

# RFID Based National E-Tolling System to Reduce Waiting Time of Vehicles at Toll Gates

Aruna T M, Nandini P, Pallavi R

**Abstract**— Toll it is a common terminology now a days for all people who are travelling either in bus or in their own vehicle. It became more familiar for the people who are residing in the metro cities as they need to cross these tolls in each and every day of their lives though they are travelling with in the city. The waiting time at Toll Gate systems has become a major issue. The main reasons for this is number of vehicles are increasing day by day. So many techniques are implemented to avoid this waiting issue. There are so many limitations because of which the waiting time has been reduced in some places but not entirely avoided. In this system the techniques introduced will avoid almost waiting time at toll gates and also provides global solution for the tolling systems to avoid heavy rush.

**OBJECTIVE:** The main aim of this system is not only to avoid waiting time and also to provide a much secured system to the user as well as toll gate owners to communicate.

**METHODS:** The main concept used in this project is keeping RF Tags to each and every vehicle by means of unique ID number.

**FINDINGS:** Whenever the vehicle comes near to the tollgate the RFID reader reads the information and respective amount will be debited and the boom will be opened automatically. In this case the car owner no need to stop his vehicle the only concern is he should maintain the speed which is specified at the toll gates until he crosses the boom (Approximately 60Kmph). So this solution will really help Vehicle owners not to waste their times at toll gates.

**Index Terms**— Tolling System, RFID, BOOM, Unique ID Number

## I. INTRODUCTION

This system is not only concentrating to avoid waiting time and also to provide a much secured system to the user as well as toll gate owners to communicate. The main concept used in this project is keeping RF Tags to each and every vehicle by means of unique ID number. Whenever the vehicle comes near to the tollgate the RFID reader reads the information and respective amount will be debited and the boom will be opened automatically.

In this case the Vehicle Owner no need to stop his vehicle the only concern is he should maintain the speed which is specified at the toll gates until he crosses the boom [1]. So this solution will really help car owners not to waste their times at

toll gates. The amount will be debited in three ways based on Vehicle Owners Interest. The three ways followed in this system are Account Debit, Credit Card Debit and Android Application (E -Wallet).

1. If Vehicle Owners ready to share his account details, the application will be directly connected to his personal account from which the amount will be debited once the RF Reader reads the Vehicles RF Tag.
2. If Vehicle Owner willing to share his credit card details then the application will be directly linked to his credit card through which the amount will be debited and same will be informed to Credit card Holder through Email or Mobile.
3. If Vehicle Owner is not really interested to share his Account details or credit card details then the E-Tolling system will be linked to an android application (E-Wallet) in which the Vehicle Owner can add money before itself and same will be debited when he reaches toll gate.

The other advantages with this applications is before he starts his journey in any direction throughout India he can enter Source and Destination details, where the Vehicle Owner will get the information like How many Toll Gates are there? How much money he need to pay? And also this application provides information such as Hotels, Hospitals etc., The main advantage of this E Tolling system is the Vehicle Owner can save the time and also can plan his journey accordingly wherever he travel throughout India [2]. One more idea behind this E Tolling system is to bring a National E-Tolling system where the toll gate owners should maintain same fee in throughout India in order to avoid corruption.

## II. MODEL AND METHODOLOGY

The fig 2.1 depicts exactly how this system is going to work. Whenever the Car reaches the nearest point to tollgate the RF reader starts reading the RF Cards which is inserted in the Vehicle. Once the RF Reader reads the Vehicle id it will invoke the operation of debiting corresponding money from customer account based on different kind of parameters such as Type of the Vehicle, Class of the Vehicle etc. once it finds the basic information from the Vehicle like Unique ID from the RF Card it will retrieve the information from the database such as how much amount needs to be debited from account and what is the mode the vehicle owner chosen for paying money, then it will debit it, once the operation is successful it will send a signal to bump the bump will open automatically. And also a notification will be made to vehicle owner regarding this through E-Mail and Message.

Aruna T M, Asst. Prof, Department of ISE, Sri Venkateswara College of Engineering, Bangalore, Karnataka, India

Nandini P, Asst. Prof, Department of CSE, Sri Venkateswara College of Engineering, Bangalore, Karnataka, India

Pallavi R, Asst. Prof, Department of CSE, Sri Venkateswara College of Engineering, Bangalore, Karnataka, India

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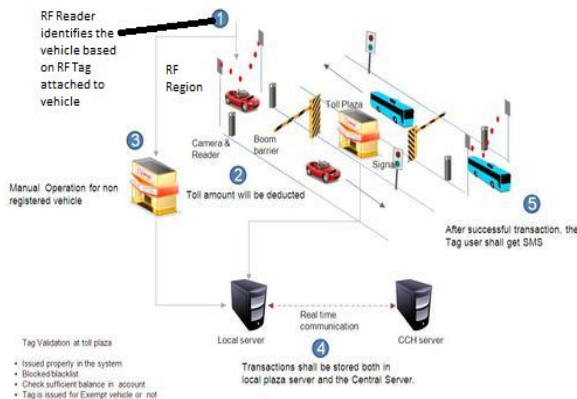


Fig 2.1: Working Principle

The Vehicle Owner should slow down the vehicle at certain point of time which is specified by the E-Tolling system to complete the above process. The maximum time consumed to complete the above operation is approximately 1 or 2 Min.

