

## PAY-OFF SYSTEM IN E-ZPASS USING RFID TECHNOLOGY

Lavanya K<sup>1</sup>, Mangayarkarasi S<sup>2</sup>

Department of Information Technology, Dhanalakshmi College of Engineering, Kancheepuram District, Tamilnadu, India

### ABSTRACT

In this paper RFID technology is used in payment system in Toll Plaza. Radio Frequency Identification (RFID) is a wireless technology, that is increasingly popular for smartphone applications including smart payments and device pairing whose effective communication range is only within a few millimeters. The payment system is done by just “tap and go”. It consists of a reader attached in the toll gate to scan RFID card which will be with the user. To pay for crossing the toll this card is just tapped on RFID reader to make Amount Transaction. The reader also checks for matching of Server ID and user ID with the database. There is also an option for the system to block the card in case of misuse. Finally, after the amount deduction a notification message is sent to the particular card holder’s mobile.

**Keywords:** RFID, Transport, Toll plaza, Mobile payment.

### I. INTRODUCTION

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader, and may be embedded in the tracked object. Radio frequency identification (RFID) is one method for Automatic Identification and Data Capture (AIDC).

Since RFID tags can be attached to cash, clothing, possessions, or even implanted within people, the possibility of reading personally-linked information without consent has raised serious privacy concerns.

The RFID world market is estimated to surpass US\$20 billion by 2014. An Electronic Product Code (EPC) is one common type of data stored in a tag. When written into the tag by an RFID printer, the tag contains a 96-bit string of data. The first eight bits are a header which

identifies the version of the protocol. The next 28 bits identify the organization that manages the data for this tag; the organization number is assigned by the EPC Global consortium. The next 24 bits are an object class, identifying the kind of product; the last 36 bits are a unique serial number for a particular tag. These last two fields are set by the organization that issued the tag. Rather like a URL, the total electronic product code number can be used as a key into a global database to uniquely identify a particular product.

### II. METHODS AND MATERIAL

#### A. Operating Modes of RFID

- a. Active RFID Systems- In active RFID systems, tagtags have their own transmitter and power soursource. Active tags broadcast their own signal to to transmit the information stored on their micmicrochips.
- b. Passive RFID Systems- In passive RFID systsystems, the reader and reader antenna send a radiradio signal to the tag
- c. Battery-Assisted Passive (BAP) Systems-A BattBattery-Assisted Passive RFID tag is a type of passpassive tag which incorporates a crucial active tag tag feature.

## B. Communication modes of RFID

There are two main communication protocols between a Radio Frequency Identification (RFID) tag and a RFID reader-

- a) Tag Talk Only (TTO) protocol
- b) Reader Talk First (RTF) protocol.

## C. Error Detection modes of RFID

There are essentially three types of error detection modes:

- a) Vertical Redundancy Check (VRC).
- b) Longitudinal Redundancy Check (LRC).
- c) Cyclic Redundancy Check (CRC).

The anti-collision process ensures the integrity of the data transmission from multiple RFID tags to a single reader.

## D. Applications of RFID

1. *Fashion*- Smart fitting rooms-In recently reported on retailers outfitting dressing rooms with interactive, RFID powered kiosks. By scanning dressing room items, shoppers can access product data, find similar alternatives, and provide feedback. Retailers in return increase the chances their customers find what they are looking for, collect product insights from consumers, and get access to a reliable anti-theft technology in the process.
2. *Amusement Parks*- *No Swipe ticket passes*-Disney integrated RFID technology into their tickets. The credit-card style tickets eliminate the need for scanning and swiping in ride lines, reducing wait times and lowering staffing costs. Additionally, the RFID-enabled tickets provide park operators a rich source of information for tracking the movement of thrill-seekers throughout the grounds.
3. *Asset Tracking*- Static or in-motion assets tracking or locating, like a healthcare facility, wheelchairs or IV pumps in, laptops in a corporation and servers in a data centre, was not so easy task. User can instantly determine the general location of tagged assets anywhere within the facility with the help of active RFID technology. Control point detection zones at strategic locations throughout the facility allow the user to define logical zones and monitor high traffic areas. Tagged assets moving through

these control points provide instant location data. Asset tracking applications will see an almost vertical growth curve in the coming years and the growth rate in this area will be much higher than the growth rate of general RFID market.

4. *People Tracking* -People tracking system are used just as asset tracking system. Hospitals and jails are most general tracking required places. Hospital uses RFID tags for tracking their special patients. In emergency patient and other essential equipment can easily track. It will be mainly very useful in mental care hospitals where doctors can track each and every activity of the patient. Hospitals also use these RFID tags for locating and tracking all the activities of the newly born babies. The best use of the people tracking system will be in jails. It becomes an easy tracking system to track their inmates. Many jails of different US states like Michigan, California, and Arizona are already using RFID-tracking systems to keep a close eye on jail inmates.



