Using Advanced RFID for Tollplaza Collection without Manpower

S. Vasantha Kumar

UG Scholar, Dept of ECE, Shree Sathyam College of Engineering and Technology, Sankari, India.

N. Prakash

Assistant Professor, Dept of ECE, Shree Sathyam College of Engineering and Technology, Sankari, India.

R. Ranjitha

Assistant Professor, Dept of ECE, Shree Sathyam College of Engineering and Technology, Sankari, India.

S.P. Santhoshkumar

Assistant Professor, Dept of CSE, Shree Sathyam College of Engineering and Technology, Sankari, India.

Abstract – Nowadays, streams of traffic are increased and toll gate on highways are congested. It will cause the traffic jam and waste time. So in this project we are proposing an Automated Toll System is used for toll collection without making traffic congestion and waiting in long queue with help of RFID technique without manpower. Also, by using this system, it will save time, i.e. by avoiding long queue as no need to stop the vehicle and no need of manual transaction. Most important that, the stolen vehicle will be able to catch easily with help of RFID technique and nail assembly. There are three portions in toll collection system. They are RFID system, balance deduction system and toll gate control system. In this paper, we are using advanced RFID for toll plaza gate open and close. The toll plaza gate design also changed for RFID characteristics.

Index Terms – Toll System, traffic congestion, Advanced RFID, Toll plaza Collection, GSM, SMS.

1. INTRODUCTION

Toll plaza system increasing traffic volume makes congestion commonly around the tollgates of Highway. So, reform measure of congestion around the tollgates is urgently required. One of the methods is Toll Collection System. Develop a micro simulation model, which reproduces the operation states of various tollgate systems: waiting time, passing time. With this simulator, proposed the optimal operation strategy of highway tollgate by benefit-cost analysis on the basis of benefit in saving total waiting time and operating cost.

Reduce time for collecting toll at the toll plaza. RFID tags can be read at much greater distances; an RFID reader can pull information from a tag at distances up to 300 feet. As the vehicle approaches the identification site, the computerized control unit placed near toll lane receives the identifier signal and calculates the toll to be debited and electronically debits the toll on the account of the particular vehicle. This system allows a vehicle to persist past the scan point without stopping,

thus offering maximum convenience to motorists, speeding up the flow of traffic, and reducing the number of human resources required at highway toll plazas. Smooth traffic flow at toll gates. Convenient toll collection without handling cash. Reduction of management costs. Convenient and quick service to the vehicle owners. Stolen vehicles can be detected. Automated Toll System using the RFID technology, it contains the RFID tag and the RFID reader. RFID tends the Radio Frequency Identification; they consist of the tags which can be either active or passive. Passive RFID tags do not have their own power supply: the minute electrical current induced in the antenna by the incoming radio-frequency scan provides enough power for the tag to send a response. Due to power and cost concerns, the response of a passive RFID tag is necessarily brief, typically just an ID number [1].

Active RFID tags, on the other hand, must have a power source, and may have longer ranges and larger memories than passive tags, as well as the ability to store additional information sent by the transceiver. The technological differences between tag types do not affect their abilities to collect travel time data; the necessary data (i.e. unique ID numbers) are transmitted from the transponders to the roadside units regardless of transponder type. At present, the smallest active tags are about the size of a coin. Many active tags have practical ranges of tens of meters, and a battery life of up to several years. Radio frequency identification (RFID) is a method of remotely storing and retrieving data using devices called RFID tags. An RFID tag is a small object, such as an adhesive sticker, that can be attached to or incorporated into a product. RFID tags contain antennae to enable them to receive and respond to radio-frequency queries from an RFID transceiver. [1].

RFID tags can be either active or passive. Passive RFID tags do not have their own power supply: the minute electrical

current induced in the antenna by the incoming radio-frequency scan provides enough power for the tag to send a response. Due to power and cost concerns, the response of a passive RFID tag is necessarily. Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag. [1].

