



## Electronic Toll Collection Using Barcode Reader

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**Abstract**— *Electronic toll collection is rapidly growing and becoming universally accepted technology.*

*In this paper work we cover the state of art of various existing electronic toll collection (ETC) technologies. All technologies understudy are reviewed in context of their suitability for Indian roads. This paper focuses on an electronic toll collection (ETC) system using barcode reader technology. The system uses tags (barcode) that are mounted on the number plate of vehicles, or on the front side of vehicles through which information embedded on the barcode are read by barcode reader, the proposed system eliminates toll authorities to manually perform ticket payments and collection of cash. It is more efficient method because it reduces the traffic and possible human errors by exchanging the data information between the motorists and toll authorities. Barcodes are much smaller and lighter and therefore easier to use. Barcodes are less expensive than RFID tags because barcodes are directly printed onto material such as plastic or paper materials and therefore the only cost involved is the ink. This technology has many advantages such as automatic and accurate toll collection, improvement in highway efficiency and low fuel consumption.*

**Keywords**— *Electronic toll collection, Barcode, Barcode Reader, Toll Gate, Vehicle.*

### I. INTRODUCTION

ETC technology is very universally and rapidly accepted method. We can collect the toll electronically by using various methods like ETC using Laser technology, Rfid, Barcode technology etc. The Barcode technology is very efficient than laser and rfid so we will discuss the barcode technology in detail. A barcode is a series of parallel black bars and white spaces, both of varying widths. Bars and spaces together are called elements. Different combinations of the bars and spaces represent different characters, such as numbers or letters. Each combination or sequence of bars and spaces is a code that can be translated into information such as price, product type, and place of manufacture. The barcode itself does not actually contain detailed information. The barcode simply provides a reference number that tells a computer to access information. A barcode reader is required to read a barcode. Barcode readers may be fixed, portable batch, or portable RF. Fixed readers are attached to a host computer and terminal, and transmit one item at a time as the data is scanned. Barcodes are simple to use, accurate, and quick. Almost everyone is familiar with their use in retail establishments. They are also often used in ware-houses and manufacturing for selecting items from storage, receiving goods, and shipping. There are different types of barcodes. Some bar-codes are entirely numeric, whereas others have numeric and alphabetic characters. The type used is dependent upon the implementation, the data that needs to be encoded, and how the barcode is to be printed. There are several barcode standards, called symbologies, each serving a different purpose. Each standard defines the printed symbol and how the scanner reads and decodes the printed symbol.

### II. AIMS AND OBJECTIVE

#### A. AIMS

Our aim is to design such system which will save time and loss of fuel. The system which will provide improvement in highway .Because of such system there will be fair and accurate collection of toll, and the system will also try to remove possible frauds in toll collection.



Fig.1 ETC System (Ref.6)

### B. OBJECTIVE

Objective of the project is to Automate Toll Collection System where a Barcode will be placed on car, so when the car passes the toll booth it does not have to wait & pay the toll. Instead a Barcode reader will read the Barcode and the toll will be directly deducted from the prepaid account.

### III. EXISTING SYSTEM

In this particular paper we describe how the Electronic Toll Collection Using Barcode Reader is more efficient than the LASER technology and the RFID technology [1].

The laser systems were used in ETC which utilized bar-coded stickers affixed to each vehicle. These barcodes were read by Laser scanner as vehicles passed the toll booths. However the scanner had poor reading reliability and it was sensitive to weather and dirt and has to be located as close as possible to toll booth [7]. To overcome these disadvantages, ETC using RFID technology was introduced. It has high accuracy and could be read even in highway speed. The RFID Technology is much better than the LASER Technology because it has a high accuracy than the Laser scanner. And it is more efficient than the Laser Technology. But the RFID Technology also had disadvantage that it is work on the radio frequency, so the device or scanner require to capture that radio frequency is mounted on the upper side or somewhere in tollbooth[1][2]. So it requires high accuracy and in RFID the particular speed has to be maintained by the driver and the vehicle need to be stop in the specified given region or area. If he/she doesn't maintain the speed the vehicle will break the barrier. This is the disadvantage of the RFID Technology. To overcome this disadvantage the ETC using Barcode Reader Technology is emerged. In the barcode reader technology the barcode is mounted on the side mirror of vehicle and barcode reader scans that barcode then it checks that the user and vehicle is registered or not if yes then it will automatically deduct the amount from users account if no then user have to register for their vehicle[2].

