

# RFID BASED PERSONAL MEDICAL DATA CARD FOR TOLL AUTOMATION

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**Abstract---** *In traditional toll gate system, the vehicle passing through must pay their tolls manually at the gate for obtaining the entry across the toll gate. The proposed RFID system uses tags that are mounted on the windshields of vehicles, through which the information embedded on tags are read by RFID readers. This eliminates the need to pay the toll manually enabling automatic toll collection with the transaction being done on the account held by the vehicles. This enables a more efficient toll collection by reducing traffic and eliminating possible human errors. In an emergency the paramedics or doctors can read RFID device that retrieve the medical records of the customer who owns the tag. This plays a vital role during emergencies where one need not wait for basic tests to be done and by referring the customer medical details the treatment can be made as it may save the life of a human which is very precious.*

**Keywords---** *Electronic toll collection, medical RFID, GSM*

## 1. INTRODUCTION

In traditional toll gate system, the vehicle passing through must pay their tolls manually at the gate for obtaining the entry across the toll gate. In order to pay tax we are normally going to pay in form of cash. The main objective of this project is to pay the toll gate tax using smart card with medical details to be used during emergency. Smart card must be recharged with some amount and whenever a person wants to pay the toll gate tax, he needs to insert his smart card and deduct amount using keypad[6]. By using this kind of device there is no need to carry the amount in form of cash and so we can have security as well. This system is capable of determining if the car is registered or not, and then informing the authorities of toll payment violations, debits, and participating accounts[1]. These electronic toll Collection systems are a combination of completely automated toll collection systems (requiring no manual operation of toll barriers or collection of tolls) and semi-automatic lanes.

The most obvious advantage of this technology is the opportunity to eliminate congestion in tollbooths, especially during festive seasons when traffic tends to be heavier than normal. It is also a method by which to curb complaints from motorists regarding the inconveniences involved in manually making payments at the

tollbooths[1]. Other than this obvious advantage, applying ETC could also benefit the toll operators.

The benefits for the motorists include:

- Fewer or shorter queues at toll plazas by increasing toll booth service turnaround rates;
- Faster and more efficient service (no exchanging toll fees by hand);
- The ability to make payments by keeping a balance on the card itself or by loading a registered credit card; and The use of postpaid toll statements (no need to request for receipts).

Other general advantages for the motorists include fuel savings and reduced mobile emissions by reducing or eliminating deceleration, waiting time, and acceleration. Meanwhile, for the toll operators, the benefits include:

- Lowered toll collection costs;
- Better audit control by centralized user accounts; and
- Expanded capacity without building more infrastructures.
- In case of emergency the customer medical details like blood group, diabetics reports, blood pressure reports etc. can be viewed.

The next sections of this paper are organized as follows. Section 2 deals with RFID technology 3. ATC (Automatic toll collection) components. Micro controller programming is discussed in Section 4. Section 5 deals with VB programming. Section 6 contains Procedure for transaction. Finally Section 7 contains the concluding remarks.

## 2. RFID TECHNOLOGY

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. The RFID data is stored on tags which respond to the reader by transforming the energy of radio frequency queries from the reader (or transceiver), and sending back the information they enclose. The ability of RFID to read objects in motion and out of the line-of-sight is its major advantage. The tags can be read under harsh conditions of temperature, chemicals and high pressure[2]. The use of RFID technology reduces operational costs by reducing the need for human operators in systems that collect information and in revenue collection.

## 2.1 RFID TAGS

RFID tag is an object that can be attached to or incorporated into a product, animal, or person for the purpose of identification using radio waves. The RFID tag is essentially a memory device with the means of revealing and communicating its memory contents, when prompted to do so.

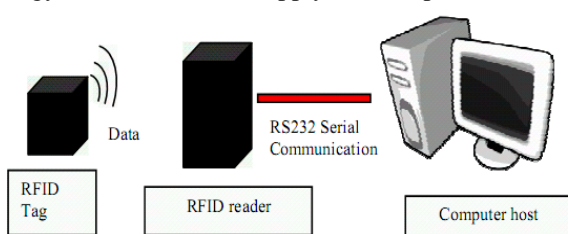
RFID tags come in three general varieties:- passive, active, or semi-passive (also known as battery-assisted). Passive tags require no internal power source, thus being pure passive devices (they are only active when a reader is nearby to power them), whereas semi-passive and active tags require a power source, usually a small battery.