5. *Document tracking*- This is most common problem. Availability of large amount of data and documents brings lots of problem in document management system. An RFID document-tracking system saves time and money by substantially reducing:
  - Time spent searching for lost document
  - The financial and legal impact associated with losing documents.
6. *Government Library*- Many government libraries use barcode and electromagnetic strips to track various assets. RFID technology uses for reading these barcodes unlike the self-barcode reader RFID powered barcode reader can read multiple items simultaneously. This reduces queues and increases

the number of customers using self-check, which in turn will reduce the staff necessary at the circulation desks.

7. **Healthcare-** Patient safety is a big challenge of healthcare vertical. Reducing medication errors, meeting new standards, staff shortages, and reducing costs are the plus points of use of RFID solutions. RFID wristbands containing patient records and medication history address several of these concerns.

**OVERALL BENEFITS**

RFID technology enables businesses to automate labour-intensive processes, authenticate and safeguard their goods, and achieve both real-time inventories and asset visibility. The primary benefit of RFID tags over barcodes is the simultaneous and automatic reading of multiple RFID tags, while barcodes must be visible and scanned manually one-by-one. RFID tags can be read or written at distances of several feet, in motion, in any orientation, through intervening objects, and without the need for line-of-sight access.

1. **Reduces warehouse and labour costs-** It replaces the barcode labour-intensive process of tracking cases, pallets, individual products and cartons with sensors. This can help reduce labour costs as well as service charges of shelf inventory and stock management. Moreover, RFID has unique tags, which make the system error-free as compared to the bar code system.

2. **Cuts labour-intensive cost-** With RFID enabled goods, calculation can be done with a swift scan of all products in the cart reducing labour-intensive costs. Additionally, this will improve the current system being used, helping to enhance adoption, thereby eliminating fraud.

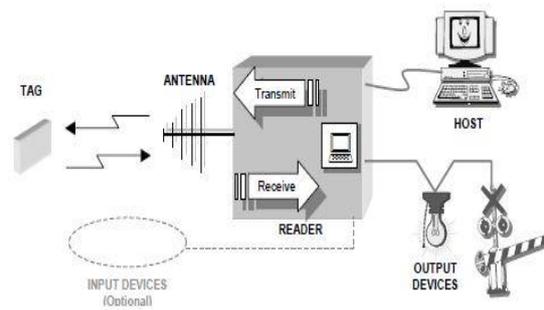
3. **Eliminates losses-** Inventory accuracy helps to eliminate missing/excess inventory, write downs and losses. With RFID, you can minimize inventory errors so that the records provided are factual. RFID tags are also popular since they can withstand harsh temperature and environment.

4. **Improves planning and forecasting-** Visibility improvement can improve the planning capabilities to keep track of the inventory and what changes are made to it. This system will therefore help reduce fraud and losses, as well as missing inventory.

5. **Reduces losses and theft-** With RFID, goods are tracked with pin-point accuracy to ensure there are no inventory errors, which can lead to loses. RFID can also be used in retail stores to keep track of high priced items, to prevent theft.

**COMPARISION WITH EXISTING TECHNOLOGY**

RFID has many advantages over the present technologies in transport like contactless cards, paper magnetic stripe. Tollgates see hundreds if not thousands of vehicles each day and they must serve each of these customers. Each booth can service one vehicle at a time, and the process requires at least one Person per booth and also time to collect payment and provide receipt .Besides this is a Full-fledged computer system and printing device are needed to process the transaction Print out a receipt. The service time is even more important now, due to the heavy traffic that passes through these gate every day any delay in this service would cause the queue waiting to be serviced to increase and cause unnecessary traffic at the tollgate.



RFID and contactless are neither phone nor credit or debit card specific, the term can be used for both. However these types of payments do currently relate to payments made when the customer and device are both physically present at the point of sale or transaction. This will help you from credit card fraud single bank account no one brings an RFID compatible payment device.As long as many plastic cards exists RFID needed other card holds our amount and increases automatically when ever depreciated. But RFID carries manual recharge of your card till sufficient amount using E-wallet concept.

**FACTORS FOR SUCCESSFUL IMPLEMENTATION**

1. **Technical** – Among the technical problems of implementation are imperfect read-rates, unproven

systems, and conflicting problems with assembling low-cost tags. RFID is more expensive than bar codes, and problems can occur when using the tags on metal objects. To reduce tag cost the size of the chip needs to be reduced. However, reductions in the size of the chip make assembly of the tags more expensive. Further, technology vendors do not have a clear idea of what RFID middleware should do. Finally, companies often lack in-house experts with the knowledge to implement RFID technology and hiring outside experts can be difficult and expensive.

2. *Security* – RFID is a wireless technology and, as such, poses some potential security concerns to users regarding the compromise of data during wireless transmission, storage of data, and security of storage sites. Some of the security issues have been addressed by RFID vendors by employing varying querying protocols, jamming and other techniques.

