

## Rfid Based Automatic Toll Collection Plaza

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**Abstract**— This paper is based on the RFID (Radio Frequency Identification) system which is a Electronic Toll Collection (ETC) implemented to develop Automatic Toll Tax Collection Plaza which is not having any human intervention. This system consists of RFID Reader, RFID Tag, AVR Controller and Database. Majority of the toll collection systems in India are semi-automatically controlled which still has a human intervention. Day by day the rate of vehicles is increasing which is leading to waste of time, money and fuel while standing in queue for the toll payment. The main objective of this paper is to transfer the semi-automatic system into a fully automatic toll collection system. This will have no human intervention hence there will be no chance for the human errors as the transaction will be cash free. To overcome all these major problems we need to implement such a automatic toll collection system which will be fruitful for the society as well as the toll tax collecting companies.

**Keywords-** Electronic Toll Collection (ETC), RFID Reader, RFID Tag, AVR Controller, Database

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### I. INTRODUCTION

Millions of vehicles pass through the toll plaza paying the toll tax. This system includes intervention of human beings which lead to number of errors. This directly affects the tax amount which should be collected by the toll collecting companies. Due to this the consumer is left away from the correct road services which he deserves.

### II. BACKGROUND OVERVIEW

#### 2.1. Existing System

Presently the toll tax is collected in two ways, it can be manually or using smart card. First one is the traditional method in which one person collects the money and issues a receipt. The second method consists of smart card in which the consumer need to show the smart card to the system installed to the toll tax collection depot to open the barrier.[1]

#### 2.2. Drawbacks of Existing System

Both the above mentioned methods are not convenient. The vehicles get in queue and thus this type of service leads to the wastage of time, money and fuel.

### **III. PROPOSED SYSTEM**

Each vehicle will be allotted with a RFID Tag. This Tag will continuously emit RF signal. A RFID Reader will be placed underground near the toll booth which will detect this RF signal. The signal will be amplified and send to the AVR controller. The controller will display the ID on the LCD. With the help of PC interface using the serial port the detected data will be displays on the monitor. Data such as ID, Date, Time, User name, balance amount, account number will be stored in the access database. Based on these details the particular amount of toll will be deducted from the users account. If insufficient balance or unregistered vehicle found then another service road will be provided for manual toll payment.



*Figure 1. Proposed system*

### **IV. NECCESITY OF PROPOSED SYSTEM**

In our country most of the toll plazas are controlled manually with some semi-automatic systems, to overcome all the drawbacks there is need to implement such an Automatic Toll Tax Collection System which will help to eliminate the drawbacks. In this research paper I present a small mathematical calculation to prove the it.

Presently the vehicle has to stop and pay the toll. Considering that the manual toll collection system is very efficient and it requires 60 seconds to complete the toll collection process for one vehicle.

- Average stop in a month:- $60 \times 30 = 1800$ seconds;
- Yearly time taken:- $1800 \times 12 = 216200$ seconds;

On an average each vehicle passing through the toll plaza has to wait for 6hr. in an engine start position which leads to pollution and wastage of fuel. Therefore the automatic toll collection system is far better than the manually controlled one.

Suppose if there are 100 toll plazas and if 100 vehicles pass through each toll system.

- No. of vehicles passing through one system yearly= $100 \times 30 \times 12 = 36,000$
- No. of vehicle that pass through 100 systems =  $100 \times 36000 = 36,00,000$
- Suppose that vehicle standing on the toll boot for 6hr in a year uses 1 liter of fuel. Total fuel used by the
- vehicle=  $36,00,000 \times 1 = 36,00,000$ .

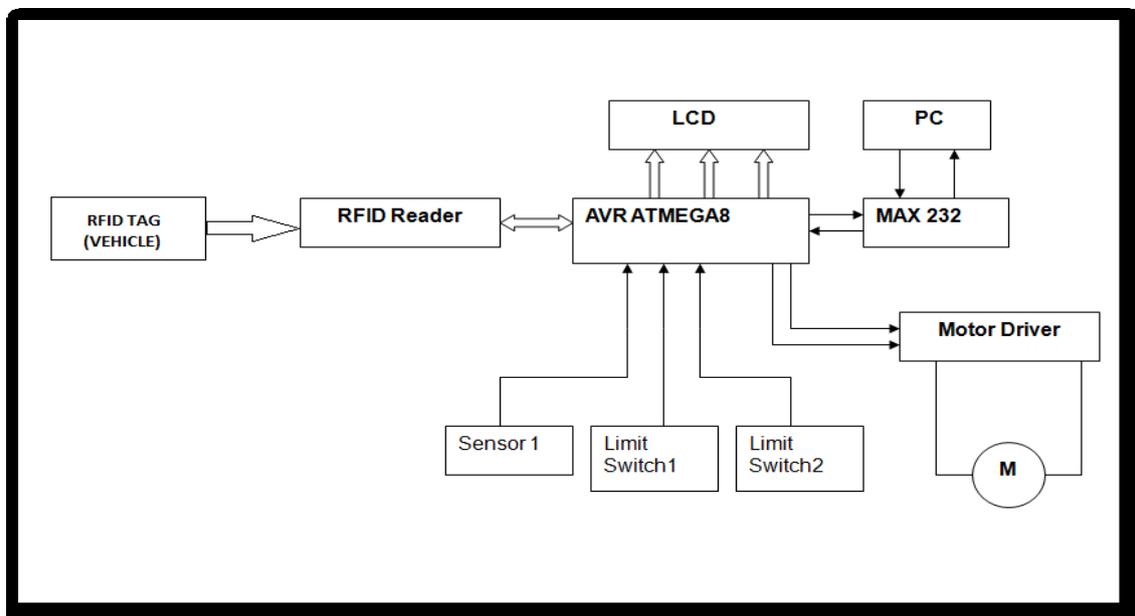
**Table 1. Fuel consumption and amount.**

VEHICLE	FUEL CONSUMED	AMOUNT
1	1ltr	Rs.65
360000	36,00,000ltr	Rs.234000000

The amount of Rs.234000000 is wasted on an average under the consideration that the vehicle stops for 60 sec and about 100 vehicles pass the toll system. A survey made by Maharashtra Government in September 2010 tells that the annual collection of toll collected should have been 1500 corers but actually it was collected 1200 corers. There was loss of 300 corers which can make a big change. These figures are all considered to be minimum they are increasing day by day with the increasing number of vehicles.