Passive RFID tags have no internal power supply. The minute electrical current induced in the antenna by the incoming radio frequency signal provides just enough power for the CMOS integrated circuit in the tag to power up and transmit a response. Most passive tags signal by backscattering the carrier wave from the reader. Unlike passive RFID tags, active RFID tags have their own internal power source, which is used to power the integrated circuits and broadcast the signal to the reader. Active tags are typically much more reliable (i.e. fewer errors) than passive tags unlike passive RFID tags, active RFID tags have their own internal power source, which is used to power the integrated circuits and broadcast the signal to the reader. Active tags are typically much more reliable (i.e. fewer errors) than passive tags.

To communicate, tags respond to queries generating signals that must not create interference with the readers, as arriving signals can be very weak and must be told apart. The RFID tags which have been used in the system consist of user details such as username, userid, address, contact number and medical details. The most common type of tag is mounted on the inside of the vehicle's windshield behind the rear-view mirror.

## 2.2 RFID READER

RFID reader is the device which is used to convert the received radio signals of a particular frequency into the digital form for the usage by the controller and PC. This reader has on-chip power supply[5]. It incorporates energy transfer circuit to supply the transponder.



**FIGURE 1:** Complete RFID System

## 3. ATC COMPONENTS

The Automatic Tollgate Collection (ATC) is a technology that permits vehicles to pay highway tolls automatically using RFID. Automatic Toll Collection is a concept that is being readily accepted globally.

The process is less time consuming. ATC s are an open system, toll stations are located along the facility, so that a single trip may require payment at several toll stations. Each system has designated toll booths designated for ATC collections.

### Automatic vehicle identification

These are electronic tags placed in vehicles which communicate with reader. Automatic Vehicle Identification tags are electronically encoded with unique identification numbers. User information is scanned for identification. By using unique numbers communication is being done. Then it classifies the type of vehicle and the amount is being deducted based on the vehicle classification.

## 4. MICROCONTROLLER PROGRAMMING

In this project the micro-controller is playing a major role. Micro-controllers were originally used as components in complicated process-control systems. However, because of their small size and low price, micro-controllers are now also being used in regulators for individual control loops. In several areas micro-controllers are now outperforming their analog counterparts and are cheaper as well.

The purpose of this project work is to present control theory that is relevant to the analysis and design of Micro-controller system with an emphasis on basic concept and ideas. It is assumed that a Microcontroller with reasonable software is available for computations and simulations so that many tedious details can be left to the Microcontroller. In this project we use ATMEL 89c51 microcontroller where it consists of 4 ports namely port0, port1, port2 and port3. The control system design is also carried out up to the stage of implementation in the form of controller programs in assembly language OR in C-Language.

## 5. VB PROGRAMMING

The Visual Basic Communication application consists of four different parts; the part which communicates with the RFID hardware, the part which communicates with the database, the part which communicates with the microcontroller and the part which enables addition of new users.

The system was developed with an aim towards enabling it to indicate the registration number of a car as it passes, according to the RFID details are taken from the database. The station attendant has a chance to see if there is any difference between the plate in the database as displayed on the application window and that on the car. It also displays the current account balance on the

card from the database. There is an automatic deduction of balance which works according to an algorithm in the Visual Basic (VB) code. The deduction occurs with respect to the type of car which has passed. The system shows the status of the gate to see if it is closed or opened. This helps the station attendant to switch to the emergency operation of opening and closing the boom if the RFID system fails.

For security, a login window for privacy and authentication was developed to reduce fraud since only authorized users are held accountable for any losses incurred. Visual basic is very good at designing smart and user friendly windows, just like any other Microsoft Windows application[2]. This can be seen from the graphical user interface image shown in Figure 2.

Fig 2: Window for entering new users into the system

## 6. TRANSACTION RELATED OPERATIONS

Microsoft Access is a relational database management system from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools. It also has the ability to link to data in its existing location and use it for viewing, querying, editing, and reporting. This allows the existing data to change while ensuring that Access uses the latest data[4]. Here the transaction related operations are being done like insertion, deletion and updation are being made. The transaction details are being made by accessing the database as each user have their own user id.

