Automated Toll Collection

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Abstract---An Automated Toll System is used for toll collection without making traffic congestion and waiting in long queue with help of RFID technique. Also, by using this system, it will save time, i.e. by avoiding long queue as no need to stop the vehicle and no need of manual transaction. Most important that, the stolen vehicle will be able to catch easily with help of RFID technique and nail assembly. The current system for collecting toll is on the basis of manual transaction. In this each vehicle has to stop at the toll plaza for payment and there can be a problem of exact transaction. It causes traffic congestion, increase in pollution, and wasting time of people. In Automated Toll System no need to stop vehicle at toll plaza, it will detect the RFID tag, which is mounted on vehicle. After detecting RFID tag, the database on the administrators screen will appear and the balance from the customer's account will get deducted. So there will not be any problem as mentioned above. The system is connected to a PC using the RS232C interface in the embedded system. This allows the system to read and write data from/to a database that is from the account.

Keywords: Automated toll collection, RFID.

I. INTRODUCTION

Electronic collection of toll payments is made through a technology known as Electronic Toll Collection (ETC). Various researchers have been working on it applied it in various highways, tunnels and bridges which requires sophisticated technology like ETC. With the help of this system one can easily determine the authentication of registration of car and if there exists any violation in debits then authorities are being informed. It provides opportunity to eliminate congestions in tollbooths. Generally tollbooths get congested during festive season when traffic gets heavier than normal. It also gives marvelous benefits to toll

A. Benefits:
1) Benefits to motorists:
- Following are the benefits of Electronic Toll Collection to motorists:
- Shorter queues at toll plazas because of increment of turnaround rate on toll booth service.
- Efficient and rapid service.

  If the credit card is loaded then payments automatically credited from the accounts of card holder and balance remains on the card.
- No need to make receipts.
- Fuel saving

2) Benefits to toll operators:
- Decrease in toll collection costs
- Centralized user accounts make better audit control.
- Expansion in capacity

B. What is RFID Tag?
A basic RFID system consists of three components:
  a) An antenna or coil
  b) A transceiver (with decoder)
  c) 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.

C. Components of RIFD:
RIFD consists of following components:
  1) Transponder
  2) Reader of writer
  3) Antenna
  4) Computer host

II. SPECIFICATION, DESCRIPTION AND DESIGN OF HARDWARE

A. Transponder:
Transponder or tag is a microchip which is combined with an antenna system which is assembled in a compact package. The microchip consisted of logic circuits to receive and memory (Ayub khan, Manoj, & Prabhu, 2009). Transponders are of two types, passive and active tags. Active tags have internal battery while passive tags are empowered with signals from the signals from its readers.

B. Reader:
A reader contains an antenna to transmit and reception of data from the transponder. Reader also consists of a decoder and a RF module.

C. Antenna:
Antenna capture signals from transponder.

D. Computer Host:

Computer host plays role as interface to an IT platform and exchange information between the RFID system and the receiver or end-used. Host system then transform this information in a format that could be easily understandable by end-user.

E. GP20:

Product Name: GP20 Proximity Reader

PROXIMITY 125 KHz readers are high performance proximity readers featuring long range and small dimensions. The readers run from any voltage from 5 to 12.5 VDC and feature high read range at as low as 5 volts making it ideally suited to a wide variety of applications, particularly access control. The same basic unit can be configured to output most of the common interface formats, including Wiegand, Magstripe, Clock/ Dataand RS-232 serial ASCII output, making it easy to upgrade existing installations.

F. Standard clamshell card

CSC-125, 125 KHz RFID Clamshell cards are water proof and provide best reading range with 125 KHz RFID readers. Clamshell cards are very popular in Access control applications but can be used in wide range of RFID applications. They are lowest cost RFID cards available currently in the market. They have 26bit factory written ID that cannot be changed, though selected number sequences can be supplied for volume orders. These are Read only tags.

III. REQUIREMENT SPECIFICATION

A. Software requirement

Framework: .NET 3.5
Software Package: VISUAL STUDIO .NET. 08
Language for Development: C# .NET
Database: SQL Server 2008

B. NEED

The current system for collecting toll is on the basis of manual transaction. In this each vehicle has to stop at the toll plaza for payment. It causes traffic congestion, increase in pollution, and wasting time of people. In Automated Toll System no need to stop vehicle at toll plaza, it will detect the RFID tag, which is on vehicle. After detecting RFID tag, the database on the screen will appear and the balance from the customer's account will get deducted. So there will not be any problem as mentioned above.

The goal is to implement the reliable system that leads to:

- Saving the time at toll plaza for toll collection.
- Reducing traffic congestion and increases security Concerns.

C. System Architecture and Business Logic:

1) Background:

The most creative & challenging phase of the system like cycle is system design. The term "design" describes a final system & the process by which it is developed. It refers to

The technical specifications that will be applied in implementing the candidate system. It also includes the construction of programs & program testing. The key question involved here is "How the problem should be solved? System design is a solution for the question of how to approach to the creation of a new system. This important phase is composed of several steps. It provides the understanding & procedural details necessary for implementing the system recommended in the feasibility study. Emphasis is on translating the performance requirements into design specifications. Design goes throughout logical & physical stages of development. Logical reviews the present physical system; prepares input & output specifications makes edit security & control specifications; details the implementation plan; prepares a logical design walkthrough. Physical design maps out the details of the physical design, plans the system implementation, devises a test & implementation plan & specifies any new hardware & software. The current system for collecting toll is on the basis of manual transaction. In this, each vehicle has to stop at the toll plaza for payment. It causes traffic congestion, increase in pollution, and wasting time of people. In Automated Toll System no need to stop vehicle at toll plaza, it will detect the RFID tag, which is on vehicle. After detecting RFIDt Ag, the database on the screen will appear and the balance from the customer's account will get deducted. So there will not be any problem as mentioned above. Develop a micro simulation model, which reproduces the operation states of various tollgate systems: waiting time,

Passing time. With this simulator, we 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.

IV. ADVANTAGES

1. Reduces the man power.
2. Enables very specific detection of vehicles.
3. Simultaneous multiple detection of vehicles are possible Using RFID.
4. Proximity of loop antenna and tag provides potential for Increased reliability.
5. Saves time and money.
6. Minimizes work stress

V. DISADVANTAGES

1. Low frequency results in lower maximum data rate, although it is fast enough to allow multiple transmissions to increase reliability.
2. Tag usually requires power from vehicle (active tag).
3. Tag installation is not as convenient as that of a windshield-mounted tag.
4. Moderate difficulty in duplicating tags.

VI. CONCLUSION AND FUTURE SCOPE

Designed a system to give complete solution for traffic and transport related problems such as Toll gate control, traffic signal control, traffic rules violation control, parking management and special zone alert using the latest RFID technology. It is proposed as a low cost optimized solution using RFID and GSM mobile technology.

At the toll plaza, there will be a large LCD screen for

Displaying details of the transaction. At the same time, it will show:

1. Total cost of that road.
2. The duration of toll plaza.
3. And the remaining balances after each transaction.

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