2. RELATED WORKS

2.1. RFID based automatic tollgate system

Electronic toll collection system allows the vehicle drivers to pass the toll tax booths without stopping at the toll booths. The toll amount is deducted from the RFID card. This RFID card is rechargeable and account is stored on the records.

Automatic toll collection system will have two benefits. First benefit is that movement of traffic will be much faster as user will not wait to give the money because, driver has to just show the RFID card in-front of the card reader. And then the RFID based automatic gate control system will open the gate to pass through. Second benefit is that driver doesn't have to carry the money each time. He/she will just recharge the RFID card by certain amount and will use this card each time he travels. This is little bit similar to using credit cards.[2]

2.2. Automated toll gate collection with complex security system

The current system for collecting toll is on the basis of manual transaction which involves stopping each vehicle at the toll plaza for vehicle information and to get the appropriate payment. An automated tollgate collection with complex security system with the help of Smart card and RFID technique is used for toll collection without making traffic congestion and waiting in long queue. Here, no need to stop vehicle at toll plaza, the system will detect the RFID tag, which gives the vehicle information.[3]

2.3. Automatic toll gate management and vehicle access intelligent control system

Radio Frequency Identification (RFID) is an auto identification technology which uses Radio Frequencies (between 30 kHz and 2.5GHz) to identify objects remotely. The paper describes a system which does the job of detecting, billing and accounting for vehicles as they pass through a tollgate using RFID as the identification technology. In the design, a frequency of 928MHz is used as it is in the Industrial Scientific and Medical (ISM) band. The system is a great investment in the transport industry. It reduces the common hustles in accounting for the movement of goods from point to point. The design can be further developed to aid the satellite surveillance systems once all toll gates are networked.[4]

2.4. Electronic toll collection system for efficient traffic control system using ANPR

In this research paper we examine the image & the respective information will be processing based toll collection system and how to make more efficient and perfect. On any toll both the vehicle has to stop for paying the toll. We are trying to develop a system that would pay the toll automatically and reduce the queue at the toll booth. In this system camera is used for capturing the image of the vehicle number plate. The captured image would be converted into the text using ANPR and the toll would be cut from the customer's account and then open the gate. Moreover in our system if a vehicle is stolen and an entry is being made in the central database by the police then if the vehicle passes through the toll both then silent alarm would buzz which would indicate the operator at the toll booth that the vehicle is a stolen vehicle. For the identification of the vehicles, the information of the vehicles is already stored on the central database. So captured number will be sent to the server received at the toll [5].

2.5. Vehicle theft alarm and tracking the location using rfid & gps

GPS is the most important technology for tracking the location of the vehicle. By using this, we can easily identify the location in which it is available. Nowadays, RFID is used in many applications such as a toll gate system, Automatic fuel filling in petrol bunk, Railways inquiry center. Security is the most important thing that everyone is expecting in their basic needs which is to be fulfilled. To achieve that, Vehicle theft alarm and tracking the location using GPS and RFID is implemented. In this technique, both security and tracking the vehicle is done. ATMEGA 162v is the low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. A buzzer is used to indicate the vehicle and give the alert to the authenticated user. GSM is used for mobile communication and also for the alert message [6].

3. EXISTING SYSTEM

The current system for collecting toll is on the basis of manual transaction. In this each vehicle has to stop at the toll plaza for payment and there can be a problem of exact transaction. It causes traffic congestion. It takes huge time to complete the transaction process for each vehicle. It requires Manpower.

