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RFID Enabled Automatic Toll Plaza System Enabled With GSM

M.K Shrivastav
Asst. Professor
Department of IT
SRM University NCR Campus
Modinagar

Shubham Kumar Sharma, Akash Kumar Sharma, Gaurav Singh
B.Tech Students
Department of IT
SRM University NCR Campus
Modinagar

ABSTRACT—
The purpose of the research paper is to show the feasibility and easiness of an automatic toll plaza system enabled with radio frequency identification device. A lot of time and fuel is wasted by standing in the long queues waiting to pay the toll taxes. A lot of man power is also wasted as everything is done manually. By enabling the toll plaza with RFID system everything can be made automatic. This will work in a manner where a RFID reader will be installed at the toll plaza and all the vehicles will be enabled with RFID card. Whenever a vehicle will pass through the toll plaza the RFID reader will read the card installed in the vehicle and the money which is the toll tax will be automatically deducted from the owner's prepaid account. A message will also be sent to the owner automatically about the balance deducted and information will be displayed at the screen. This will prevent long queues at the toll plaza and improve the efficiency of collecting money from toll taxes.

I. INTRODUCTION

This project primarily gives the importance of an automatic toll plaza system for efficient passage of vehicles through it and providing convenience to the users by saving their fuel and time by preventing them from standing in long queues.

For example let's consider the manual toll plaza system, according to a report published by the transport department an average vehicle takes around 70 seconds waiting at the toll plaza, this is about 8 hours in an year. So 8 hours of working time gets wasted for one vehicle in a year at the toll plaza, this is about 8000 hours for 1000 vehicles, just imagine the magnitude of fuel and time that gets wasted by just waiting to pay toll taxes. This indeed can be reduced by enabling the toll plaza with rfid system and making it fully automatic to make the passage of vehicles smoother and less time consuming.

We here, are interfacing the RFID receiver to the microcontroller. The receiver is Active and the RFID tags are passive. The receiver will be fixed at the toll plaza constantly trying to search for the tag. As soon as the tag comes in the range of the receiver, the unique code from the tag is identified by the receiver and transmitted serially to the microcontroller.

The controller then matches the unique code to the Central Database and checks if the owner of the tag is in good standing with respect to the balance in his account. Stipulated price of the toll will be deducted from his account. Hence a complete cashless operation is made possible. Then an SMS will be sent to the owner using the GSM module about how much money has been debited from his account OR if there is insufficient balance. Moreover, the owner will be sent the information regarding the location of the toll plaza from where the vehicle has passed. In this way he will get a warning to maintain sufficient balance in his account and also be able to track his vehicle in case of theft. Also as he passes the portal he will be able to see his details on site on the LCD on site. Accordingly, if the toll is paid properly the gate will automatically open for him.

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II. LITERATURE SURVEY

In [1], the automation of toll plaza has been done based on image processing. ANPR (Automatic Number Plate Recognition) system has been employed which uses a camera to capture the number plate of the vehicle and deducts the toll by matching it with the owner database.

In [2], the system is based on infrared sensors. In this, the user has to get the IR transmitter from the main toll office. The transmitter will be charged by the store office and the data of the user will be stored in the microcontroller. When the car arrives at the toll plaza the user will have to mount the transmitter on the car and press a button to turn it on. It must be in the line of sight of the receiver. The receiver will confirm the data from the transmitter with the database and the amount of toll will get deducted. It uses a stepper motor for gate control.

In [3] also the system is based on the RFID technology. The controller used is PIC 18F4550 and has been connected with the system using USB. The RFID receiver senses the tag coming in its range and the amount gets deducted from the account of the owner after all the related information is checked from the database. The IR senses the vehicle motion for controlling the opening and closing of the gate. A stepper motor is used to control the gate.

The rest of the references mentioned below have also employed the RFID technology and the working is quite similar to [3] except the database creation methods. The authors have put the GSM interfacing in their future scopes which we have implemented in our project.

