

# Automatic Toll collection and Antitheft system

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**Abstract** – In 2011 prepaid card toll collection was introduced in India. This Electronic toll collection system avoids wastage of time and little bit good management also. But It does not provide security as anyone can utilize that card. Hence motivation behind our project is to provide efficient time utilization, good management and antitheft system also. RFID has an unique identity number. Every vehicle will be given an unique number, all information will be transferred and toll payment will also be done. For security purpose also RFID can be used. Radio-frequency identification (RFID) is the advanced technology with wireless use to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. Message of amount of toll will also be given to owner of the vehicle using GSM. In this paper avoidance of use of Prepaid card is the feature. So In this paper we describe automatic toll collection using RFID.

**Index terms** – Toll collection, RFID, GSM

## I. INTRODUCTION

A basic commercial contract is agreed by a road user and the operator in Toll collection mechanism. The Operator states a charge for use of his road network the road user agrees to pay that charge which is decided by the operator. The reason behind the toll tax collection is to recover the total capital outlay. There is need of the new facility to be constructed to provide reduced travel time. There is need to increase the level of service. The concept of toll collection for use of transport infrastructure is not new. In this paper RFID is used to detect the vehicle and to provide all information about vehicle. Radio-frequency and identification (RFID) is the wireless use of electromagnetic fields. It is used to transfer data for the purposes of automatically identifying and tracking tags attached to objects. Electronically stored information is contained by the tag. The purpose of this type of toll collection is to provide automation to the process of toll collection in order to provide the best toll collection as well as antitheft system. Currently, Gujarat started use of RFID for tracking vehicle on toll plaza. [1][2]



Figure 1. RFID

This paper explains the method which not only detects the vehicle but also provides many features along with it. In this paper Vehicle is tagged with its own RFID tag. At the toll plaza RFID reader is there. When vehicle comes in range of RFID then it will try to match the unique code of vehicle. And information is transferred by RFID to PC. Auto Update is there in PC for every vehicle. Vehicle no., License no., license issue date, license expiry Date, time of toll collection and mobile no. of owner is displayed on PC.

Time required to be in queue is reduced as well as change problem is also not there due to online payment. In short this paper describes an efficient way of toll collection. This paper explains well managed toll collection system.

## II. TOLL COLLECTION METHODOLOGIES

In the circumstances of Toll collection, the toll is collected by different methods. An overview of some of these toll collection methods are given below :

**1. Manual Toll collection:** Manual approach is the most traditional approach for collecting charging or toll collection. The most significant components of a MTC / MRC system are:

- Toll Collectors & Staff
- Road Side Equipment (RSE)
- Cash Handling System
- Toll Plaza / Booths
- Back Office System

According to the manual toll collection methodology, a driver stops at a charging booth. A driver pays the required fee directly to a collector. According to the characteristics and classification the amount will be paid by each vehicle. The purpose of toll tax collection is to recover the total capital outlay. This total capital outlay includes the cost of repairs, construction, maintenance, expenses on toll operation and



interest on the outlay. To provide reduced travel time and increased level of service the new facility is constructed.[4][6]



Figure 2. Manual Toll collection

**2. Automatic Toll collection:** Automated Coin Machine (ACM) is used in Automatic toll collection. Coins and tokens both are accepted by operating agency. Automated Coin Machine is used and it is based on toll collection rate. This method reduces transaction and processing time. Transaction and processing time is more in manual toll collection method. This method also reduces operating cost. When vehicle stops at toll booth, the operating agency accepts coins and tokens. Automatic Toll collection is easier and better as compared to manual toll collection method. Automatic toll collection speed up the processing time but it needs improvement. [4]

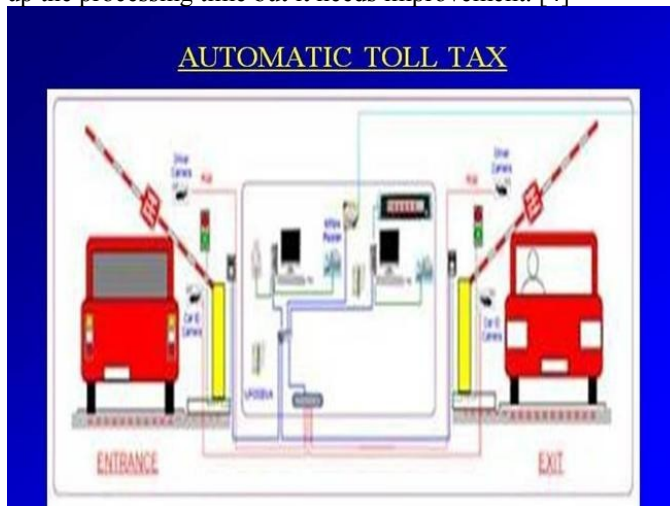


Figure 3. Automatic Toll collection

**3. Electronic Toll collection:** In this method a vehicle equipped with a valid encoded data tag or it is equipped with transponder as it moves through a toll lane or checkpoint. Electronic Toll Collection (ETC) is a system that automatically identifies that data tag or transponder. Without the patron having to stop to pay the toll, the ETC system then posts a debit or charge to a patron's account.

