



Automated Toll Collection System Using RFID

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ABSTRACT: This paper presents an Automated Toll Collection System (ATCS) used for collecting tax automatically. In this, the identification with the help of radio frequency is done. A vehicle will hold an RFID tag. This tag is nothing but unique identification number assigned. This will be assigned by RTO or traffic governing authority. In accordance with this number it will store, all basic information as well as the amount he has paid in advance for the TOLL collection. Reader will be strategically placed at toll collection centre. Whenever the vehicle passes the toll, the tax amount will be deducted from his prepaid balance. New balance will be updated. In case if one has insufficient balance, his updated balance will be negative one. To tackle this problem, a notification is made, which will alert the authority that this vehicle doesn't have sufficient balance and that particular user's account should be recharged. As vehicles don't have to stop in a queue, it assures time saving and fuel conservation.

I. INTRODUCTION

Toll plaza system increasing traffic volume makes congestion commonly around the tollgates of Highway. So, reform measure of congestion around the tollgates is urgently required. One of the methods is Toll Collection System. Develop a micro simulation model, which reproduces the operation states of various tollgate systems: waiting time, passing time. With this simulator, proposed the optimal operation strategy of highway tollgate by benefit-cost analysis on the basis of benefit in saving total waiting time and operating cost.

- Reduce time for collecting toll at the toll plaza.
- RFID tags can be read at much greater distances; an RFID reader can pull information from a tag at distances up to 300 feet.
- As the vehicle approaches the identification site, the computerized control unit placed near toll lane receives the identifier signal and calculates the toll to be debited and electronically debits the toll on the account of the particular vehicle.
- This system allows a vehicle to persist past the scan point without stopping, thus offering maximum convenience to motorists, speeding up the flow of traffic, and reducing the number of human resources required at highway toll plazas.
- Smooth traffic flow at toll gates.
- Convenient toll collection without handling cash.
- Reduction of management costs.
- Convenient and quick service to the vehicle owners.
- Stolen vehicles can be detected.

Automated Toll System using the RFID technology with an android application, it contains the RFID tag and the RFID reader.

In the proposed system the user can register through the web application. If the user can login to the system, they can select the route and toll both, then register the toll pass. Then the toll pass is accept by the admin. In the proposed system we use php language to design the web application. PHP didn't have the direct communication with the embedded system. So we introduce an android application to communicate the embedded system. The web application send the values to the android app. Then the android app send to the values to the embedded.



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RFID tends the Radio Frequency Identification; they consist of the tags which can be either active or passive. Passive RFID tags do not have their own power supply: the minute electrical current induced in the antenna by the incoming radio-frequency scan provides enough power for the tag to send a response. Due to power and cost concerns, the response of a passive RFID tag is necessarily brief, typically just an ID number.

Active RFID tags, on the other hand, must have a power source, and may have longer ranges and larger memories than passive tags, as well as the ability to store additional information sent by the transceiver. The technological differences between tag types do not affect their abilities to collect travel time data; the necessary data (i.e. unique ID numbers) are transmitted from the transponders to the roadside units regardless of transponder type.

At present, the smallest active tags are about the size of a coin. Many active tags have practical ranges of tens of meters, and a battery life of up to several years. Radio frequency identification (RFID) is a method of remotely storing and retrieving data using devices called RFID tags. An RFID tag is a small object, such as an adhesive sticker, that can be attached to or incorporated into a product. RFID tags contain antennae to enable them to receive and respond to radio-frequency queries from an RFID transceiver.

RFID tags can be either active or passive. Passive RFID tags do not have their own power supply: the minute electrical current induced in the antenna by the incoming radio-frequency scan provides enough power for the tag to send a response. Due to power and cost concerns, the response of a passive RFID tag is necessarily.

Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags or transponders. The technology requires some extent of cooperation of an RFID reader and an RFID tag.

What is RFID Tag?

A basic RFID system consists of three components:

- An antenna or coil
- A transceiver (with decoder)
- A transponder (RF tag) electronically programmed with unique information.

Automatic vehicle identification tags can be further broken down into distinct tag types based on the degree to which they can be programmed and the type of power source.

Type I: The information stored in these tags is fixed (read only), and the tags do not have any processing capabilities.

Type II: These tags contain an updateable (read/write) area on which the antenna/reader may encode information such as point of entry, date/time of passage, etc.

Type III: (also called Smart Tags) are used in conjunction with an in-lane RF antenna/reader to communicate identifying information about the vehicle, customer, and account balance information to the toll system. Some portions of the tag information are fixed (such as vehicle and customer data) while others are updateable (such as balance information). The Smart Tag contains a microprocessor, which maintains account balance information that is updated each time the smart tag is used.