System Design and Implement at

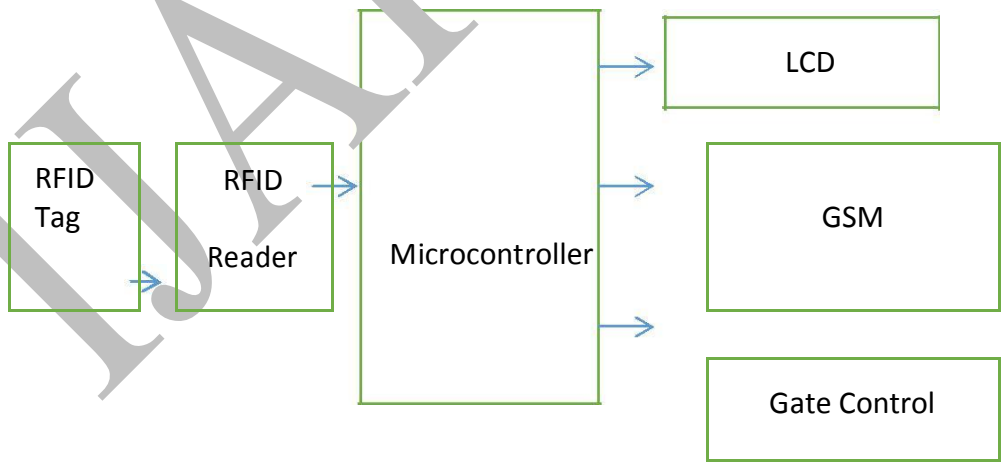

Figure 1: Block Diagram of the system

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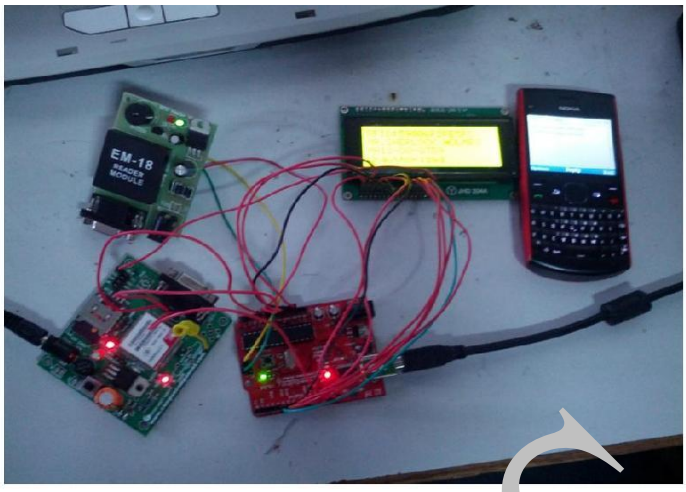

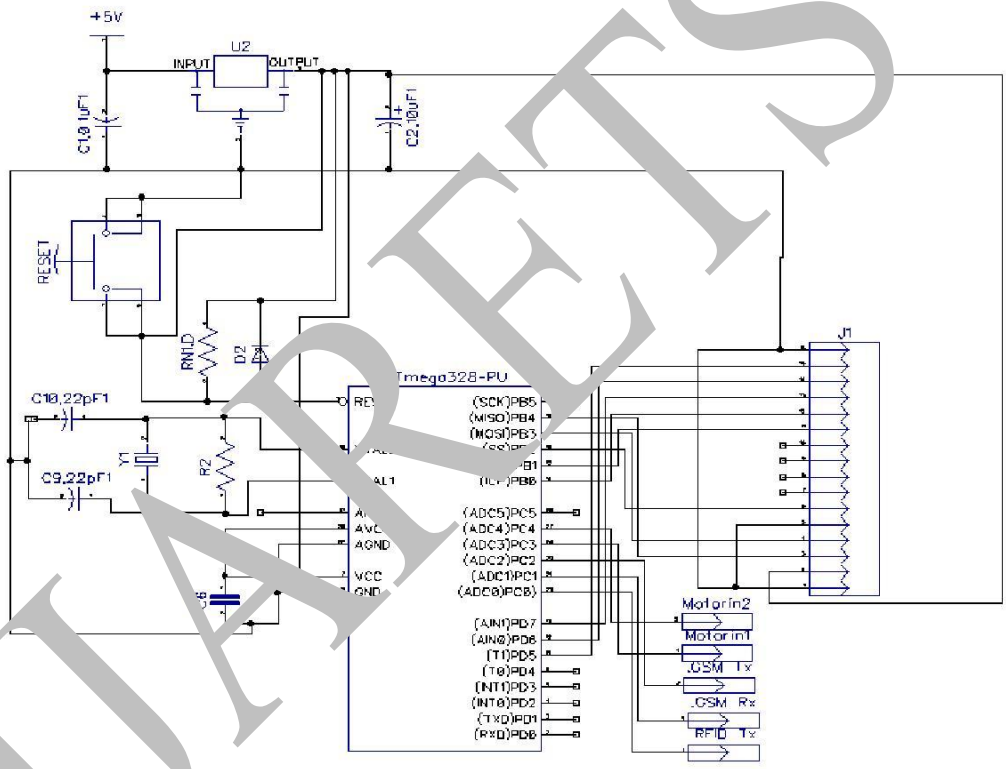

Figure 2: Circuit Diagram

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The major components of the gate control system are as follows:

- ATMega328PU microcontroller
- EM-18 (RFID reader module)
- SIM900 (GSM module)
- DC Motor with driver(L293D)
- LCD display
- Power supply unit

1. **ATmega328-PU µC:**

   Features: 28 Pin I/O

   RESET Pin NO. 1 (ACTIVE LOW) Crystal Pins at 9-10 PIN
   Software Declarable Serial Ports

   We have selected this controller because it has programmable UARTs required for both RFID and GSM modules.

2. **EM-18 (RFID reader module):**

   Features:

   Operating Distance – 10cm Operating Voltage – 5V Operating Frequency – 125 KHz
   Current Consumption - <50 mA
   This is the stationary Active RFID receiver module situated at the toll plaza. It continuously keeps monitoring for the RFID tags. As soon as the tag comes in the range of the receiver, the buzzer on the module gives an indicative beep and sends the data serially to the microcontroller.

