, accelerate the speed of commodity circulation, enhances the entire logistics industry competitiveness.

Along with the Internet development, abroad has been widely used in various fields of RFID technology, at the ticket anti-counterfeiting applications, in China, through the Beijing Olympic Games, the Shanghai World Expo, the Guangzhou Asian Games, Xi'an Fair Park, Shenzhen Universiade, National Democratic Movement and other large events using the RFID anti-counterfeiting technology, at the same time based on RFID security there is nothing comparable to this technology also has the advantage of tickets, using RFID anti-counterfeiting technology various concerts, exhibitions, sports competitions, scenic areas, emerge in an endless stream, specializing in RFID tickets to the Guangzhou city Fuh-Chyau electronic technology limited company in 2010 has to undertake 56 screenings of RFID ticket making at the sun or light observation can see printed a special mark chip, convenient for consumers to fake identification.

4. The Application of Management Information System in Internet of Things based on RFID Technology

This paper uses RFID automatic identification technology, realizes the data acquisition automation and paperless patrol system; improve the completeness and effectiveness; the use of advanced technology for storing data to be fully utilized and the data and the application results of the convenient, efficient query.

Network based RFID technology in the article; goods and people between established a huge "Internet of things". The Internet of things will be in the most important Internet technology revolution, a combination of communication and computer technology, physical communication will continue between the human and the human communication has become the great market potential and economic benefits of the mode of communication, they will bring about a complete supply chain revolution, and it will profoundly affect the economic and every aspect of social life [20]. In the face of the RFID rise abruptly quickly of the industry, including the equipment manufacturing industry and the operators, communications enterprises should keep a keen business sense, actively explore business opportunities brought about by RFID for the communications industry, such ability in the future RFID stage to seize the initiative.

Communication network can provide RFID required high speed, safety, real time data

communication network of channels, abundant data service can meet the RFID in different areas of different application requirements, equipment manufacturers to provide high performance support for RFID communications terminal equipment, we believe that RFID technology and communications systems integration may become the future development of the Telecom industry in one direction. The future of RFID technology and computer network, wireless communication network and a satellite communications network interconnection, can easily realize RFID data transmission, scheduling, tracking of goods, management center through a computer network to obtain a large amount of information on the goods, according to the transport of goods and distribution links in the specific case of replenishment and deployment, enterprise can whenever and wherever possible by field personnel mobile phone, PDA, computer and other communication terminals to access the internal business system data, receiving information center to send up single, single, also can use a hand-held scanning gun real-time goods barcode is transmitted to the background system, realize freight logistics and information flow simultaneously, as is shown by Equation 8.

$$R(W_j^\sigma, F_e) = \frac{E[(\xi_{W_j^\sigma} - E(\xi_{W_j^\sigma}))(\xi_{F_e} - E(\xi_{F_e}))^T]}{\sqrt{D(\xi_{W_j^\sigma})D(\xi_{F_e})}} \quad (8)$$

RFID to achieve the information identification and collection of intelligence, it's just the achievements of the future efficient transportation and logistics in the first step, to fully play a RFID high efficiency, with full information needs, the need for other information management supporting system. Many of the goods information through the scientific, fast way of allocation, communication technology in the application of great play space.

RFID technology has many advantages that no bar code technology. (1) Reading speed, distance. RFID reader can read more RFID label; also can realize the remote reading. Bar code technology only in specific environment a scan a bar code; (2) It can be accurately labeled single items [21]. The electronic tag can only labeled single articles and other articles with distinction, bar code technology in every bar code can only be labeled class of objects not to single items tracking. (3) Have the advantages of small size, shape. RFID in the read is not affected by the size and shape restrictions, can also be based on the need to miniaturization and diversification of development; (4) Superior physical properties. Can be stored for permanent data, data can be updated dynamically, repeated use, long service life, high and low temperature, can adapt to the working environment, especially the greasy dirt, dust, radioactive and other harsh environment.