4. PROPOSED SYSTEM

In this proposed system an automatic system of toll gate for monitoring and controlling the entry of vehicle. This RFID-based system automatically records time and the details of vehicle's entry time, owner's name, mobile number and vehicle model etc. Once if the RFID tag is been read then the amount for the transaction will be debited automatically from the users

account. The IR sensor is used for the automatic gate opening once if the payment details are successful.
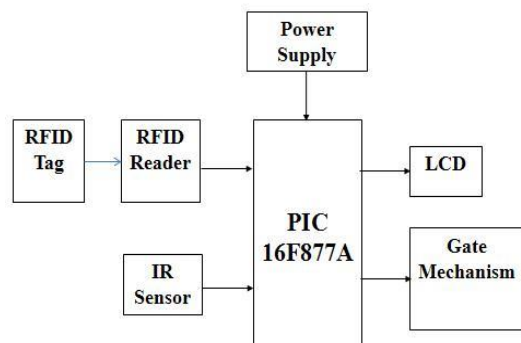

Figure 1: Block Diagram of the Toll plaza System

4.1. GSM information with SMS Indication:

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves.

A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer. It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. As mentioned in earlier sections of this SMS tutorial, computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands. You can use a GSM modem just like a dial-up modem. In addition to the standard AT commands, GSM modems support an extended set of AT commands.

These extended AT commands are defined in the GSM standards. With the extended AT commands, you can do things like:

(a). Reading, writing and deleting SMS messages.

(b). Sending SMS messages.

(c). Monitoring the signal strength.

(d). Monitoring the charging status and charge level of the battery.

(e). Reading, writing and searching phone book entries.

The number of SMS messages that can be processed by a GSM modem per minute is very low -- only about six to ten SMS messages per minute.
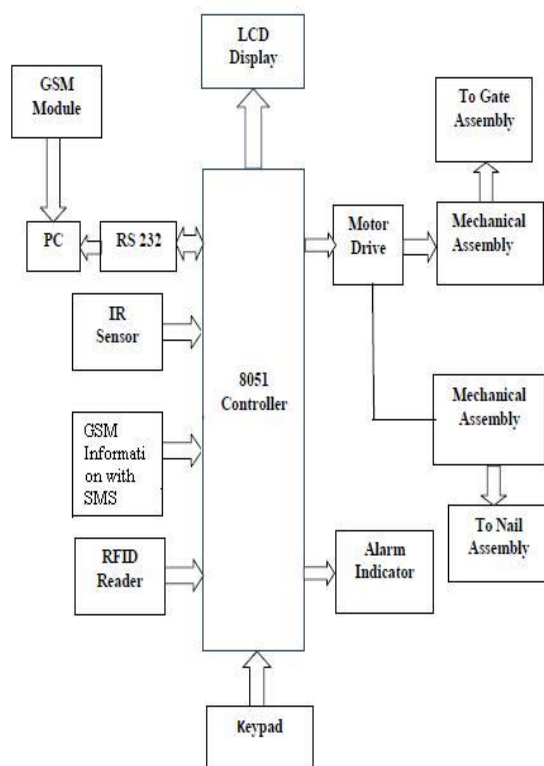
5. SYSTEM ARCHITECTURE

The deals with the transmitter section where the vehicle Number , smart card number details of the vehicle are taken they are verified with the data base and checked, if the details satisfy, after transferring the data the comes to the receiving section the encoded signal is decoded and the given to the microcontroller the microcontroller does the two things, it displays the data on the PC which is to be verified by the security and the vehicle gets the relevant receipt, if the details are verified after the transaction then goes to actuator unit and then the gate opens automatically.

Radio frequency identification (RFID) is a method of remotely storing and retrieving data using devices called RFID tags. An RFID tag is a small object, such as an adhesive sticker, that can be attached to or incorporated into a product. RFID tags contain antennae to enable them to receive and respond to radio-frequency queries from an RFID transceiver.

Microcontroller is used to controlling the process.IR sensor is used to detect whether the vehicle gone or not to close the gate again and to make nails down. The system is connected to a PC using the RS232C interface in the embedded system. This allows the system to read and write data from/to a database that is from the account. From this database send the user update about his balance. And from that send the reminder on him mobile and balance update. RS232 is used for serial communication. By using RS232 signal is transferred from RFID to pc. An RFID tag is installed on each vehicle with read/write memory. A reader device reads this data when near to toll system from the vehicle and compares it with the data in the computer database, if ID is in defaulter i.e. complaint is in police station about lost or something for security purpose nails get up so that it will not able to go outside and it will get automatically caught then allows the access accordingly by opening the gate. But, ID is not in the defaulter list, toll collection is taken and nails goes down and gate get open .The entire system is developed as an embedded system using micro-controller and associated devices. The system is connected to a PC using the RS232C interface in the embedded system. This allows the system to read and write data from/to a database that is from the account. Keypad is used to control the gate and nail position. IR sensor is used to detect whether the vehicle gone or not to close the gate again and to make nails down.

