Advanced Toll Automation Using RFID

R. Keerthana

Assistant Professor, Easwari Engineering College,
Ramapuram, Chennai

Sreeram.V

Surendar Rahul.R.

Suresh Kumar.S

Yuvaraj.J

Undergraduate Students, Easwari Engineering College,
Ramapuram, Chennai

Abstract: This project describes the automated toll collection system for toll gate based on RFID technology. Most of the toll collection systems commonly used are manual transaction. Nowadays, streams of traffic are increased and toll gate on highways are congested. It will cause the traffic jam and is time consuming. The objective of this project is to transform manual transaction to automated toll collection with the help of RFID technology. There are three portions in toll collection system viz., RFID system, balance deduction system in host computer and toll gate control system.

The ARM microcontroller is also used to control and display the deposit on the LCD. The authorized person at the toll gate can check the ID numbers, vehicle numbers and the amount of balance with the database on PC. The new user can register and update the amount of balance easily. The amount of deposits will also update simultaneously at the two database of the toll gate because of LAN network. By using this system, it will save time, i.e. by avoiding long queue.

I. EXISTING SYSTEM

Active wave Inc has currently deployed a system of active tag vehicle monitoring solution. Active wave vehicle products have a range of 30 meters and operate in the 916 – 927 MHz for the transmit operations and 433 MHz for the receive link. Active wave products are currently equipped with 256 Kbits of fixed memory. The tag is powered with a replaceable 3V battery and the total weight is 14 grams.

Elementary signals are shown with the help of blinking LEDs and beeping sounds. Smart key Access Control System has a client – server model based system with an SQL server handling multiple vehicle monitoring.

II. INTRODUCTION

RFID can be defined as follows: Automatic Identification Technology which uses radio-frequency electromagnetic fields to identify objects carrying tags when they come close to the reader. For many of us, using a key to start a car, a card to access a building and validating a bus or realizing it, we are using automatic technology that relies on radio- frequency electromagnetic fields.

The main idea behind implementing RFID Based Toll Collection System is to automate the toll collection process thereby reducing the long queues at toll booths using the RFID tags installed on the vehicle. In addition to this, it can not only help in vehicle theft detection but also can track vehicles crossing the signal and over speeding vehicles.

This system can be used by vehicle owners and system administrator. Other general advantages for the motorists include fuel savings and reduced mobile emissions by reducing or eliminating deceleration, waiting systems. They have designed a user interface using the Microsoft .NET Framework. Smart key also operate in the 900MHz band but have a small range of 30 meters. RFID based toll collection system uses active RFID tag which uses car battery power. The implementation is divided into the design of two modules the Vehicle Module (Active Tag) and the Base Module. The two modules communicate via RF modem connected to each module. These RF modules communicate over the ISM Frequency Range of 902 – 928 MHz.

III. PROPOSED SYSTEM

This project deals with the simplification of data capture procedure followed by drivers to pay toll at toll collection booths, like making it automated, vehicle theft detection etc. All these activities are carried out using single smart card (RFID tag), thus saving the efforts of carrying money and records manually.

IV. AUTOMATIC TOLL COLLECTION

The RFID Readers mounted at toll booth will read the prepaid RFID tags fixed on vehicles' windshield and automatically respective amount will be deducted. If the tag is removed from the windshield then cameras fixed at two sites at toll plaza take snaps of the front and back number plate. Since every vehicle registration ID is linked to users account, toll can be deducted from the account bank directly.

V. WEAPON DETECTION

It is done using molecular sensor.Every weapon consists of molecules in it.These molecules are sensed by the molecular sensor and it sends signals to RFID.Thus the weapons can be detected in the vehicle.

VI. TRACKING OVER SPEEDING VEHICLE

Vehicle travelling above speed limit can be tracked with 100 % accuracy.

VII. SIGNAL BREAKING AVOIDANCE

The vehicle ignoring the traffic signal will be detected by the RFID readers fixed at the signal crossing and notified to taffic police. This can be done efficiently and with great accuracy.

