RFID Based Automatic Toll Collection System Using GSM Technology

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ABSTRACT

This paper describes the RFID based automatic toll collection system for the toll gate. The greater part of the toll collection frameworks regularly utilized as a part of India comprises of manual exchange. Presently a day's activity has expanded on an extensive scale bringing about blockage at the toll courts. It causes congested driving conditions and wastage of time and additionally fuel. The goal of this task is to change manual exchange to computerized toll gathering with the assistance of RFID innovation. Programmed toll courts dispense with wastage of time, and in addition it can keep the client refreshed about it's adjust by communicating something specific each time it goes through the toll square. The toll is deducted from the vehicle proprietor's prepaid record each time it goes through it. A 125 KHz RFID peruser is utilized for recognizing the detached labels utilized by the client. The engine utilized for the blockade, nearby LCD show, which shows every one of the insights about the exchange, and GSM modules have been interfaced with the microcontroller (ATMega8). This framework will chop down time and fuel wastage at the toll courts, give data to the client about his/her adjust as the SMS is sent and will guarantee a smoother travel understanding for the voyagers. Likewise switches have been accommodated energize alternative if there should arise an occurrence of insufficient balance.

Keywords : ATMega8, LCD, RFID, GSM SIM900, Automated toll collection and GSM.

I. INTRODUCTION

The venture depends on making the toll squares programmed and diminishing the wastage of time and in addition fuel. Assume the manual toll gathering framework is exceptionally proficient, at that point Time taken by 1 vehicle at the court = 60 sec (approx.) Time taken by 1 vehicle/year = 60 X 365 = 21900 sec = 6 hours. Assume 10000 vehicles are going through a toll square 60000 fuel hours get squandered every year and in this way proportionate measure of fuel which brings about an extraordinary misfortune. The time and fuel wastage can be radically brought under control by utilizing this procedure of computerized toll squares. We here, are interfacing the RFID beneficiary to the microcontroller. The beneficiary is

Active and the RFID labels are latent. When the RFID label comes extremely close to the collector it will be recognized by the peruser. The peruser will serially convey the data to the microcontroller. The stipulated sum will be deducted from the record of the client and same will be shown on the LCD screen. After the sum is deducted the engine driver, which is driven by the microcontroller, will open the entryway and enable the vehicle to go through it. A message will be sent to the client who will give him/her the data about the toll sum and current adjust utilizing GSM module. On the off chance that the adjust in the record is deficient changes are given to revive the card and data about the energize is additionally sent to the client by means of SMS.

II. Literature Survey

There are distinctive strategies that can be utilized to actualize mechanized toll gathering. By doing study, distinctive strategies that were discovered are as per the following:

- In the computerized toll square is actualized in light of picture handling. Here the number plate of the vehicle is caught utilizing a camera and the toll is deducted by coordinating the number plate with the database.
- In framework depends on infrared sensors. At first the client needs to get a transmitter from the workplace which will comprise of the considerable number of points of interest of the client. As the client touches base at the toll court, the transmitter should be situated such that it comes in viewable pathway of with the recipient. When this is accomplished the switch is squeezed and the beneficiary will look for a match in the database and the coveted sum will be deducted.
- In the framework is completely in light of RFID Technology. As the RFID label comes in the scope of the peruser stipulated sum is deducted subsequent to coordinating the data from the database and the door that is controlled by the engine enables the vehicle to go through it. The rest of the references are very comparable. Our task depends on RFID innovation like yet we have excluded the database. We have additionally included GSM module in our venture which is thought to be future degree in a large portion of the papers.

III. System Design and Implementation
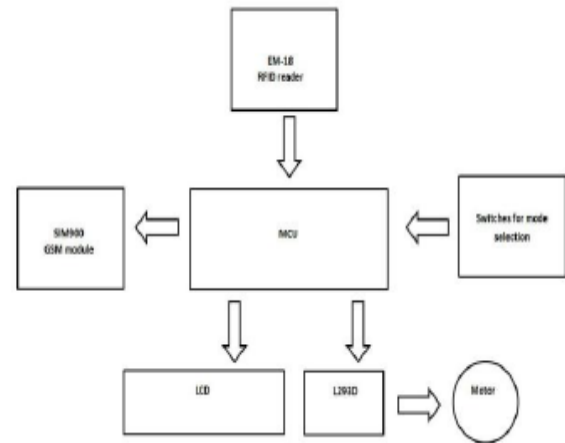
Fig-1: Block Diagram is the major components of system as seen in the block diagram are as follows:

ATMega328PU microcontroller

EM-18 (RFID reader module)

SIM900 (GSM module)

DC Motor with driver(L293D)

