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Transport System Using Automatic Toll E-Ticketing

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Abstract: As we all know that these days the operations of the toll plazas are done manually, in which cash is collected by the operator from the driver and a receipt of it is given to the driver. Basically, this initiative is chosen for making the transporting system through toll gate more convenient and viable for the passer by. It will effectively reduce time, work power and amount of effort put into it. For the Electronic Toll collection purpose we make use of the RFID modules that receive the data from the vehicles as it crosses the toll booth/plaza. The owner needs to have a prepaid account through which the amount generated can be paid. If the balance in the account is low or if the RFID system is not installed in the vehicle, under such circumstances the plaza remains shut and the owner needs to do cash payment with certain amount of fine imposed. The payment information is all digitized and is sent through messaging. A database is maintained to find out the amount or number of vehicles getting passed by the toll plaza for the given day. This technique helps us for time management, to reduce effort with lesser workforce.

I. INTRODUCTION

The automated e-ticketing is the method or initialization used for locomotives when the vehicles comes across the toll-plaza. For its detection an IR sensor is used. For the identification of each vehicle RFID tags are issued and designated to each vehicle, these RFID tags are read with the help of an RFID reader. Once the pulses are received by it IR receiver it forwards it to the controller(MSP430) which further sends the identification number with the RF transmitter placed in the vehicles.

The identification number of the vehicle can be assumed to be of 16 bit. The RFID tags used are read by the RFID reader. A computers parallel port receive the RF signal that is being sent by the RF receiver. A software is used to get the details of the vehicle from the database. As per the received information the stipulated charge is deducted from the account of various vehicle owner. But anyhow, if the owners account does not have sufficient amount for the bill generated it is not allowed to pass through and the amount is then availed through hard cash with a certain amount of fine imposed for which the car has to stop.

There are many shortcomings to the toll systems that are being used presently. They incur power loss because of the continuous supply to the receiver, i.e, the receiver switch on even if there is no car around the toll plaza. This shortcoming is overcome in our technique as the IR sensor which is being used by us only turns on whenever there is any detection of a vehicle.

II. RELATED WORKS

- A. This paper presents effective means to curb pollution by reducing the amount of emission from vehicles. The system takes into account every minute detail like the type of car and the human-beings inherent ability to react in such situations.
- B. This research paper makes use of IoT to develop an intelligent traffic administration system. This system is far more effective in controlling the traffic on highways and busy roads than the manual way of handling traffic.
- C. This paper uses Fuzzy algorithm to automate traffic system based on dynamic output technique. The system proposed doesn't use a specific set of predefined rules to provide result instead it has an efficient way of dynamically producing data through the real time data from the non deterministic traffic data input. To prove the effectiveness our project in comparison between the existing system and the one proposed by us is demonstrated in experimental section.
- D. RFID tags that are installed on the vehicle helps to reduce the long queue of the toll plaza which is being done by implementation of ATCSR to automate toll collection.
- E. Automated toll systems have helped in reducing the heavy traffic caused in big cities nowadays. This method is easiest way to manage the rush in traffic. In this paper when a car crosses the toll plaza on any road it is detected by RFID reader. In this paper manual toll collection is eliminated any toll collection is done automatically. So this paper reduces time and work force.

III. HARDWARE IMPLEMENTATION

A. Programming Board

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A programming board is designed for MSP430 launch pad microcontroller which is constituted of JTAG based on Spy-Bi-wire mode. A fuse blow protection is used that is connected to the power supply. The first pins are connected to the single pole single throw switch and LED for verifying and testing the code.

B. IR Proximity Sensor

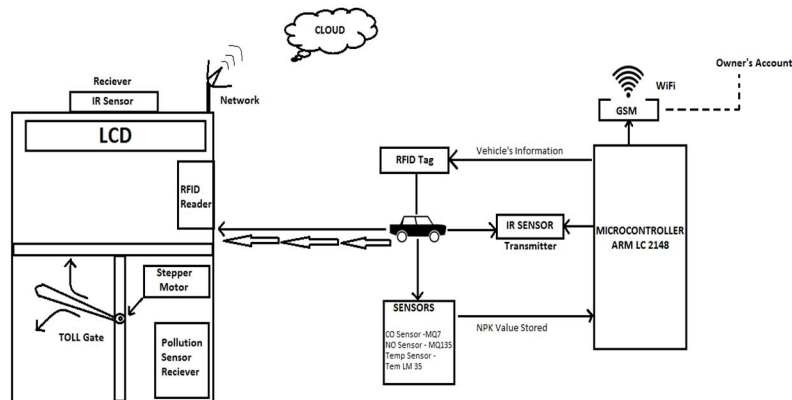
An Infrared proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. This is easy to build, easy to calibrate, provides a detection range of 35cm and can be used to measure the speed of object moving at a very high speed. In our example, it is used to detect vehicles arriving at toll plaza gate. The NA555 timer is used in mono stable mode. The sensor is installed at the toll plaza to detect the presence of a moving vehicle. The sensor transmits an infrared signal and when no vehicle is approaching a the IR radiation is received back resulting in triggering and high output. Similarly when the timer output is low indicates that where in a vehicle approaching the Toll gate. The Microcontroller senses the output of timer and takes action.