The only drawback of this system is if Car Owner don't have sufficient or required amount in his account or credit card or in E-Wallet then he has to make some alternate arrangement before he reaches tollgate then should move towards the tollgate [3].

In order to avoid the above problem this system also provides a special feature whenever he is travelling towards the tollgate. Fig 2.2 depicts the architecture of E- Trolling system. The E-Tolling system gives information to Vehicle Owner that there is a toll gate in another 1 Km distance. So if customer feels there is something wrong with his or her account or credit card or E-Wallet he/she can stop there itself and fill the required amount or make some alternate arrangement and move towards tollgate.

In a scenario if customer reaches toll gate he does not have money in his account, credit card or E Wallet then the E-Tolling application will wait for 2-3min after initiating the activity of debiting amount and will give a error signal to Vehicle owner and send a unique error number to alert and to do necessary action[4].

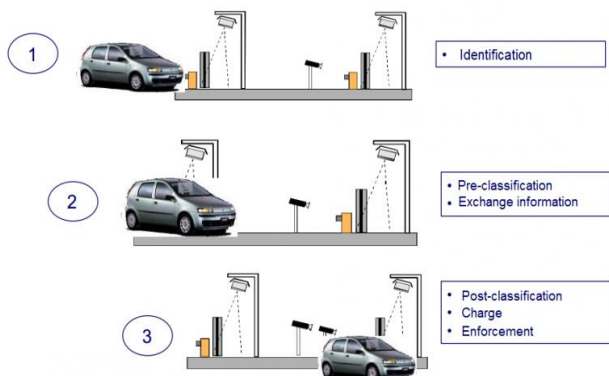


Fig 2.2: E-Tolling System Overview

### III. ALGORITHMS USED

#### Algorithm to find out the waiting time of a Vehicle

- Start
- Initiate the clock function to find out the waiting time.

- Identify the Vehicle with Radio Frequency
- If the vehicle is identified
- Start the transaction using any of the 3 options
- Switch(choice)
- Case 1: Debit the amount from account
- Case 2: Debit the amount from the Credit/Debit card
- Case 3: Debit the amount from the E Wallet
- Stop the clock function and open the bump
- If Exact Vehicle is not found
- Close the bump/boom
- And indicate the vehicle he cannot pass this toll gate.

The system will collect the different samples of waiting time in order to reduce the time.

#### Algorithm to find the distance and different toll gates exists between source and destination:

Here the Vehicle Owner opens the application provided by the E-Tolling system which needs to be installed before itself. in order to find out the distance he/she need to travel, number of toll gates heshe need to cross ,amount he should pay for each and every toll gate and total amount to be paid as toll till he/she reaches destination.

#### Alg: Finding the distance ,Number of Tolls and Amount need to be maintained in the account

1. Start
2. Enter the source and destination.
3. Find the distance between given source and destination.
4. Display the distance and also number of toll gates.
5. Now find the amount to be paid.
6. Number of tolls \* Toll amount for that particular class of vehicle=Total Toll amount
7. Display toll amount and total toll amount.
8. Stop

In order to use this system the customer should switch on GPS in his mobile if he wants to receive the information regarding the tolls ahead.

### IV. TECHNOLOGY

In this system the technology used is RFID based system in order to perform the activities with respect E-Tolling. And the base technology used for programming in this system is Java to open and close Boom.

This system also uses Open Street Maps to identify the location, number of toll gates, hospitals, hotels etc.,

## V. CONCLUSION

After studying the entire ETolling system it is concluded that the waiting time for the vehicle owner has been reduced at max and also it is fully secured, vehicle owner no need to worry about the toll fee as this system works on the principle of Global Toll Fee System. And the other advantages if vehicle owner added some amount to his E-Wallet if he is not travelling for 15 or 20 days time he can make use of same amount for different purposes such as Recharge, Shopping Etc....,

## VI. FUTURE ENHANCEMENT

In Future this system will integrate with the toll cards which are going to be provided by the banks to do smoother functionality with respect to money. This system can also be implemented for State Tolls and also for the small tolls at Techno parks in India.

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