3. **SIM900 (GSM module):**

   Features:

   - Quad-Band GSM/GPRS 850/ 900/ 1800/ 1900 MHz
   - Built in RS232 Level Converter MAX3232)
   - Configurable baud rate
   - SMA connector with GSM L Type Antenna.
   - Built in SIM Card holder.
   - Built in Network Status LED
   - Inbuilt Powerful TCP/IP protocol stack for internet data transfer over GPRS.
   - Normal operation temperature: -20 °C to +55 °C
   - Input Voltage: 5V-12V DC

4. **DC Motor with driver(L293D)**:

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction.

The L293D is a Dual Full Bridge driver that can drive up to 1 Amp per bridge with supply voltage up to 24V

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Two H bridges of L293D can be connected in parallel to increase its current capacity to 2 Amp.

Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal

Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

Technical Specification:

Power Supply: Over FRC connector 5V DC External Power 9V to 24V DC Temperature Range: 0°C to +70 °C

5. **LCD display:**
   20X4 lines display
   5X7 dot matrix display
   4 bit data interface
6. **Power supply unit:**
   Specifications: 12 V, 2A

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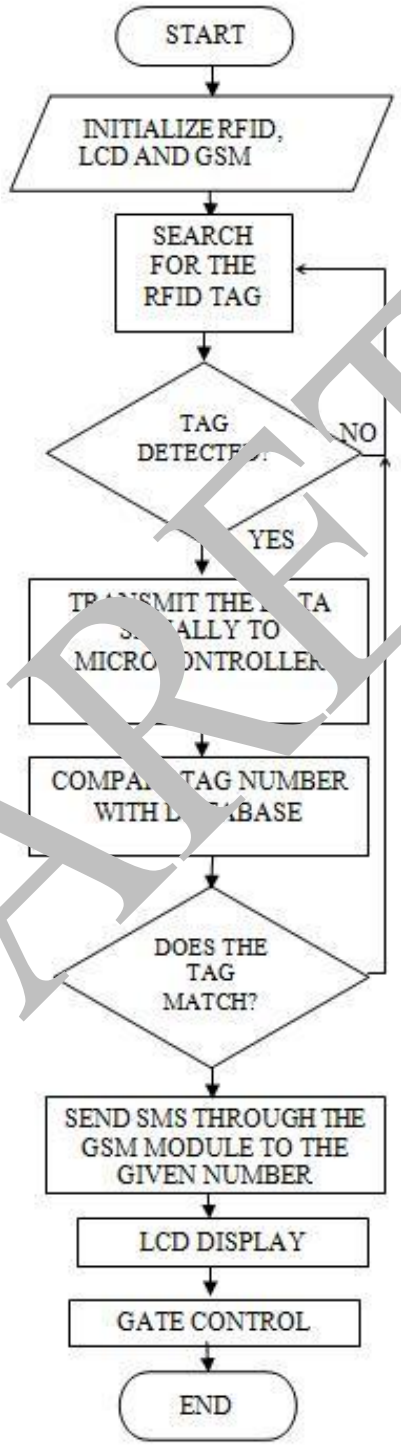
Flow Chart



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III. ADVANTAGES

- RFID system does not need Line Of Sight (LOS) unlike bar-codes or image processing based system. Thus it can be installed inside the car from where it is not visible, which saves tampering with the process in case of theft.
- As in [1], the cars need to be at a specified position for the system to scan the number plate which is not required in RFID based system. Also, the number plates can easily be exchanged which has no way to get detected.
- High speed passage of car is possible (60 mph or 85 kmph).
- Wastage of fuel is substantially reduced.
- Traffic jams are avoided to a great extent.
- Security is an added advantage - The location of a stolen car can be notified to the concerned owner through the GSM module.
- The owner will also be informed about the amount deducted and the remaining balance which will help him to maintain a sufficient balance in his account.

IV. CONCLUSION

By enabling the toll plaza with RFID system we have established that a lot of time and fuel can be saved. After each passage the user will be informed of the balance deducted and balance remaining, this will help the user to maintain sufficient balance. The gates of the toll plaza will automatically open on detecting a valid RFID card as the car passes from them.

V. FUTURE SCOPE

In addition to the current progress toll plazas can be enabled with GSM tracking devices connected to RFID Central system to provide more security and reliability to the vehicles. By combining these two technologies we can track our vehicles at all times and also mobile banking and internet banking can be used for charging our balance.

REFERENCES

1. Aung Myint Win, "RFID Based Automated Toll Plaza System" http://www.ijsrp.org/research-paper-0614/ijsrp-p3009.pdf
2. Sachin Bhosale, "AUTOMATED TOLLPLAZA SYSTEM USING RFID" http://ijsetr.org/wp content/uploads/2013/07/IJSETR-VOL-2-ISSUE-2-455-460.pdf

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