This mathematical calculation we shows that there is need to implement such a Automatic toll collection system in a country like India, where time and money are the crucial parts of automatic toll collection to save both of them.

### V. BLOCK DIAGRAM OF PROPOSED SYSTEM

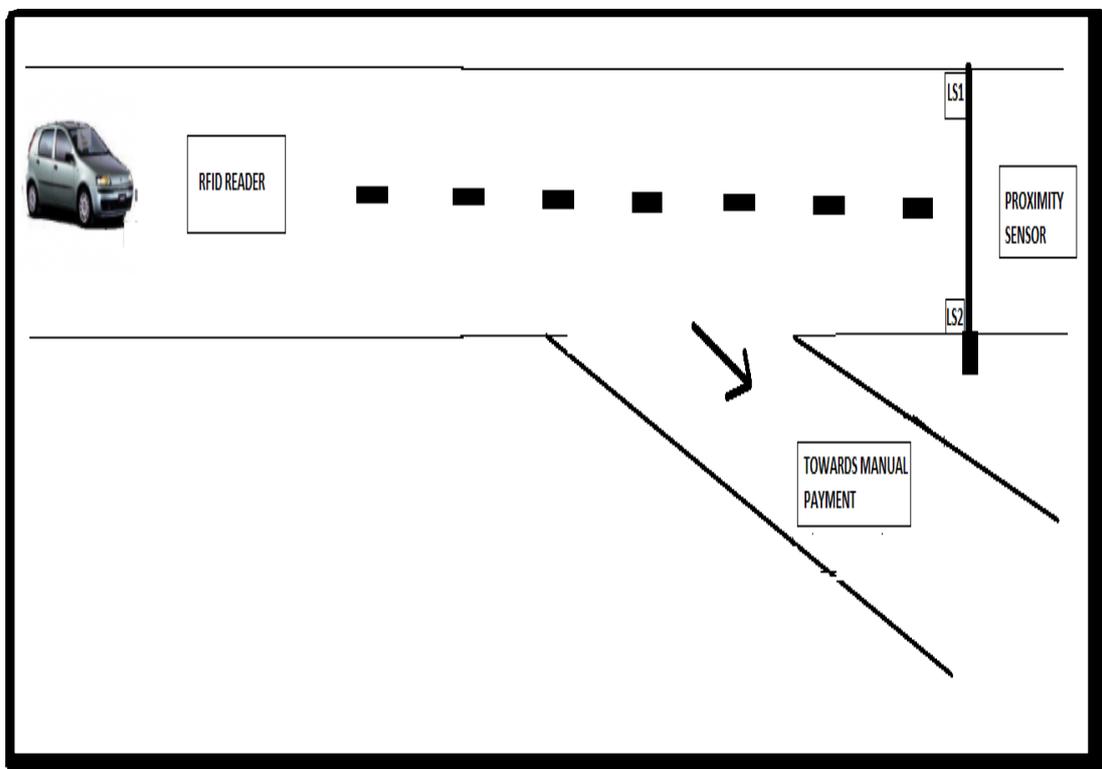


**Figure 2. Block Diagram of Proposed System**

In RFID Based Automatic Toll Tax Collection plaza system a RFID tag appearing like a audio cassette is placed at the base of the vehicle. This will continuously emit a RF signal. A RFID reader is placed beneath the road near the toll booth. When the vehicle comes near the toll booth this reader will read the RF signal emitted by the RFID tag.

This received signal is amplified and given to the AVR ATMEGA8 controller. The AVR is the heart of the system. Different modules such as LCD, Proximity sensor, Limit Switch 1, Limit Switch 2, Motor Drive, MAX 232 are interfaced with AVR. This received data will be displayed on the LCD, which will consist of the unique ID provided to each user. A PC is interfaced using serial port with the controller. This will display the detected data on the monitor which will consist of ID, Date, Time, User name, balance amount, account number and will be stored in the database. Each user will have a account where he will have some balance amount and this account will be controlled by the toll company itself. Based on the user details which are detected the particular toll amount will be deducted from the users account. The balance will be updated in the users account as soon as the user leaves the toll booth and will be stored in the database. This will prove helpful when the user reaches the next toll plaza.

If insufficient balance is found in the users account a separate provision is made. The vehicle is when about 100 meters from the toll booth the user will get message whether he has a sufficient balance or not. If sufficient balance found the vehicle is allowed to pass through the same lane, but if in case insufficient balance is found a separate lane is provided and the user can do manual toll tax payment.



*Figure 3. Service road provided in case of insufficient balance or unregistered vehicle.*

## **VI. OBSERVATION**

In this proposed system the automatic vehicle identification was done due to unique ID. Automatically the toll tax amount will be deducted from the user account. Thus there is no need to stop the vehicle at toll plaza. This will save the time and fuel. This will definitely help in economical growth of the country.

## **VII. FUTURE SCOPE**

Only the imagination can limit the applications of this proposed system.

- Anti-theft
- Automatic identification of vehicle
- If system will be centralized then tracing of vehicle becomes easy.

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