This system (ETC) increases the lane throughput the reason is that the vehicles need not stop to pay at the toll booth. E-Tolls aims to eliminate the delay which occurs on toll road. All this is done by collecting tolls electronically.

The cars passing are enrolled in the program or not is determined by ETC and then alerts are enforced for those that are not. Then it electronically debits the accounts of registered car owners. Hence there is no need to stop.[5]



Figure 4. Electronic Toll collection

### III. PROPOSED SYSTEM

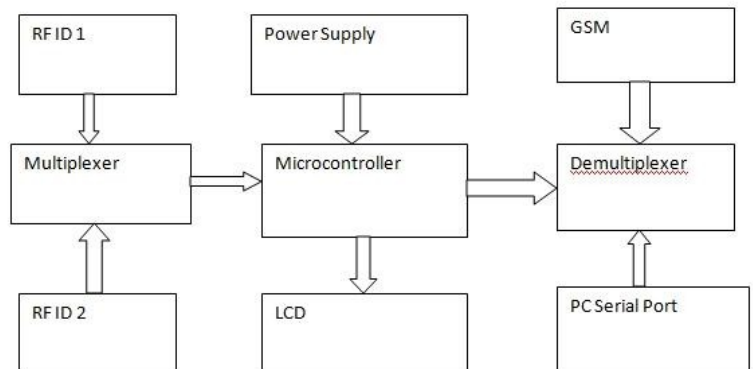


Figure 5. Block Diagram

Proposed system is consisting of RFID, Multiplexer, Microcontroller, LCD, GSM. Every vehicle will be tagged with RFID tag. The vehicle will be detected by RFID receiver. Then all the data corresponding to that particular vehicle will be sent to PC. At the same time toll payment will also be done. Simultaneously message will be sent to the owner of the vehicle. So this system will be more efficient in time as well as in management.

### III. COMPARATIVE ANALYSIS FOR TOLL COLLECTION SYSTEM

Sr. No.	Toll collection systems	Advantage	Disadvantage
01	Manual Toll collection	Increased level of service	Change problem is there
02	Automatic Toll collection	Automated Coin Machine(ACM) is	Not so efficient

		used	
03 Electronic Toll collection than manual toll		Better performance	Security is poor collection

Table 1. Performance comparison of toll collection system

#### IV. FEASIBILITY STUDY

This Automatic toll collection is more efficient than other toll collection systems as it gives good management at toll plaza as well as it can save fuel. Hence, this paper describes an efficient toll collection system.

Consider 50 manual toll tax system and consider 200 vehicles pass everyday through that each toll system.

No. of vehicles passing yearly:  $200 \times 30 \times 12 = 72000$

No. of vehicles passing 50 tolls:  $200 \times 72000 = 1,44,00,000$

Vehicle	Days	Toll Booth
200	1	1
72000	30x12	1
144,00,000	30x12	50

Table 2. Vehicles passed through toll booth yearly

Above figure indicates that in each year each of the 72,00,000 vehicles just stand still for about 6.0 hours in engine start condition creating pollution and burning fuel. Consider that in 1 lit fuel is used in 6 hours. So, Total amount of fuel used by all the vehicles:  $1,44,00,000 \times 1 = 1,44,00,000$  liter.

Assuming cost of 1liter fuel=69

Total cost of fuel consumed by 72000 vehicles= $49,68,000$

This is the calculation for consideration that vehicle stops for 60 seconds at every toll system, for 100 vehicles each day and 100 toll plazas considering minimum figure.

#### V. CONCLUSION

In this paper, we have discussed toll collection system which provides an efficient toll collection as well as antitheft system. This paper describes the toll collection method which is also user friendly. This toll collection system has main feature that it uses RFID not only to detect the vehicle but also to transfer data time to time to keep system secured and well managed.

The old toll collection techniques were having many drawbacks like there was change problem and time required to process one vehicle was also more. Electronic toll collection was saving time but there was problem of security. This paper gives solution to all these problems.

#### VI. ACKNOWLEDGEMENT

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