II. LITERATURE SURVEY

A.EXISTING SYSTEM

In existing system, current times of increasing traffic on the road, it is important to collect the toll tax in a managed and controlled process so that it doesn't result in a total unorganized jungle of traffic. It is very challenging to handle a vehicular flow by a manual system of revenue collection. Poor management at toll plaza may result into great chaos and revenue loss. This would not be desired any one. Collecting toll tax is time consuming method. Chances of escaping the payment of toll tax are there. It leads to queuing up of following vehicles. Suppose the manual toll collection system is very efficient then for one vehicle to stop and pay taxes total time taken is 50 seconds. And suppose 200 vehicles cross the toll plaza. Then, time taken by 1 vehicle with 60 second average stop in a month is: $50 \times 30 = 1500$ seconds.

Yearly total time taken = $1500 \times 12 = 18000$ seconds = 5.0 hours

On average each vehicle that passes through the toll plaza has to wait 5.0 hours in engine start condition yearly. The figure is staggering if on an average we take 200 vehicles pass through the toll plaza each day, then yearly 72000 vehicles pass through the toll plaza and each year 72000 vehicles just stand still for 5.0 hours in engine start condition

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thereby aiding pollution and wasting fuel and money. This study is if the system is very efficient but what if the vehicle has to wait for 5 minutes? This is a figure considering one toll plaza. If considering 50 toll systems the figure will drastically increase and the wastage of fuel, money will increase and pollution will also increase.



FIG: Existing system model

III. PROPOSED SYSTEM

Vehicles online gate pass require less time to conduct a toll transaction. Thus the average service rate of a mixed toll lane is generally higher than a manual lane, depending on the proportion of tagged vehicles in a mixed-use lane. Reduction in vehicle waiting times: An increase in a toll lane service rate causes a decrease in the average waiting time of vehicles at the toll plaza.

Vehicle emissions are reduced as vehicle speeds through the toll plaza are increased and accelerations and decelerations reduced. Reduction of toll user costs also reduces the cost of processing toll transactions. Simplified infrastructure and accounting system. Requires for less road side infrastructure than manual tollbooths

In a toll pass system each vehicle consists of a specific rfid. The control room consists of the data for toll payment balance for that particular vehicle. The microcontroller checks the information and the due of that vehicle. For each travel the balance of the vehicle decreases if the payment of the vehicle is having without due that allows the vehicle; if not automatically gate closes.

The growing demand for Electronic Toll Collection systems has increasingly shifted focus towards optimization in the areas of efficiency, faster service, and cost.



FIG: Proposed System



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IV.METHODOLOGIES

A.PHP

PHP web development includes the following services supportive of creating efficient and high-ranking web pages and applications:

- PHP web programming
- PHP application development
- PHP web application development
- Custom PHP application development
- PHP e-commerce solution
- Zend PHP development
- Cake PHP development

B. MySQL

MySQL database has become the world's most popular Open source database because of its consistency, fast performance, high reliability and ease of use. It has also become the database of choice for a new generation of applications built on the LAMP stack (Linux, Apache, MySQL, PHP / Perl / Python). MySQL runs on more than 20 platforms including Linux, Windows, OS/X, HP-UX, AIX, Netware, giving you the kind of flexibility that puts you in control. MySQL offers a comprehensive range of certified software, support, training and consulting. MySQL is a multithreaded, multi-user SQL Database Management System. MySQL's implementation of a relational database is an abstraction on top of a computer's file system. The relational database abstraction allows collection of data items to be organized as a set of formally described tables. Data can be accessed or reassembled from these tables in many different ways, which do not require any reorganization of the database tables themselves.

C. ANDROID

Android is a mobile operating system (OS) based on the Linux kernel and currently developed by Google. With a user interface based on direct manipulation, Android is designed primarily for touch screen mobile devices such as smart phones and tablet computers, with specialized user interfaces for televisions (Android TV), cars (Android Auto), and wrist watches (Android Wear). The OS uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard.

Android is popular with technology companies which require a ready-made, low-cost and customizable operating system for high-tech devices. Android's open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices which were officially, released running other operating systems. The operating system's success has made it a target for patent litigation as part of the so-called "smartphone wars" between technology companies.

D.HTML

Hyper Text Markup Language (HTML) is the standard markup language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript it forms a triad of cornerstone technologies for the World Wide Web. Web browsers receive HTML documents from a web server or from local storage and render them into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

V.SYSTEM DESIGN

The goal of the design system is to produce a module of the system, which can be used later to build that system, the produced module is called design of the system. The most creative and challenging phase of the system life cycle is system design. The term design describes a final system and the process by which it is developed.

A.SYSTEM ANALYSIS

System analysis is the application of the system approach to problem solving using computer. Analyst must consider its elements like outputs and inputs processors, control, feedback and environment when construction the system.



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In system design the focus is on deciding which modules are needed for the system, the specification of these modules should be interconnected is called System Design. System design is also called as top-level design. The design of a system is a plan for the solution for the system.

During the design phase two separate documents are produced, one for system design and one for detailed design. A system design is the first design stage in which the basic approach to solving the problem is selected. During system design, the overall structure is decided.

