Automatic Toll Collection Using RFID

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ABSTRACT: Now a days there is a huge rush in the toll plazas in order to pay the toll tax. Therefore in order to reduce the traffic jam and to save time & also to reduce the money loss. we have designed project for the automation in toll tax payment using RFID. We have made the automation of toll plaza using combination of microcontroller, RFID. This concept explains the implantation of automation in toll plaza which is a step towards improving the monitoring of vehicles, travelling in predetermine routes. The aim of our project is to design a system which automatically identifies an approaching vehicles and record vehicles number and time. If the vehicle belongs to the authorized person, it automatically opens the toll gate and a predetermined amount is automatically deducted from its account. This translate reduced Traffic congestion at toll plazas and helps in lower fuel consumption. This is very important advantage of this system.

KEYWORDS: Radio Frequency Identification (RFID);RF Modules ;Toll plaza; Electronics Toll; RFID tags; Traffic Jams

I. INTRODUCTION

Our life is changing very fast and the role of automation in our day to day life is increasing at a very fast rate. This is the motive behind our project i.e. "Automation". Now a days we see frequently traffic jams or long queues at the toll stations waiting for paying the toll. Paying the toll every time through cash or checking the pass takes a lot of time. And today Time is more precious than money. Therefore our project is aimed at reducing time consumed for manual transactions and human effort. Automatic Toll Collection using RFID modules that automatically collects the toll from moving vehicles when they cross the toll plaza. We also assume that an owner maintains a prepaid account, so that toll tax is deducted automatically from the driver's account at toll plaza. If the balance in the owner's account is low or if the vehicle is not equipped with an RF system, the toll gate remains close. In such a case vehicle owner will have to pay the toll tax in cash and collect the receipt. The owner receives an SMS message on his/she mobile about the details of the payment and there is no need for him to stop the vehicle.

II. LITERATURE SURVEY

1) IEEE –"Automatic Toll E-ticketing System For Transportation systems" (2016)
   In this paper they propose a low cost and efficient technique which collects the toll from moving vehicle without stopping the vehicles. And the owner receives the SMS on his/her mobile number about the detail of the payment.

2) "Automatic Toll E-Ticketing system for Transportation Systems" (2016 3rd MEC), by Dr.S.Asif Hussain, Muna ah Al Rahbi, S.Zahid Hussain.
   In this paper propose a low cost and efficient technique called Electronic Toll Collection using RFID modules that automatically collects the toll from moving vehicles when they cross the toll plaza. We also assume that an

owner maintains a prepaid account, so that toll tax is deducted automatically from the driver's account at toll plaza.

3) "Electronics Toll Collection Based on Vehicle-Positioning System Techniques", by Bor-Shenn Jeng, Ching-Hung Wang, sin-Shyong Tseng.
   In this paper the electronic toll collection system implementation are based on vehicle positioning system(VPS)using global positioning system (GPS) and mobile communication techniques.

4) "Radio Frequency Identification (RFID) Based Toll Collection System"2011 Third International Conference on Computational Intelligence, Communication Systems and Networks.
   In this paper the system is designed in such way that it cut the amount of time for paying toll in large queues. The detailed monthly bills will be sent to the customer at the end of the month. The customers could register and get a transmitter module and thereafter would not need to stop at toll booth whenever they get on or off the motor.

