PROJECT ON

**“RFID TOLL COLLECTION SYSTEM”**

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**ABSTRACT**

This paper is related to RFID technology; this system uses a tag and the reader which collects information of vehicle passing through the toll plaza and will automatically debits the toll amount from the prepaid account of each vehicle, which in turn will reduce the traffic congestion and human errors. The vehicle owner has to register his vehicle with RFID tag, creating a rechargeable account.

A manual toll collection system is been used widely in India. But it is not very reliable. Manual toll collection system requires more processing time at the toll booth. This leads a very long queue at the toll booths and results in increase in pollution in that area. This also increases the traffic resulting in waste of fuel.

This project is designed to reduce these kinds of problems which are being faced by the travellers. This project will reduce the queue in front of the toll booths and pollution to some extent. This will also reduce the cost by less manpower requirement. This will also ensure correct toll collection & correct record keeping.

The project focuses on the collection of toll by RFID [Radio Frequency Identification]. The RFID card uses RFID tags for identification. Each card is given a unique number which is been saved in the system. This unique code is used by the RFID reader to get the information embedded in the tags.

In this system, each vehicle is given these tags. Every Toll collection booth will have a RFID system setup. The only thing driver needs to do is place his RFID tag on the reader. RFID reader will identify the unique code and will collect the amount of toll from the account the vehicle holds. After the toll is deducted, driver will receive a message for toll amount deducted and the remaining balance in his amount. This information will also be displayed on the screen at the toll booth gate.

After the toll is deducted, system will open the barrier and the vehicle can pass through.

**INDEX**

|  |  |  |
| --- | --- | --- |
| **CH.NO** | **CHAPTER** | **PAGE**  **NO.** |
| **1.** | **Introduction**   * 1. Motivation   2. Background   3. Need   4. Literature survey |  |
| **2.** | **Proposed Work**  2.1 Problem Definition  2.2 Features  2.3 Goals  2.4 Feasibility Study |  |
| **3.** | **Project Design**  3.1 Hardware Description  3.2 Software Description  3.3 Algorithm  3.4 Flowchart |  |
| **4.** | **Schedule of work** |  |
| **5.** | **Implementation and Result**  5.1 Experimental Setup  5.2 Hardware Testing  5.3 Results with Screen Shots  5.4 Advantages  5.5 Disadvantages  5.6 Application  5.7 Costing |  |
| **6** | **Conclusion and Future scope** |  |

**List of Figures**

**CHAPTER 1**

**Introduction**

* 1. **Literature Survey**

William Vickrey, the Nobel Economics prize winner, in 1959, was the first who proposed electronic toll system for Washington Metropolitan Area. Free flow tolling with fixed transponders undersides of vehicles and the readers were located under the highway surfaces (1960s and 1970s). This system was first introduced in Bergen (1986). World’s first use of completely unaided full speed electronic toll system was introduced by Trondheim (1991). Norway has electronic fee collection (EFC). The United States was the first to used ETC system in several states. In California, Texas, Florida, vehicles can travel at full speed through electronic lanes.

In 1959, Nobel Economics Prize winner William Vickrey was the first to propose a system of electronic tolling for the Washington Metropolitan Area. He proposed that each car would be equipped with a transponder. “The transponder’s personalised signal would be picked up when the car passed through an intersection, and then relayed to a central computer which would calculate the charge according to the intersection and the time of day and add it to the car’s bill”  Electronic toll collection has facilitated the concession to the private sector of the construction and operation of urban freeways, as well as made feasible the improvement and the practical implementation of road congestion pricing schemes in a limited number of urban areas to restrict auto travel in the most congested areas.

In the 1960s and 1970s, free flow tolling was tested with fixed transponders at the undersides of the vehicles and readers, which were located under the surface of the highway.

Norway has been the world's pioneer in the widespread implementation of this technology. ETC was first introduced in Bergen, in 1986, operating together with traditional tollbooths. In 1991, Trondheim introduced the world's first use of completely unaided full-speed electronic tolling. Norway now has 25 toll roads operating with electronic fee collection (EFC), as the Norwegian technology is called AutoPASS. In 1995, Portugal became the first country to apply a single, universal system to all tolls in the country, the Via Verde, which can also be used in parking lots and gas stations. The United States is another country with widespread use of ETC in several states, though many U.S. toll roads maintain the option of manual collection.