The development of RFID technology can be traced back to the Second World War, when it was

used in the air combat operations conducted. Historically, RFID is not a new technology. From the classification, because after years of development, the following 13.56 MHz RFID technology is relatively mature already, at present the industry pays close attention to most is located in the high frequency band of RFID technology, especially the 860 MHz ~ 960 MHz (UHF band) remote RFID's fastest growing; And 2.45 GHz and 5.8 GHz bands by product crowded, its related research and application is still in the exploration stage, as is shown by Equation 9.

$$g = \begin{bmatrix} g_x \\ g_y \end{bmatrix} = \begin{bmatrix} \frac{\partial I}{\partial x} \\ \frac{\partial I}{\partial y} \end{bmatrix} \quad (9)$$

UHF RFID air interface standards including ISO / IEC series, F2C series, as well as China is working on a national standard, a digital receiver can update the software and multiple protocol support, compared with the analog receiver with easy debugging, flexible application advantages, so in the ultra-high frequency being read / write device can be widely used. Improving ultra high frequency RFID reader reading is always the research focus in recent years. After a comprehensive analysis and experimental verification, this paper presents a solution to the problem.

Radio frequency identification system usually consists of electronic tags (RFID) and reader. Electronic tag memory format of electronic data and it is often as symbolic information to identify objects. Application of electronic label attached to identify items to be identified, as goods electronic marker. The reader and an electronic label can be agreed protocol mutual information, typically by the reader to the electronic tag to send commands, electronic label reader according to the received command, the memory of the landmark data back to the reader. This communication is in contact less manner, by using an alternating magnetic field or electromagnetic field spatial coupling and radio frequency signal modulation and demodulation technology to realize, as is shown by Fig. 4.

The paper presents the application of management information system in Internet of things based on RFID technology. RFID technology as a transformative technology, although in recent years it is applied to the field of supply chain management, has shown its role should not be underestimated, for the safe transport of goods to provide technical standards; and UCR for every piece of goods provide a unique number, such goods in transit once lost or to the wrong destination, we can find in UCR the goods, and transported to the exact location, to prevent the loss of the goods occurs. The two technologies make global supply chain transparency, convenient, for future international trade provides a safe environment.

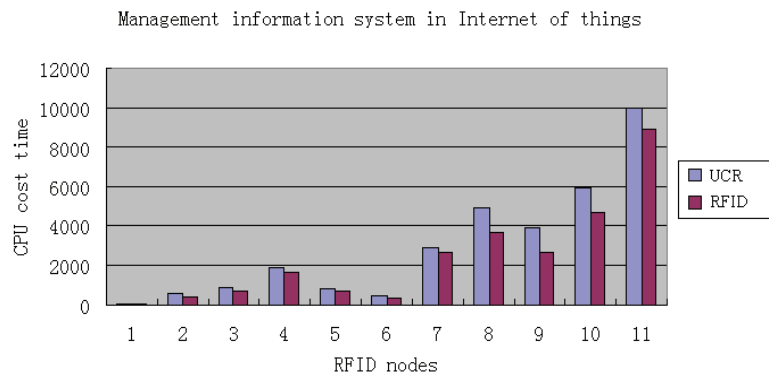


Fig. 4. Compare of management information system in Internet of things based on RFID technology with UCR.

6. Conclusions

RFID technology is the realization of the global supply chain transparent a crucial technology. And non-contact identification technology, RFID system without contact between the transponder and reader can complete the identification, relative and bar code technology, and RFID technology to identify distance more far; therefore it can be widely applied in occasions. Along with large scale integrated circuit technology, the RFID system greatly reduced the volume, has been initially into the practical stage.

RFID is a non-contact automatic identification technology, which can identify the moving objects, the simultaneous identification of multiple objects, non contact mode and no intervention has been widely used in industrial automation, business automation and information automation and many other fields.