When designing the system the points taken care are:

- Identify the data to be retrieved.
- Identify the user requirements.
- Identification of the output and input screen.
- System specification.
- A design phase follows system analysis phase.

B.DFD (Data Flow Diagram)

A data flow diagram is a graphical representation of the flow of data through an information system. Data flow diagrams (also called as data flows graphs) are commonly used during problem analysis. Data flow diagrams are very useful in understanding a system and can be effectively used during analysis.

A DFD shows the flow of data through a system. It views a system as a function that transforms the inputs into desired outputs. The DFD aims to capture the transformation that take place within the system to input data so that eventually the output data is produced.

The agent that performs the transformation of data from one state to another is called a Process (or a bubble). The processes as shown by named circles and data flows are represented by named arrows entering or leaving the bubbles. A rectangle represents a source or a sink and is a net originator or consumers of data.

VI.RESULTS

Shown below are the screenshots of the various activities from the Android application, hardware part and web application along with their description.

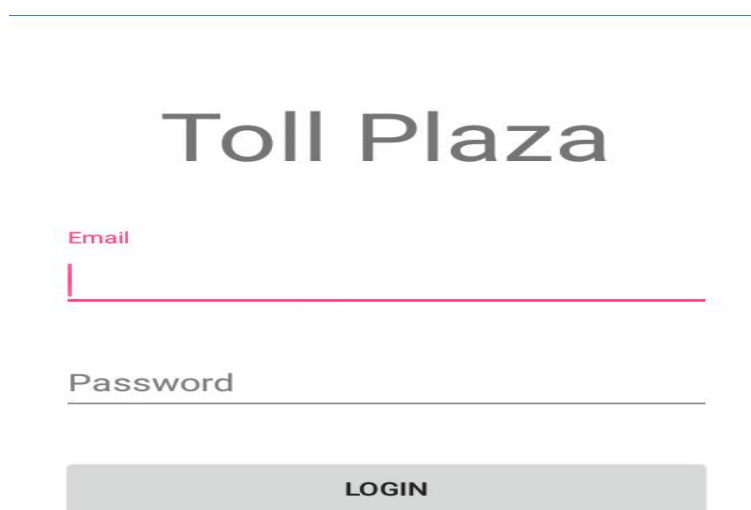


Figure 1: Login Page of Android Application

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Description:

The Figure 1 shows user login page. In this user has to login with a valid Email and Password to get started with the Android application. After clicking “Login” button, the entered username and the entered password will be sent to the RFID tag and the user will be granted access if he is registered within the system.

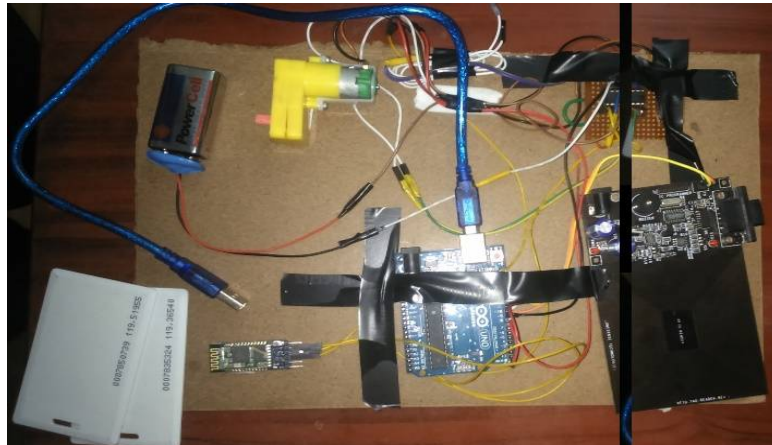


Figure 2: Hardware part of the system

Description:

The Figure 2 shows hardware part of toll management system which includes 9v Battery, Bluetooth, RFID tag and reader, DC Motor, arduino Board. The hardware works when the details is send to the rfid tag, that details will be read by the rfid reader. After verifying the details the DC motor gets instruction from microcontroller. Then the toll gate will automatically open.

VII. CONCLUSION

In this system the techniques such as Radio Frequency Identification and Bluetooth are introduced. This technique will include the RFID tag & reader which in coordination with each other can be used to detect the vehicle identity. Bluetooth connects the android application to the RFID. The IR Transceiver is used for detecting the presence of vehicle at different locations which will act as the gate pass to the toll plaza. By effectively utilizing these techniques at different stages of 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 helps to reduce money leakage in a very cost effective manner. In turn it also reduces the consumption of fuel and reduces the pollution.

This system describes the toll collection system which provides an efficient toll collection as well as antitheft system. The toll collection method which is also user friendly. This toll collection system has main feature that it uses RFID not only to detect the vehicle but also to transfer data time to time to keep system secured and well managed. The old toll collection techniques were having many drawbacks like there was change problem and time required to process one vehicle was also more. Electronic toll collection was saving time but there was problem of security. This paper gives solution to all these problems.

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BIOGRAPHY

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