## 7. BLOCK DIAGRAM

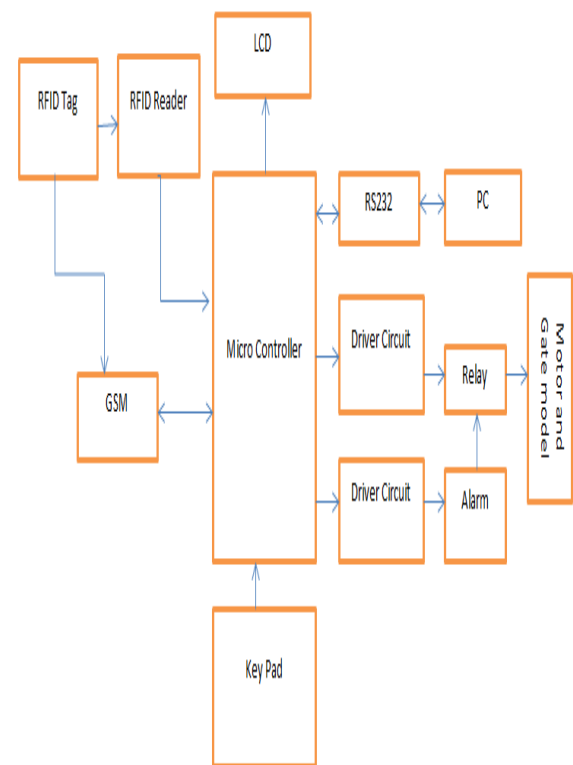


Fig3.Components of the system (Block diagram)

### GSM

Global System for mobile communications. The main application of GSM In our project is that it provides support of SMS to the customer about the transaction.

### LCD

Liquid Crystal Display. The main application of LCD in our project is that it provides display information about the transaction being carried near toll booth.

### RS232

It is being used to connect the RFID module to the personal computer (PC) .By using this port a PC is being connected and share information.

### DC MOTOR

This circuit is designed to control the motor in forward and reverse direction. It consists of two relays named relay1, relay2.The relay ON and OFF is controlled by the pair of switching transistors. In this project the DC motor is being used to open the gate if the transaction is successful.

The following flowchart gives the process flow of ATC during the passing of the vehicle through the toll gate.

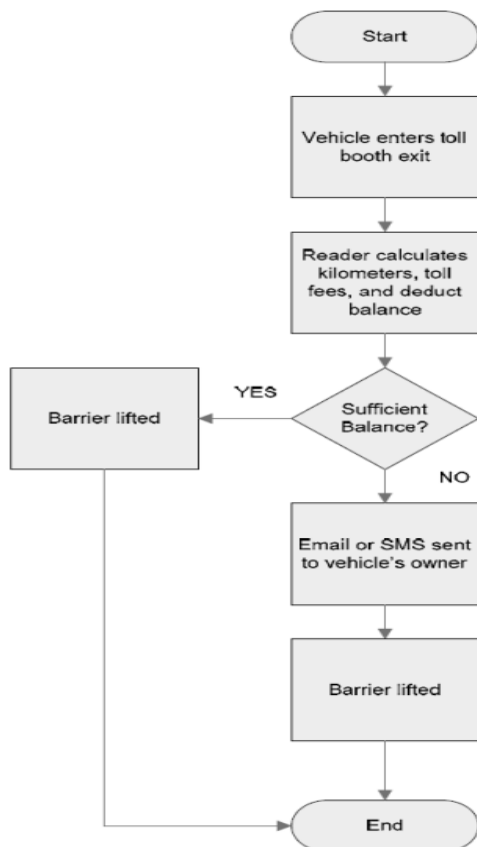


Fig.4 Flowchart for RFID Toll gate automation

## 8. PROPOSED SYSTEM

The main objective behind this proposal is to create a suitable ETC (Electronic toll collection) system to be implemented in India. The term “suitable” here refers to minimal changes in the current infrastructure with maximum increase in efficiency. In India there are many toll gates but they are being operated manually. As India is one of the largest populated country obviously it leads to increase in vehicles, so toll gates performing manually lead to heavy traffic and wastage in time waiting in the queue. Our proposed system eliminates all these issues and ensures safer journey.