### IV. SYSTEM ARCHITECTURE

The figure 2 illustrates the system architecture-

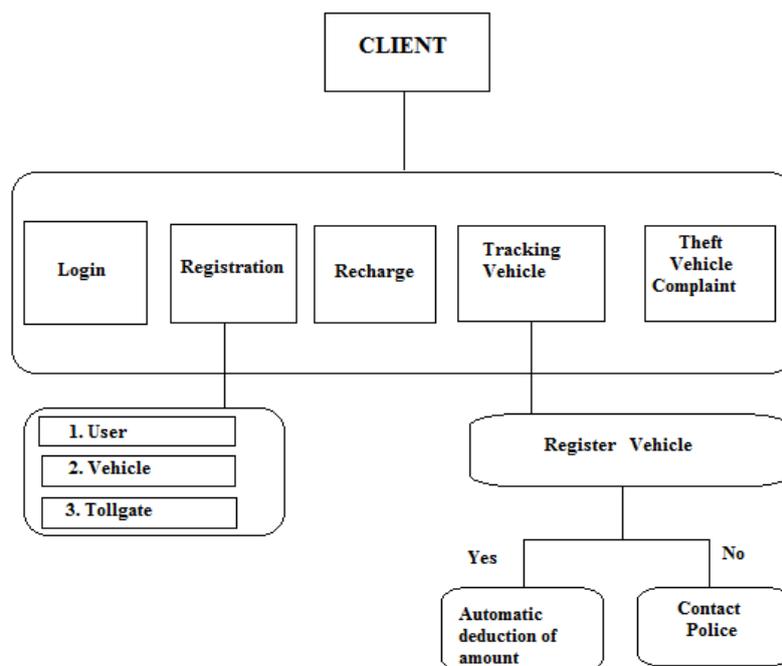


Fig.2 System Architecture

The System Architecture is explain below –

When the client entered the toll plaza, he/she has to login first. In **registration** the client has to register for user, vehicle, tollgate respectively, and then only the client is able to enter in ETC System. The Process of **Recharge** will be pre-paid. If the vehicle is already registered & have sufficient balance in account then that vehicle can move because the vehicle tracking is done automatically, to ensure that the vehicle is register or not. And if the vehicle is lost then theft **vehicle complaint** can be done for searching that vehicle [4][9].

### V. METHODOLOGY

#### A. REGISTRATION

First vehicle owner needs to register by giving basic details, and then comes the registration of an account pertaining to the owner -either prepaid or post-paid, during registration the owner needs to deposit certain amount in his account. Then vehicle information needs to be entered. This registration provides barcode to vehicle. Registration is successful. The second part of this module is for the tollgate management, tollgates need to register or the various toll amounts levied on different vehicle types that approach a tollgate[1][4].

### B. TRACKING

As the vehicle approaches the toll gate the barcode readers placed beneath the toll area identifies the Barcode tag and amount is deducted from its prepaid account. A text message is send to the owner’s phone as soon as the tag is detected at the tollgate, assuring the owner of the transaction [1][2].

### C. RECHARGE

The owners account is managed in such a way that the account balance can be recharged when the balance is low, the owners account id should be entered for using this functionality.

### D. COMPLAINT

A complaint should be lodged on the theft on the complaint page. The vehicles details along with the barcode registration ID should be entered. This helps in identifying stolen vehicles at the tollgate.

## VI. COMPARISON BETWEEN RFID AND BARCODE

TABLE .1 (BARCODE V/S RFID)

	<b>RFID</b>	<b>BARCODE</b>
<b>Read Rate</b>	High throughput. Multiple (>100) tags can be read simultaneously.	Barcode has very low throughput. The system tags can only be read manually, one at a time, but it is efficient [8].
<b>Line Of Sight</b>	This system does not required line of sight. Items can be oriented in any direction, but they must be in readable range [1].	This system definitely required the line of sight. Scanner must physically see each item directly to scan, and each item must be oriented in a very specific manner.
<b>Usage</b>	It involves assembling and also inserting a computerized chip, which works out very difficult.	Barcodes are much smaller and lighter in weight than RFID tags, therefore easier to use.
<b>Cost Involve</b>	RFID tags are very expensive.	Barcodes are less expensive because they are directly printed on material.
<b>Security</b>	Provides high protection, or include a “kill” feature to remove data permanently, so information stored in this is much secure [1][3].	Low. Much easier to reproduce or forged.
<b>Accuracy</b>	Tag collision can occur when numerous tags in the same area respond at the same time. Therefore less accuracy.	Barcodes work with the same accuracy on various materials in which they are placed .Barcodes are much accurate than RFID [2][3].
<b>Other Features</b>	RFID readers struggle picking up information when passing through metal or liquid[5].	This can be read even through metal or liquid [8].

## VII. CONCLUSION

The proposed system has many advantages as mentioned. In this system, we used Barcode technology as a type of ETC system. By doing this we eliminate the human interaction in the entire toll collection process and increase the security. Our system is a user friendly toll collection method which can save time and reduce traffic congestion at toll gates and provide solution for users to reach their destination without wastage of time. It gives the toll authorities the flexibility to set variable pricing for toll services and thus a fair policy of tax collection can be followed. Here there is no transaction of cash which reduces the cash handling. Thus difficulties with cash handling are eliminated. Prior to implementation of such optimally identified technique very sincere efforts are required to modify it according to the needs of local people and government.

## VIII. FUTURE WORK

This technology will be used on different toll booths in different regions so the traffic can be controlled and time required to manually payment of cash will be reduced. and also it is used in ware-houses and manufacturing for selecting items from storage, receiving goods, and shipping.

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