LCD display

3.1 ATmega328-PU μC ATmega8 is an 8-bit microcontroller which delivers high performance at low power consumption rate. It has an advanced RISC (Reduced Instruction Set Computing) architecture with 130 instructions that mostly execute in one machine cycle. The maximum frequency of operation is 16MHz at 4.5V. It has 16KB of in-system self-programmable flash program memory, 1KB of internal static RAM and 512 bytes of internal EEPROM. It has data retention capacity of 20 years at 85°C and 100 years at 25 ^{o}C.
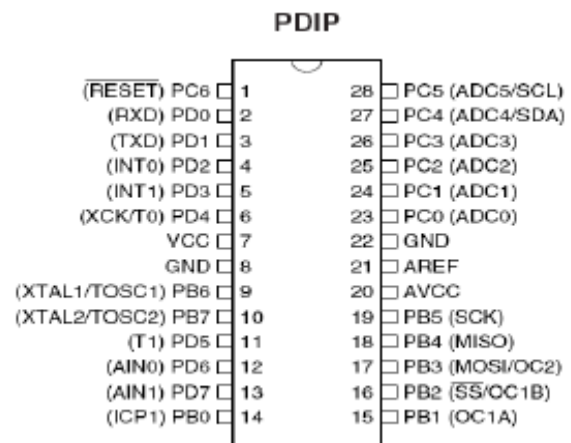
Fig-2: Pin configuration of ATMega8

The microcontroller is a 28 stick IC out of which 23 pins are programmable I/O ports. The IC and its stick setup are appeared in Figure 2.

3.2 EM-18 (RFID reader module): Operating distance of the peruser is 10cm and working voltage is 5V. It is a dynamic RFID recipient module which is arranged at the toll square. It always continues scanning for the RFID tag. When the tag arrives wi9thin the scope of the recipient it advises the microcontroller and serially speaks with it. The working recurrence is 125 KHz and current utilization under 50mA.
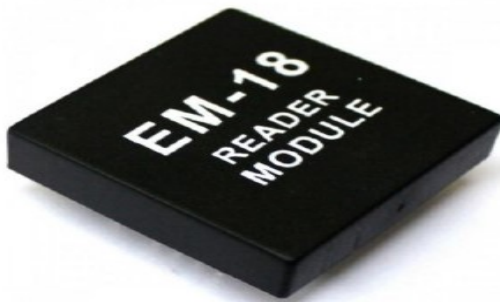

Fig-3: EM-18 Reader Module

3.3 SIM900 (GSM module): SIM900 is a complete Quad band GSM/GPRS solution in a SMT module which can be embedded in the customer applications. It delivers GSM/GPRS 850/900/1800/1900 MHz performance for voice, SMS, data and fax in such a way that it takes small form factor and low power consumption. With tiny configuration it can fit in almost all space requirements. Features:

- Quad-Band 850/900/1800/1900 MHz
- Dual-Band 900/1900 MHz
- GPRS multi-slot class 10/8
- Compliant to GSM phase 2/2+ Class 4(2W) Class 1 (1W)
- Control via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.5mA(sleep mode)
- Operation temperature: -40°C to +85 °C
- SIM application tool

Fig-4: GSM modem using SIM900 module

3.4 DC Motor with driver (L293D): This is the motor driver that can drive two motor simultaneously. L293D IC is a dual H-bridge motor driver IC. One H-bridge is capable to drive a dc motor in bidirectional. L293D IC is a current enhancing IC as the output from the sensor is not able to drive motors itself so L293D is used for this purpose. L293D is a 16 pin IC having two enables pins which should always be high to enable both the H-bridges. Features include

➤
➤ Featuring Unitrode L293 and L293D Products Now From Texas Instruments

Wide Supply-Voltage Range: 4.5 V to 36 V
Separate Input-Logic Supply
Internal ESD Protection
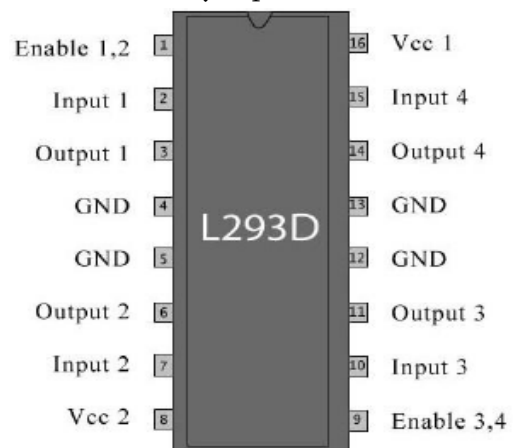Thermal Shutdown
High-Noise-Immunity Inputs

Fig-5: Pin configuration of L293D

- Functional Replacements for SGS L293 and SGS L293D
- Output Current 1 A Per Channel (600mA for L293D)
- Peak Output Current 2 A Per Channel (1.2 A for L293D)
- Output Clamp Diodes for Inductive Transient Suppression (L293D)

Fig-6: DC Motor

3.5. LCD Module

Fig-7: LCD Display

The show contains two inward far reaching registers, one for orders (RS=0) and the second for characters to be shown (RS=1). It likewise contains a client modified RAM territory (the character RAM) that can be customized to produce any coveted character that can be shaped utilizing a spot grid. To recognize these two information zones, the hex order byte 80 will be utilized to connote that the show RAM address 00h will be chosen.Port1 is utilized to outfit the charge or information compose, and ports 3.2 to 3.4 outfit enlist select and read/compose levels. The show sets aside shifting measures of opportunity to achieve the capacities as recorded. LCD bit 7 is observed for rationale high (occupied) to guarantee the show is overwritten. Fluid Crystal Display likewise called as LCD is exceptionally useful in giving UI and in addition for troubleshooting reason. The most widely recognized kind of LCD controller is HITACHI 44780 which gives a basic interface between the controller and a LCD. These LCD's are extremely easy to interface with the controller and also are financially savvy.