* 1. **Block Diagram**

RFID Tag

Buzzer

**MICROCONTROLLER**

Power Supply

Motor

GSM Module

Display

RFID Reader

**2.2 Features-**

* Man power is reduced.
* We get a message of toll amount and remaining balance in the account.
* Queue in front of toll booths is reduced.
* Pollution gets decreased.
* Toll information is displayed on the screen.
* Fuel consumed is less.
* Traffic gets reduced.
* Requires less time to pay the toll.
* Transparency of Toll Transactions.
* Reduces Revenue Leakages.

**2.4 Feasibility Study**

Suppose a manual toll collection system takes around 20 seconds per car to collect the toll, if there are about 500 cars crosses the toll plaza,

This takes 20\*500 i.e. about **167 minutes** for just 500 cars.

But if the same number of vehicles crosses the toll plaza, this system will only take 5 seconds,

This takes 5\*500 i.e. about **50 minutes**

So, there is a great difference in the time required to collect the toll between the manual and RFID toll collection system. This reduces the pollution as there less queue in front of toll plaza

**3.3 Algorithm**

When a vehicle will enter in the toll area the IR sensor will get activated. First the driver has to place the RFID tag in front of the RFID reader. The RFID reader detects the unique number assigned to that tag. Then system checks if it has sufficient balance for the toll amount.

If there is sufficient balance, the system deducts the applicable toll amount from the account and the gate will open. When the amount is deducted from the account, car owner gets a message regarding the toll amount and the remaining balance.

If there is insufficient balance, system will indicate for the low or no balance. In this case system will debit the driver the toll amount and he will be given a credit period of 30 days to replenish the account. Gate will not open in incase there is overdue payment.

With the help of software, we can keep records of cars passed by. And if there is a stolen vehicle, this system can be useful to catch the thief by inserting the vehicle’s registration number. If the stolen vehicle reaches the tool booth, the gates will not open and the system will automatically send a message to the concerned person.

**6.1 Scope**

As we have used a short range RFID reader, the driver has to take the tag near the reader. But if we use a high range RFID reader, we can stick the tag to the wind shield and the reader will automatically detect the tag from a long range. This way no car has to stop on the toll booth. This system is called as Electronic Toll Collection System.

* 1. **Motivation-**

This paper is based on RFID Toll Collection System. This system is based on Radio Frequency Identification technology which uses RFID Tag and RFID Reader for identification. The RF sensor in the system detects the approach of the incoming vehicle. The driver has to place the tag on the reader and toll deduction takes place through a prepaid card assigned to the concerned RFID tag that belongs to the owners’ account. This makes tollgate transaction more convenient for the public use.

The basic advantages of the system are travelling time is decreased, congestion free network, less emissions in toll area and no infrastructure cost is required.

The main idea behind implementing RFID BASED TOLL COLLECTION SYSTEM is to automate the toll collection process their by reducing the long queues at toll booths using the RFID tags owned by car owner.

* 1. **Background-**

Manual toll collection system is been used widely in India, but it is not very reliable. Manual toll collection system requires more time to collect the toll. This leads a very long queue on the toll booths and results in increase in pollution in that area. This also increases the traffic.

This system is designed to reduce these kinds of problems which are being faced by the travellers. It will also reduce the man power and the queue in front of the toll booths and pollution at some instance.

This system focuses on the collection of toll by RFID [Radio Frequency Identification]. The RFID card uses RFID tags for identification. Each card is given a unique number which is been saved in the system. This unique code is used by the RFID reader to get the information embedded in the tags.

In this system, each car is given these tags. Every Toll collection booth will have a RFID system setup. The only thing driver needs to do is place his RFID tag on the reader. RFID reader will identify the unique code and will deduct the amount of estimated toll from the account the driver holds. After the toll is deducted, driver will receive a message saying about the toll amount deducted and the remaining balance in his amount. This information will also be displayed on the screen provided in the system itself.

After the toll is deducted, system gives the instruction to the motor which opens the barrier and the driver can leave for the remaining journey.

This project will help in “SMART CITY” project laded by our Prime Minister Hon. Narendra Modi.