3. *Privacy Issues and Government Regulations* -The use of RFID could have profound social implications. Without safeguards in place, RFID technology has the potential to compromise consumer privacy and threaten civil liberties. Consumer groups have expressed concern over the privacy invasion that might result with widespread application of RFID tags. Governments around the world regulate the use of the frequency spectrum. There is virtually no part of this spectrum that is available everywhere in the world for use by RFID. This means that a RFID tag may not work in all countries. This ultimately hinders the use of RFID tags in a global environment.

### III. RESULTS AND DISCUSSION

#### A. Research work

Arguably the most comprehensive single source on the subject of RFID technology is the book by Finkenzeller (2003) that covers the physical principles of RFID systems and issues related to RFID data processing. Hassan and Chatterjee (2006) present taxonomy for RFID, we have compiled the figures in their paper into a single hierarchical chart that we present as an appendix in Section 7, in order to try and show the breath of this field. Juels (2006) gives a comprehensive survey of the security and privacy issues related to RFID, while Shih et al. (2006) present a survey and taxonomy of RFID anti-collision protocols. Abraham et al. (n.d.), also present a survey paper focusing on anti-collision

protocols for RFID systems and how these systems can be used in inventory management applications. As Zappone's (2007) article infers, RFID systems have become synonymous with "insecure" systems, a situation that must be thoroughly addressed before it severely limits widespread deployment of RFID systems.

#### B. Practical Implementation

Grinvald founded iDriveThru to improve customers' experiences at drive-through windows. The four-year-old company uses a driver's RFID-based E-Z Pass to streamline the ordering and payment process. Grinvald claims that the system, now in use at five Wendy's locations on New York City's Staten Island, has helped to increase consumer spending. The solution incentivizes repeat business by rewarding customer loyalty. (Aug 22, 2014)

PayPal account holders who attended the low festival this summer were able to leave their wallets and purses at home, and instead use RFID wristbands to enter the event, as well as pay for drinks and other goods inside the park on (Sep 23, 2014).

Guests at Hershey Entertainment and Resorts Co.'s Hershey park won't need to reach for their wallets anymore if they participate in using the amusement park's newly adopted Smart Band RFID Wristband system, provided by Precision Dynamics Corp. (PDC). Those utilizing the wristband can load money into a prepaid account, and then use the wristband's built-in RFID tag to make payments at concession stands and stores (Jul 31, 2012)

#### C. Antennas Equation

The success in object identification in manufacturing and logistics using RFID systems Depends on the correct choice and coupling of the transmitting and receiving devices.

The power received by the two antennas (of the reader and of the tag) follows the Friis

Equation:

$$PRX = PTX GTX GRX (\lambda/4\pi r)^2 \tau \rho T$$

Where PRX is the power received by the tag, PTX is the power transmitted by the reader, GTX and GRX are the gains of the transmitting (reader) and receiving (tag)

antennas respectively,  $r$  is the distance among transmitter and receiver,  $\lambda$  is the wavelength of the RF signal,  $\tau$  is the polarization factor, and  $\rho \in [0, 1]$  accounts for the proper antenna-transponder-chip coupling.

Optimization (Trends and Future direction). Pp .46  
Pp.469- 476 20.

[11] <http://www.rfidjournal.com/payment-systems/news>

#### IV. CONCLUSION

RFID has a broad range of possible applications in transport area is necessary. More availability of RFID handsets/devices will be significant in gaining the user attraction. Business structure need to connect many stakeholders who need to be involved in developing an RFID payment system and can bring together information, payment and location through the means of the RFID card and reader attached. With the deployment of RFID, toll gate payment can be done in a easier and smart way and will obviously lead to a good travel experience for passengers.

#### V. REFERENCES

- [1] Weinstein, Ron. "RFID: A Technical Overview and Its Application to the Enterprise." IT Professional, May/June 2005, p 27-33.
- [2] Wikipedia. "Radio Frequency Identification.
- [3] Want, Roy. "An Introduction to RFID Technology." Pervasive Computing, January/March 2006.
- [4] Ferguson, Renee Boucher. "Wal-Mart's CIO Dishes on RFID at NRF Tech Conference." E-Week.com, Aug. 9, 2006.
- [5] IEEE. "Developing National Policies on the Deployment of Radio Frequency Identification (RFID) Technology."
- [6] Ondrus J. and Pigneur, Y.2007. An assessment of NFC for future Mobile Payment Systems. IEEE International Conference on the Management of Mobile Business(ICMB 2007).
- [7] A. Zmijewska. "Evaluating Wireless Technologies in Mobile Payments-A Customer Centric Approach." IEEE International Conference on Mobile Business (ICMB'05).
- [8] Chen, L.2008. A model of consumer acceptance of mobile payment. Int J.Mob. Comm, 1(Jan 2008)32-52.
- [9] Vibha Kaw Raina, "Integration of Biometric authentication procedure in customer oriented payment system in trusted mobile devices.
- [10] Vibha Kaw Raina & U.S Pandey. Research Objectives and an overview of wireless Technologies in payment systems. Proceedings of International Conference on Reliability, InfoCom, Technology and