Another main advantage of our system is the customer medical details which are being stored in the RFID tag and are being used in case of emergencies. Here the customer medical details like blood group, blood pressure (BP), Diabetics, etc. are being stored by using the customer unique id which is being given to them during registration. During emergencies it plays a vital role for the doctors to take decision easily and to give treatment according to the reports being stored in the tag.

The proposed system also considers the size issue. All the system requires is a tag the size of a sticker, which could be affixed on the windshield[4]. In this system, the tag used is capable of withstanding all kinds of weather, and is much more durable compared with the one used in the

existing system. The advantages of this proposed system is summarized as follows:

1. Higher efficiency in toll collection;
2. Cheaper cost;
3. Smaller in size compared with the existing system;
4. Durable tags;
5. Medical details; and
6. Life saver.

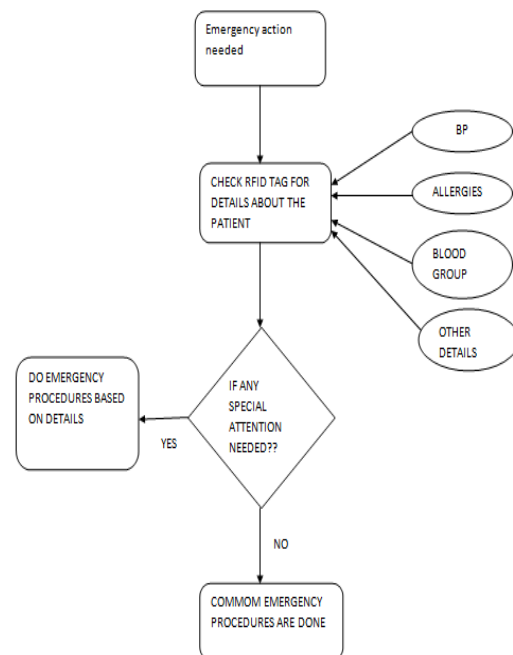


Fig.5.Flowchart for medical details usage

## 9. CONCLUSION

The automatic toll gate system we have discussed has been implemented in various countries though not in India. But it is essential in India where the population is much higher and the condition of the roads is not very good. This creates a long queue in the toll gates inconveniencing a lot of population, particularly during peak times. This also leads to lot of accidents since people tend to go faster to avoid queues.

Hence the smart card which also contains the medical details of the card holder will definitely be boon to the public in case of emergencies. Nowadays all toll gates are equipped with mobile emergency medical assistance unit and these details will be particularly useful if the person who needs attention has an additional longstanding ailment such as heart problem or diabetes. The screen shots of our system given below. In future this can be enhanced to give an instantaneous alert to the medical unit nearby.

The following screen shots show the vehicle identification and amount deduction from the card using the Automatic Toll Collecting System.

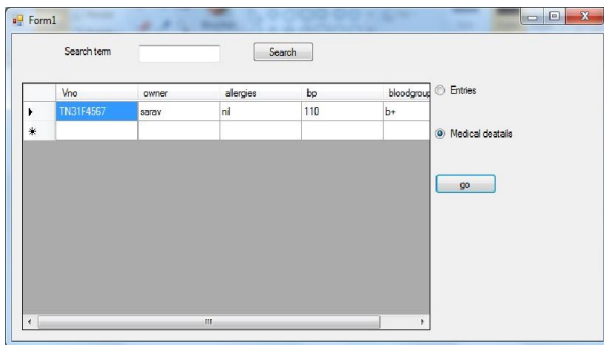


Fig. 6 Vehicle identification

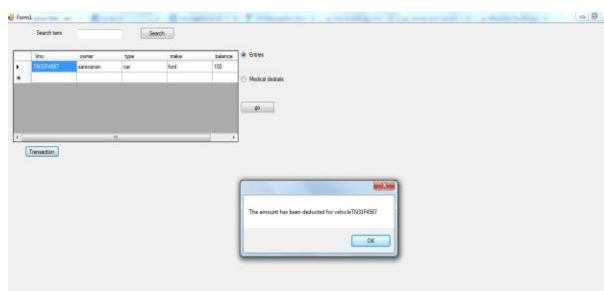


Fig. 7 Vehicle classification and fee deduction

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