VIII. WORKING

As the vehicle enters the toll gate its details are been fetched by the RFID reader from a RFID tag fixed inside the vehicle.Once the reader gets information ,it passes to the ARM controller H. The controller verifies the data and the vehicle is allowed to pass through the toll. If the controller finds any variations in data, it does not allow the vehicle to pass through by not opening the toll gate. The information will be displayed on the LCD screen.
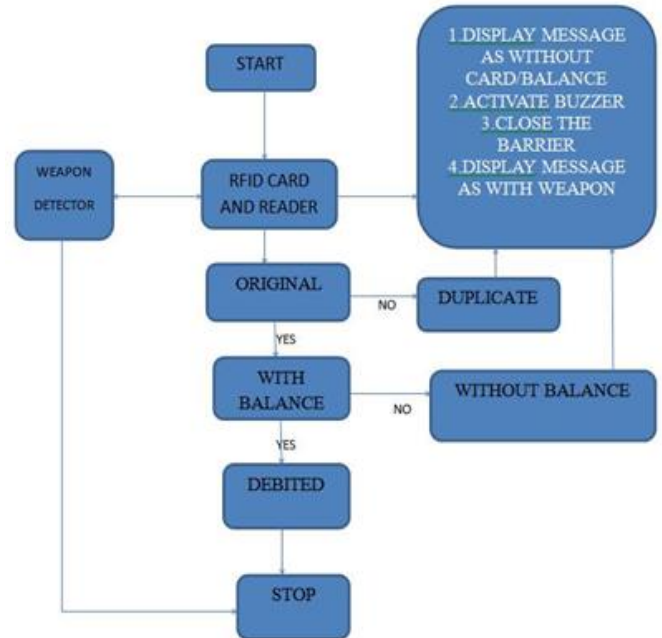

Figure 1: Block Diagram

IX. SIMULATION

Proteus is a simulation process for various designs with microcontroller. It is mainly popular because of availability of almost all microcontrollers in it. So it is a handy tool to test programs and embedded designs for electronics hobbyist. You can simulate your programming of microcontroller in Proteus Simulation Software. After Simulating your circuit in Proteus Software you can directly make PCB design with it.

This program allows users to interact with the design using on-screen indicators and/or LED and LCD displays and, if attached to the PC, switches and buttons. One of the main components of Proteus is the Circuit Simulation -- a product that uses a SPICE3f5 analogue simulator kernel combined with an event-driven digital simulator. Proteus VSM comes with extensive debugging features, including breakpoints, single stepping and variable display.

SIMULATION OF TOLL AUTOMATION WHEN AMOUNT IS DEBITED

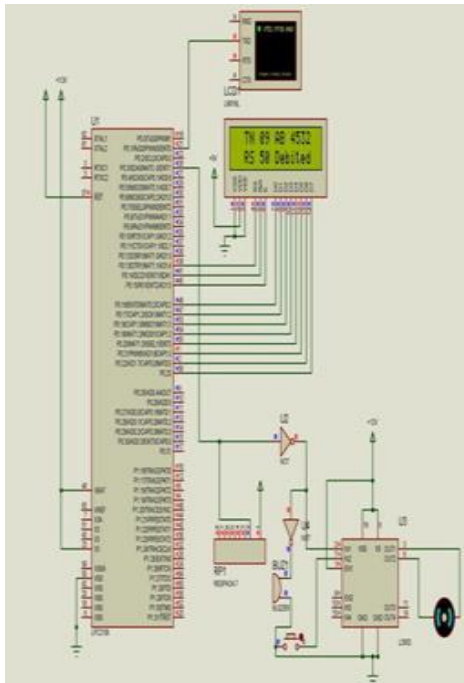Figure 2 shows simulation of toll automation when the amount is debited by reading the RFID card.

Figure 2: Simulation Of Toll Automation When Amount Is Debited

SIMULATION OF TOLL AUTOMATION WHEN THERE IS NO BALANCE

If there is no balance in the user's account, it will be automatically displayed in the LCD screen and the vehicle will not be allowed to pass through the toll. In such cases, the user will be asked to pay the amount in cash.

Figure 3 shows the simulation of toll automation when there is no balance.

Figure 3: Simulation Of Toll Automation When there is no balance

SIMULATION OF TOLL AUTOMATION WHEN WEAPON IS DETECTED

If a vehicle with weapon inside tries to pass through the toll, weapon detector detects the weapon and doesnot let the vehicle to pass through the toll gate.