5.1. Advantages:

No man power. Simultaneous multiple detection of vehicles are possible using RFID. Saves time and money. Minimizes work stress and GSM information with SMS indication.

[5] Manish Buhptani, Shahram Moradpour, "RFID Field Guide - Developing Radio Frequency Identification Systems", Prentice Hall, 2005, pp 7-9, 16-225, 160, 231.

[6] Sewon Oh, Joosang Park, Yongioon Lee, "RFID-based Middleware System for Automatic Identification", IEEE International Conference on Service Operations and Logistics, and Information, 2005.

[7] Shi-Cho Cha Kuan-Ju Huang Hsiang-Meng Chang, " An Efficient and Flexible Way to Protect Privacy in RFID Environment with Licenses ", IEEE International Conference RFID, April 16-17,2008.

[8] Raj Bridgelall, Senior Member, IEEE, " Introducing a Microwireless architecture for Business Activity Sensing ", IEEE International Conference RFID, April 16-17,2008

[9] Rahman, Rohisyam (2007-07-23). "Case Study: Malaysian Smart Shelf". http://www.rfid-asia.info/2007/07/case-studymalaysian-   smart-shelf.htm.Retrieved 2007-08-03.\

[10] "Hitachi's RFID powder freaks us the heck out". Engadget http://www.engadget.com/2007/02/14/hitachis-rfid-powderfreaks-us-the-heck-out. Retrieved 2010-04-24.

[11] ["Looking Back at the Wal-Mart RFID Time Line". 2009-03-24. http://www.scdigest.com/assets/On_Target/09-02-23-1.php?cid=2275.Retrieved 2009-12-03.

[12] N. E. Fenton and S. Pfleeger, Software Testing, Thomson Asia, 2007.

[13] Urachada Ketprom, Chaichana Mitrpant, Putchapan Lowjun, "Closing Digital Gap on RFID Usage for Better Farm Management", PICMET 2007, 5-9 August.

[14] Markus Hansen, Sebastian Meissner: Identification and Tracking of Individuals and Social Networks using the Electronic Product Code on RFID Tags, IFIP Summer School, Karlstad, 2007.

6. CONCLUSION

Designed a system to give complete solution for traffic and transport related problems such as Toll gate control, traffic signal control, traffic rules violation control, parking management and special zone alert using the Advanced RFID technology. It is proposed as a low cost optimized solution using RFID and GSM mobile technology. At the toll plaza, there will be a large LCD screen for displaying details of the transaction.

At the same time, it will show:

a. Total cost of that road.

b. The duration of toll plaza.

c. And the remaining balances after each transaction.

REFERENCES

[1] RFID based toll collection system,2011 IEEE third international Conference.

[2] "Hitachi's RFID powder freaks us the heck out". Engadget http://www.engadget.com/2007/02/14/hitachis-rfid-powderfreaks us the heck out. Retrieved 2010-04-24.

[3] Sachin Bhosale, "AUTOMATED TOLLPLAZA SYSTEM USING RFID", ISSN: 2278 – 7798 International Journal of Science, Engineering and Technology Research (IJSETR) Volume 2, Issue 1, January 2013.

[4] Asif Ali Laghari, "RFID Based Toll Deduction System", I.J. Information Technology and Computer Science, 2012, 4, 40-46 Published Online April 2012 in MECS (http://www.mecs-press.org/)DOI: 10.5815/ijitcs.2012.04.06.