C. RFID

Radio frequency identification (RFID) technology is a wireless communication technology that endless users to uniquely identify tagged objects or people. An RFID system has four basic components – A tag, an interrogator, a controller and an antenna. The tags contain electronically stored information. The RFID reader is placed at Toll plazas and the RFID tag attached to each vehicle. When vehicle approaches, the tag is read by the reader and information is sent to the software running on the PC. The best part about RFID in that it can be placed anywhere on the car i.e need not be in the perfect LOS of the RFID reader.

D. Data Transmission

The computer system at Toll plaza receives all the information that should be known about the arrived vehicle through the RFID tag. The software on the system then searches its database and appropriate tax is levied depending on the category the vehicle falls in – heavy weight, light weight, two wheeler, four wheeler etc. If the vehicle owner doesn't have sufficient funds in the account linked for payment, then the Toll gate will not open and ticket is generated. In this situation the driver needs to take and pay for the ticket manually and then he will be allowed to cross toll plaza.



Block Diagram of system overview

IV. SOFTWARE IMPLEMENTATION

A. Microsoft access

Microsoft access is a relational database management system from Microsoft. It is used by software developers, data architects and power users for secure and easy access of the database. This software, in addition to providing access to its database, also provide other multiple backend sources for data.

B. Visual Basic

Visual basic provides programmers with rapid application development (RAD) of GUI applications using components provided by visual basic progress itself. In this work it is used to interface Microcontroller with PC in E-toll plaza. When Microcontroller raises request for E-ticket, the program carries out the transaction and generates E-ticket and provides the details as SMS to owner's mobile number.

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C. Sending SMS

First the mobile phone and the computer at toll plaza are connected through GSM, in which the SIM card in the mobile phone is used to send the SMS, when START_SMS function is activated, the registers in SEND_SMS are sent. This consists of the information about the amount charged as toll.

V. RESULTS

The prototype can be explained and tested in the simulated environment with the help of an toy vehicle and a SMS will be sent to the owner registered number as shown below in Fig1.

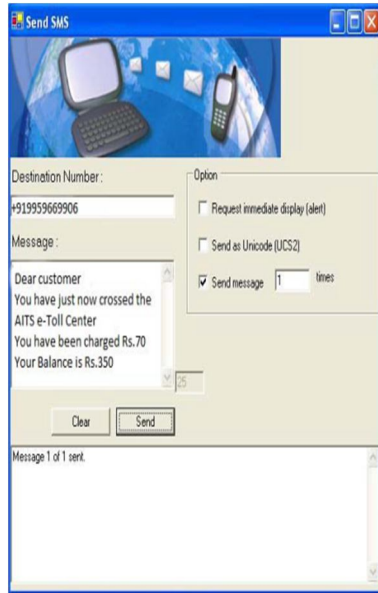


Fig1 -Graphical User Interface for the Toll Plaza Software acknowledgement

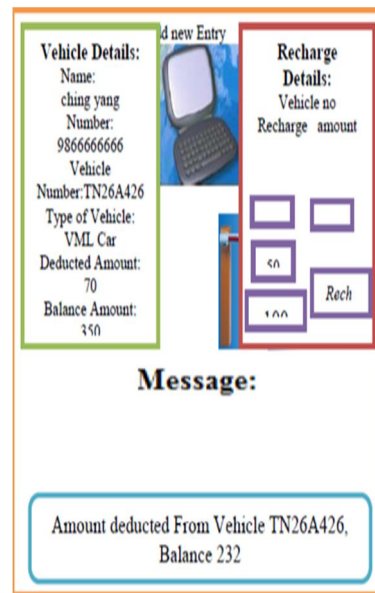


Fig2- Graphical User Interface for sending SMS

The collection mechanism we are using has several advantages and benefits. The data transfers are accurate as we are using RFID. The graphical user Interface for SMS sending and acknowledgement is as shown in the Fig2.

Stolen vehicles can be easily detected at the toll booth. Below shown is the prototype developed for the test environment, in this as the car passes the toll booth the receipt is generated and sent as discussed earlier. RFID reader are placed at the sides of the toll gate as shown in the Fig3.



Fig3- Prototype developed for Test environment of project-Vehicle at the Toll Plaza

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VI. CONCLUSION

In this paper, we have used an unique technique that helps us to pay the toll taxes automatically through online transactions without making the vehicle to stop at the toll gate/plaza using RFID communication technology and the messaging service. We can also determine the no of time a vehicles passes through the toll plaza in a day.

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