IV. System Working

At the point when the vehicle goes through the toll at first the RFID tag is distinguished by the RFID collector. When the tag is recognized the LCD will show 2 methods of activity, in particular, exchange mode and revive mode. On the off chance that adequate adjust is available in the vehicle stipulated sum will be deducted, engine driver will open the entryway and the vehicle will go through the toll. The clients should pick revive mode wherein 3 switches are accommodated energize. Each switch has a particular add up to revive, for example, 50, 100 and 150. The client can press a change as indicated by the sum he/she wishes to revive. The greatest adjust in a record is 250. It can't surpass this sum. In both the cases a SMS will be sent to the client utilizing a GSM modem. At the point when the vehicle goes through the toll utilizing the exchange mode a SMS is sent to the client which indicates the toll sum and additionally the rest of the adjust. At the point when the client chooses the revive mode and energizes the card, SMS seeing the revive subtle elements, for example, sum charged, new adjust is sent to the client.

V. Advantages

- RFID framework is superior to anything standardized identifications and frameworks in light of picture handling. RFID tag can be introduced inside the auto from where it isn't obvious and it is considerably speedier than any of them.
- Wastage of fuel is diminished as it were.
- Traffic jams are stayed away from.

- The proprietor will dependably know about his adjust due to the SMS being sent amid every exchange. It will likewise enable the client to keep least to adjust.
- RFID Technology is steady and developing with open design and is ending up progressively accessible.

VI. Conclusion

The issue of avoiding the instalment at the toll squares and in addition the issue of long lines can be settled via robotization. By utilizing this framework time and fuel are spared. Requirement for human intercession is diminished on an expansive scale. Client is likewise dependably refreshed about his/her prepaid record so as to dodge lacking equalization. In this manner, the RFID based Automatic Toll Collection System utilizing GSM is the most ideal route for toll gathering at the toll square. This framework will guarantee a smooth and safe voyage for the travellers and will likewise keep the travellersaware about their adjust by utilizing GSM.

VII. REFERENCES

[1]. Khadijah Kamarulazizi "ELECTRONIC TOLL COLLECTION SYSTEM USING PASSIVE RFID" TECHNOLOGYhttp://www.jatit.org/volumes/research-papers/Vol22No2/1Vol22No2.Pdf.

[2]. Sachin Bhosale, "AUTOMATED TOLLPLAZA SYSTEM USING RFID" http://ijsetr.org/wpcontent/uploads/2013/07/IJSETR-VOL-2-ISSUE-2- 455-460.pdf

[3]. Simple toll plaza system using low frequency RFID interfaced with 8051 microcontroller (AT89C51) http://www.engineersgarage.com/microcontroller/805 1projects/simple-toll-plaza-rfid-interface-at89c51- circuit

[4]. PriyankaChhoriya, "Image Processing based Automatic Toll Booth in Indian conditions"http://www.ijetae.com/files/-Volume3Issue4/IJETA E_0413_71.pdf

[5]. Thomas Kaiweit (2003), Exacting a Toll :GPS magazine, June 2003.

[6]. Myint Win, "RFID Based Automated Toll Plaza System" http://www.ijsrp.org/research-paper-0614/ijsrp-p3009.pdf

[7]. V. Sandhya, A. Pravin, "Automatic Toll Gate Management and vehicle access Intelligent Control System based on ARM7 Microcontroller" Vol.1, Issue 5, July-201.

[8]. PriyankaChhoriya, "Image Processing Based Automatic Toll Booth in Indian Conditions"http://www.ijetae.com/files/Volume 3Issue 4/IJETA E_0413_71.pdf

[9]. Shilpa Mahajan, "Microcontroller Based Automatic Toll Collection System" http://www.ripublication.com/irph/ijict_spl/09_i jict v3n8spl.pdf

[10]. AungMyint Win, "RFID Based Automated Toll Plazas System" http://www.ijsrp.org/research-paper0614 /ijsrp-p3009.pdf

[11]. KhadijahKamarulazizi, Dr.Widad Ismail, "Electronic toll collection system using passive RFID technology" 2. Automatic Toll Gate System Using AdvancedRFID and GSM Technology, S.Nandhini, P.Premkumar

[12]. Jerry.L and Barbara.C Smart Card Based Toll Gate Automated System

[13]. AUTOMATIC TOLL COLLECTION SYSTEM USING RFID, Aniruddha Kumawat1, KshitijaChandramore.

[14]. Unified electronic toll collection technology for national highways in India, The Ministry of Road Transport & Highway Vide Order.

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