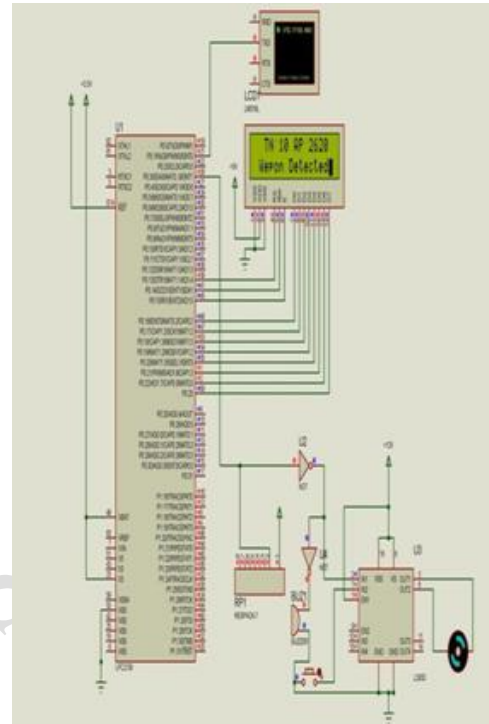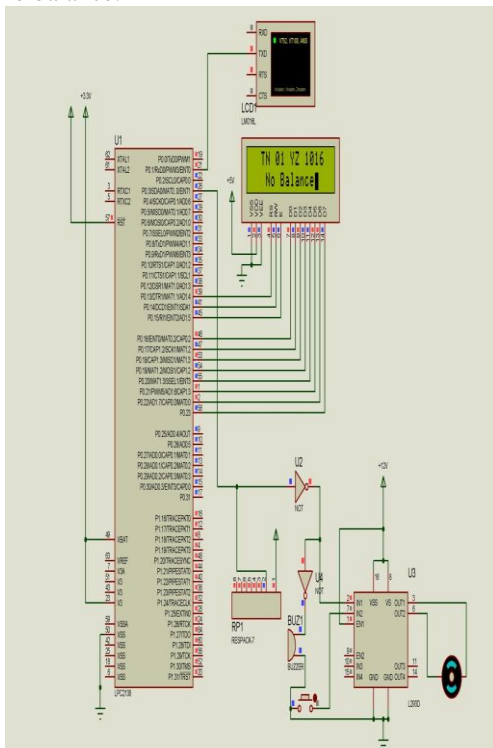Figure 4 shows the simulation of toll automation when weapon is detected.

Figure 4: Simulation Of Toll Automation When weapon is detected

ADVANTAGES

- ✓ Fewer or shorter queues at toll plazas by increasing tollbooth 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.
- ✓ The use of postpaid toll statements. (no need to request for receipts)
- ✓ Lowered toll collection costs.
- ✓ Better audit control by centralized user account.

X. CONCLUSION

The automation of toll plaza can have the best solution over money loss at toll plaza by reducing the manpower required for collection of money and also to reduce the traffic indirectly resulting in reduction of time at the toll plaza. In this project, the technique such as Radio Frequency Identification is introduced. This technique will include the RFID tag & reader, which in coordination with each other can be used to detect the vehicle identity. The IR Transceiver is used for detecting the presence of the vehicle at different locations which will act as the gate pass to the toll plaza. By effectively

utilizing these three techniques at different stages, this project is able to represent the automation in toll plaza which will reduce the complete processing time by few seconds, which is very important as well as it helps to reduce money leakage in a very cost effective manner.

REFERENCES

[1] Rakhi Kalantri, Anand Parekar,Akshay Mohite,Rohan Kankapurkar, "RFID Based Toll CollectionSystem", IJCSIT VOL 5 (2),2014,2582-2585.

[2] Aung Myint Win, Chaw Myat Nwe, Kyaw Zin Latt, "RFID Based Automated Toll Plaza System", International Journal of Scientific and Research Publications, Volume 4, Issue 6, June 2014 ISSN 2250-3153.

[3] Sachin Bhosale, "Automated Tollplaza System Using RFID"ISSN: 2278 – 7798 International Technology Research (IJSETR) Volume 2, Issue 1, January 2013.

[4] Sewon Oh, Joosang Park, Yongioon Lee, "RFID-based Middleware System for Automatic Identification", IEEE International Conference on Service Operations and Logistics, and Information, 2005.

[5] Shi-Cho Cha Kuan-Ju Huang Hsiang-Meng Chang, " An Efficient and Flexible Way to Protect Privacy in RFID Environment with Licenses ", IEEE International Conference RFID, April 16-17,2008.

[6] Kin Seong Leong, Mun Leng Ng, Member, IEEE, Alfio R.Grasso, Peter H. Cole, "Synchronization of RFID Readers for Dense RFID Reader Environments", International Symposium on Applications and the Internet Workshops (SAINTW'06), 2005.

[7] Lovemore Gunda, "RFID Based Automatic Tollgate System", (RATS)", CIE42 Proceedings, 16-18 July 2012, Cape Town, South Africa© 2012 CIE & SAIIE