References

- [1]. Seonghun Ahn, Byoung Seob Park, Design and Implementation of RFID Middleware System for Ubiquitous Learning Environment using Large Scale Data, *IJACT*, Vol. 1, No. 2, 2009, pp. 73 - 80.
- [2]. He Jialiang, Ouyang Dantong, Ye Yuxin, An Efficient Lightweight RFID Authentication Protocol for Low-cost Tags, *AISS*, Vol. 3, No. 9, 2011, pp. 331 - 338.
- [3]. Minbo Li, Hua Li, Research on RFID Integration Middleware for Enterprise Information System, *Journal of Software*, Vol. 6, No. 2, 2011, pp. 218-226.
- [4]. Joseph K. Siror, Liang Guangun, Pang Kaifang, Sheng Huanye, Wang Dong, Impact of RFID Technology on Tracking of Export Goods in Kenya, *JCIT*, Vol. 5, No. 9, 2010, pp. 190 - 199.
- [5]. Joseph K. Siror, Liang Guanqun, Kaifang Pang, Sheng Huanye, Wang Dong, Use of RFID for Intelligent Pre-shipment Inspection, *JDCTA*, Vol. 4, No. 8, 2010, pp. 242 - 251.
- [6]. Jie Zeng, Meng Zhang, Hu Sheng, Jinxiu Luo, The Intelligent Video Playback System Based on RFID Technology, *Journal of Networks*, Vol. 7, No. 10, 2012, pp. 350-361.
- [7]. Hyung Rim Choi, Byung Kwon Park, Soon Goo Hong, Yong Sung Park, Chang Sup, A Study on Application of a Marine Leisure Activity Management System Using IPRFID, *IJIPM*, Vol. 2, No. 1, 2011, pp. 140 - 147.
- [8]. Chun-Yi Wang, Chi-Chung Lee, Ming-Cheng Lee, An Enhanced Dynamic Framed Slotted ALOHA Anti-Collision Method for Mobile RFID Tag Identification, *JCIT*, Vol. 6, No. 4, 2011, pp. 340 - 351.
- [9]. Jie Wu, Dong Wang, Huanye Sheng, Architecting a Configurable and Reconfigurable RFID Infrastructure, *JCIT*, Vol. 6, No. 6, 2011, pp. 162 - 175.
- [10]. Shi-Feng Liu, China Medicine Pedigree System based on RFID: Analysis and Design, *AISS*, Vol. 3, No. 6, 2011, pp. 95 - 106.
- [11]. Ho Sun Yoon, Heung Youl Youm, An Anonymous Search Protocol for RFID Systems, *JCIT*, Vol. 6, No. 8, 2011, pp. 44 - 50.
- [12]. Feng Xiao, Yajian Zhou, Jingxian Zhou, Hongliang Zhu, Xinxin Niu, Security Protocol for RFID System Conforming to EPC-C1G2 Standard, *Journal of Computers*, Vol. 8, No. 3, 2013, pp. 150-159.
- [13]. He Jialiang, Ouyang Dantong, Xu Youjun, A BRS-based Approach for Modeling RFID Untraceability, *IJACT*, Vol. 3, No. 11, 2011, pp. 96 - 103.
- [14]. He Xu, Suo-Ping Wang, Ru-Chuan Wang, A Novel RFID Reader System Framework based on Peer-to-Peer Network, *IJACT*, Vol. 3, No. 3, 2011, pp. 104 - 110.
- [15]. Kee-Hyun Choi, Kyung-Soo Jang, Ho-Jin Shin, RFID-ACP: RFID-based Digital Content Identification and Authentication Mechanism in Smart Home Environments, *JDCTA*, Vol. 5, No. 6, 2011, pp. 129 - 141.
- [16]. Jie Wu, Dong Wang, Huanye Sheng, RISE-IS: A Semantic Bridge Between EPC Network and RDF-based EPCIS Accessing Applications, *JDCTA*, Vol. 5, No. 6, 2011, pp. 155 - 162.
- [17]. Bing Chen, Chengxiang Tan, Bo Jin, Xiang Zou, Yuebo Dai, RFID-based Electronic Identity Security Cloud Platform in Cyberspace, *Journal of Networks*, Vol. 7, No. 7, 2012, pp. 280-290.
- [18]. He Jialiang, Ouyang Dantong, Xu Youjun, Shang Yu, An Efficient RFID Authentication Protocol Supporting Tag Ownership Transfer, *IJACT*, Vol. 4, No. 4, 2012, pp. 244 - 253.
- [19]. Liu Wei, Niu Ben, Chen Hanning, RFID Network Scheduling Using a Discrete Multi-swarm Optimizer, *AISS*, Vol. 4, No. 22, 2012, pp. 429 - 437.

- [20]. Haitao Zhang, Pu Miao, An Improved RFID Localization Algorithm Based on Layer By Layer Exclusion, *Journal of Computers*, Vol. 6, No. 12, 2011, pp. 58-93.
- [21]. Xue-Jun Zhang, Chuan-Ling Ye, Jun-Fei Ma, An Improved Anti-collision Algorithm with Intelligent Separation for RFID System, *IJACT*, Vol. 4, No. 22, 2012, pp. 823 - 831.

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