III. RELATED WORK

In this project, we are designing an automatic Toll Collection System in which we use RFID tag and RFID readerWhich reduces the manual work which is currently operated at toll booth .This system avoid the problem like traffic jam, man power, Wastage of valuable time, Traffic jam and money loss, fuel loss.
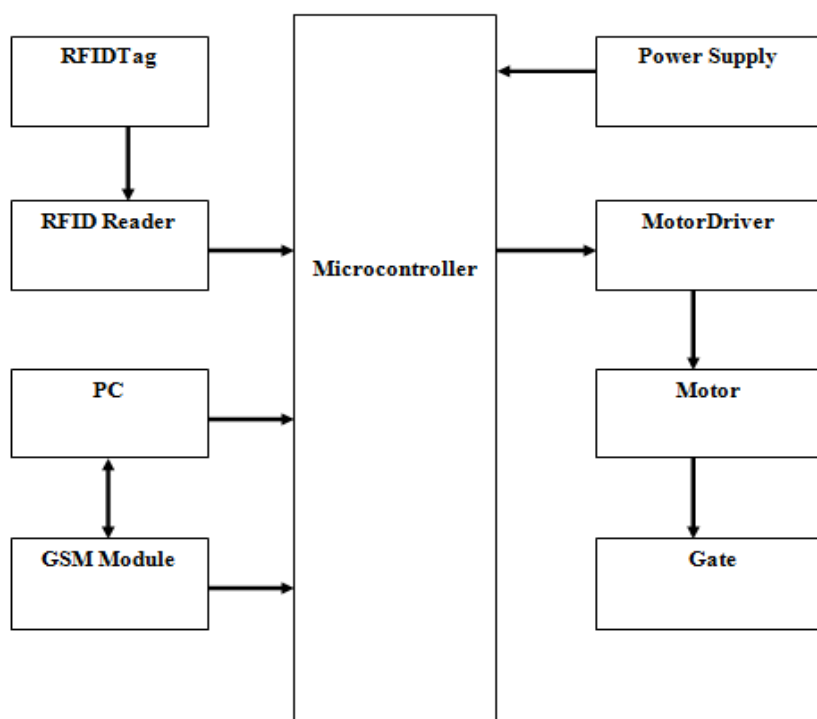
BLOCK DIAGRAM

Fig. 1 Block Diagram

A. RFID card

This is one of the most important part of the project .RFID cards are used for applications as access control in security system, cashless payment etc.

B. RFID reader

A RFID reader is a device which is used to interrogate an RFID tag. It reads the unique number from the RFID cards and sends it to the microcontroller.

C. Microcontroller:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 4K bytes of In System Programmable Flash memory. Microcontroller is the heart of the complete system. It is actually responsible for all the process being executed. It will monitor & control all the peripheral devices or components connected in the system. In short we can say that the complete intelligence of the project resides in the software code embedded in the Microcontroller. The controller here user will be of 8051 family. This unit requires +5VDC for it proper operation. Microcontroller is the CPU of our project. The various functions of microcontroller are:

1. Reading the RFID card number from the RFID reader.
2. Sending this data to the LCD so that the person operating this project should read various informative messages.
3. Sending the data to the motor or buzzer depending upon the RFID card number and balance inside the car.

D. LCD:

It is called Liquid Crystal Display. We are going to use 16x2 character LCD. This will be connected to microcontroller. The job of LCD will be to display all the system generated messages coming from the controller. LCD will provide interactive user interface. This unit requires +5VDC for it proper operation. This module is used for display the present status of the system.

E. Power Supply:

This unit will supply the various voltage requirements of each unit. This will be consists of transformer, rectifier, filter and regulator. The rectifier used here will be Bridge Rectifier. It will convert 230VAC into desired 5V/12V DC.

F. Motor driver: Motor driver is an IC which is used to drive the motor.

G. DC Motor: Motor is used to open the gate.

IV. SYSTEM SPECIFICATION

There are different components are used in this system to run the Toll booth system. The specifications of these components are as follows:

- **8052 Microcontroller:**8052 is the main controller of the system. It will control all the operations of project. It is the 40 pin IC which includes 4 ports i.e. port0, port1, port2 and port3.
- **Liquid Crystal Display(LCD):**In this system, 16*2 LCD is used. It will display the actions which are detected by RFID reader like name of the tag owner, previous balance, reduced balance, and available balance. The LCD is used for the user convenience.
- **Driver IC:** 16 pin driver ICs are used in this system to enhance the current to the motors. The current supplied by the microcontroller is about 5 mA. The power transistors used in the driver IC will enhance the current and it will increase up to 1A which is sufficient to drive all the motors.
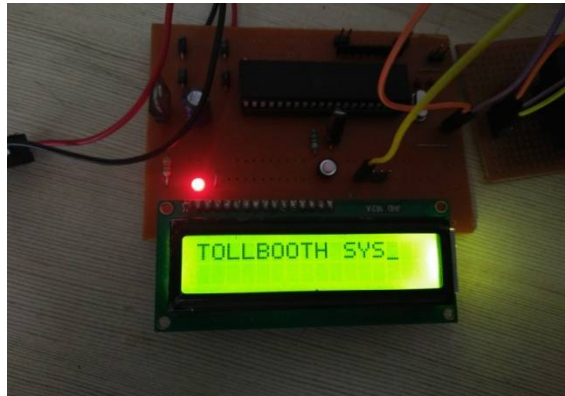- **Motors:**There is one DC motors used in the system. 45 rpm are used to run the DC motor,
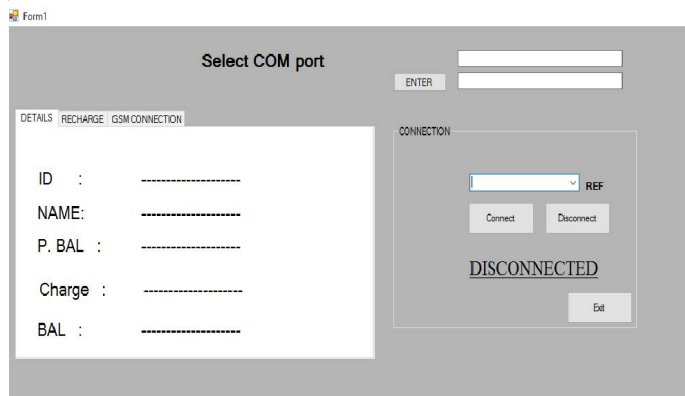
V. RESULT

(a)

(b)

When vehicle passes through toll booth,RFID tag is detected by RFID Reader Module then vehicle number and card number is display on LCD display .
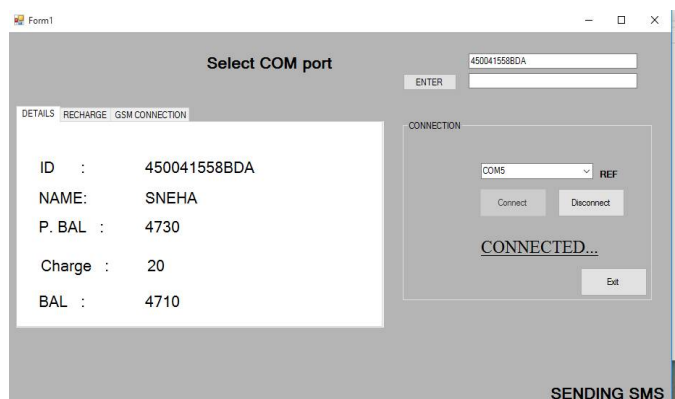

We create a form using VB.NET.In this form the data related to that particular person is displayed. Whenever vehicle passes through tollbooth,the RFID card is scanned ,all information is updated on PC.

(d)

Fig. Project Work

Whenever any person buys a vehicle, first he/she need to do her vehicle registered at the RTO office. RTO people will assign a number plate to it along with it they will give a RFID enabled tag. This card will have a unique ID feasible to use with that vehicle only. They will also create an account for that particular smart card and maintain transaction history in database. Owner of the vehicle needs to deposit some minimum amount to this account. Every time a registered vehicle approaches the toll booth, first the Infrared sensors will detect the presence of the vehicle which in turn activate the RFID circuit to read the RFID enable smart card fixed on the windscreen of the vehicle. Transaction will begin, depending upon the balance available toll will be deducted directly or the vehicle will bedirected towards another lane to pay tax manually. The software further updates the details in the Centralized database.

VI. CONCLUSION

The Electronic Toll Collection system in expressway based on RFID, a design scheme was put forward. It is low cost, high security, far communication and efficiency, etc. It not improve the passage ability of expressway but also improve the technology level of charge. Electronic toll collection system using RFID is an effective measure to reduce management costs and fees, at the same time, greatly reduce noise and pollutant emission of toll station. In the design of the proposed Electronic toll collection (ETC) system, real time toll collection and anti-theft solution system have been designed. This reduces the manual labour and delays that often occur on roads. This system of collecting tolls Is eco-friendly and also results in increased toll lane capacity. Also an anti-theft solution system module which prevents passing of any defaulter vehicle is implemented, thus assuring security on the roadways.

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