Toll Collection and Stolen Vehicle Detection Using RFID
Prathamesh Jagtap¹, Pankaj Barge², Shailesh More³, Prof. A. D. Gujar⁴
¹prathameshjagtap155@gmail.com
²pankajbarge93@gmail.com
³shaileshmore@gmail.com
¹²³ Dept. of Computer Engineering, B.S.C.O.E.R. University of Pune, Maharashtra, India.
⁴Professor. Dept. of Computer Engineering, B.S.C.O.E.R. University of Pune, Maharashtra, India.

ABSTRACT
In automated toll collection system passive Radio Frequency Identification (RFID) tag used, it emerges as a best solution to the manually operated toll collection method. Time and efficiency are so much affect’s in present day. In order to overcome the vital issues of vehicle congestion and time consumption RFID technology is used. RFID reader is at toll booth (or even a hand held reader at manual lane, in case RFID tagged vehicle enters manual toll paying lane) reads the tag attached to the vehicle. The object detection sensor in the reader identify the approach of the incoming vehicle’s tag and toll deduction takes place through a prepaid card assigned to the concerned RFID tag that belongs to the owners’ account. This makes tollgate transaction easier for the public use.

Radio Frequency Identification (RFID) is an automatic identification technology which uses Radio Frequencies (between 30 kHz and 2.5GHz) to identify objects automatically. Due to long queues in toll plazas it is not comfortable to pay a toll immediately. We design a system which remove this problem using automated toll plazas. Basic idea behind this is that reduced time & money in existing toll collection system.

Keywords— RFID, Reader, Prepaid Card, Electronic Toll Collection.

I. INTRODUCTION
Radio frequency identification (RFID) technology is a non-contact method of item identification based on the use of radio waves to communicate data about an item between a tag and a reader. In addition to this, it can not only help in vehicle theft detection but also can track vehicles crossing the signal and over speeding vehicles. This system is used by vehicle owners, system administrator. Other general advantages for the motorists include fuel savings and reduced mobile emissions by reducing stopping time and acceleration.

The benefits for the motorists include:
1. Fewer or shorter queues at toll plazas by increasing toll booth service turnaround rates.
2. Faster and more efficient service (no exchanging toll fees by hand)
3. The ability to make payments by keeping a balance on the card itself
4. The use of post-paid toll statements (no need to request for receipts)
5. Lowered toll collection costs
6. Better audit control by centralized user account and
7. Expanded capacity without building more infrastructures.

II. LITERATURE SURVEY
The need for manual toll based systems is completely reduced in this method and the tolling system works through RFID. A complete RFID system consists of a transponder (tag), reader/writer, antenna, and computer host. The transponder, better known as the tag, is a microchip combined with an antenna system in a compact package. The microchip contains memory and logic circuits to receive and send data back to the reader. These tags are classified as either active or passive tags. Active tags have internal batteries that allow a longer reading range, while passive tags are powered by the signal from its reader and thus have shorter reading range. Passive RFID have no
internal power source and use external power to operate. These tags are powered by the electromagnetic signal received from a reader. The received electromagnetic signal charges an internal capacitor on the tags, which in turn, acts as a power source and supplies the power to the chip. Though these passive tags have both UHF and LF, the low frequency tags are best because UHF tags have high read range and hence capable of reading multiple tags simultaneously which in turn may lead to collision.

The obvious advantage of the strip in our project is that it reads only one tag at a time and hence it is very advantageous compared to all the other previously existing system. With reference to Journal of Theoretical and Applied Information Technology the study regarding the previously existing techniques such as using Optical Camera Recognition, Microwave Technology, RFID technology (active), GPS proved to be inefficient in some ways and these are discussed below. When taken into consideration the optical camera recognition since the whole object will be captured it is a time consuming process and also the error rectification in the laser cameras is very difficult. Seeing through the Microwave technology it requires different transponders and also it tends to produce various problems regarding reflection. The Active RFID technology also did not prove to be useful since the reader used has long read range which can result in collision reading multiple tags at a time and also it cannot function without battery power, limiting the lifetime of the tag. Thus our project which uses passive RFID technology proves to be very efficient having small read range and also avoids problems like reflection, cost, lifetime and different transponders.

**Limitation of existing system**

- The current toll collection system is manual so it required a large time.
- The manual toll collection system has less efficiency and accuracy.

The manual toll collection is required large time so traffic jam at toll plazas

**III. PROPOSED SYSTEM**

This project deals with the simplification of procedure followed by passengers to pay toll at toll collection booths, like making it automated, vehicle theft detection etc. All these activities are carried out using single smart card (RFID tag), thus saving the efforts of carrying money and records manually.

Whenever any person buys a vehicle, one first needs to get his or her vehicle registered at the RTO office. RTO officials will not only assign a number plate to it but also will give a RFID enabled smart card or a tag. This card will have a unique ID feasible to use with that vehicle only.

They will also create an account for the use of that particular smart card and maintain transaction history in database. User needs to deposit some minimum amount to this account.

Every time a registered vehicle approaches the toll booth, first the Infrared sensors will detect the presence of the vehicle. It will in turn activate the RFID circuit to read the RFID enable smart card fixed on the windscreen of the vehicle. Transaction will begin, depending upon the balance available toll will be deducted directly or the vehicle will be directed towards another lane to pay tax manually. The software further updates the details in the Centralized database server. It also triggers mechanism to generate the bill and will be sent to user as a text message.

![Figure 1: Working module](image-url)

On the other hand, whenever any vehicle owner registers a complaint to RTO office regarding theft respective entry is made in the database. Now any vehicle arriving at toll booth with same ID as already present in stolen vehicle category will be easily identified as the ID assigned with it is unique.

All the toll plazas will be connected to each other along with the centralized server in the form of LAN. Updates of any sort of transaction will be immediately updated to local database and centralized server.

**Architecture of RFID based toll collection system:**
Algorithm

- Step 1: start.
- Step 2: Detect the RFID tag.
- Step 3: check for stolen vehicle. If vehicle is stolen then report to the Police. Else read RFID tag.
- Step 4: check balance. If balance is enough then deduct the toll amount from the tag. Else go to 7.
- Step 5: update database and tag balance.
- Step 6: send text message to the user.
- Step 7: recharge account & go to step 4.
- Step 8: end.

IV. EXPERIMENT

To execute our proposed framework we will set experiments. As our first step is giving unique ID to each user with RFID reader. We can perform the registration of all the users with all model numbers of vehicles. The police compliant of stolen vehicle is done with the proper database connectivity.

V. RESULT

With consideration of proposed architecture we design an automated toll collection system which gives a result as deduction of toll from users unique account. And secondly if the vehicle is stolen then successful compliant to the police.

VI. CONCLUSION

The RFID Automatic tollgate system designed could automatically detect the identities of the vehicles and performed the billing in accordance to the identity of each vehicle as pre-recorded in the database. The system could automatically open and close the gate as well as automatically emailing the owners of the vehicles. These were the major achievements met in the project, among other objectives also achieved which include tracking of the vehicles and remote database connection. However proper demonstration of some of the objectives did not yield to the wanted extent due to lack of resources for example remote database connection needed a pre-set Virtual Private Network and automatic synchronizing software which was not readily available. Reading items and objects in motion can be done accurately using RFID. A system developed with a log in windows enables security and the overall cost of implementing the system may seem high but after a year of running the system, very high benefits will be realized.

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REFERENCES
