Electronic Toll Collection (ETC) of Transportations System with active RFID

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ABSTRACT

This paper focuses on an automatic toll collection system using RFID technology. The technology uses an active tag that is mounted on the vehicle, and each tag contains a unique identity code. In this system, we use the concept of Radio Frequency at toll plaza. The RFID reader (receiver) is connected when the vehicle reaches the toll plaza, and the connection between the vehicle and toll plaza is automatically created, so there is no need to stop a vehicle at the toll plaza. It provides ease of payment to vehicle users at toll plaza. The amount of toll tax is automatically deducted from the ID, and the user receives an SMS on their mobile after passing the toll plaza. It reduces the man effort, time wasting, and congestion at toll plaza.

Keywords: Active RFID, authentication, automatic transmission, GSM, multiple tag reader.

I. INTRODUCTION

Active RFID technology is used for transmitting the unique ID code to the receiver. Electronic Toll Collection Technology is very useful and advanced technology. Security of barcode technology is less. In the RFID tag, more information is stored. The line of sight is not required for communication through radio wave. In previous systems, the toll plaza was manually operated, so there was congestion, wastage of time, and wastage of fuel. These are the problems created in toll plazas when they are manually operated. This process is speeded up at toll plazas. We will make a device i.e. RFID based automated electronics toll collection system. In this system, accuracy is high for the toll plaza and vehicle owners. In active RFID technology, fuel loss is avoided, time is saved, and toll payment is easy. Toll gate entry for illegal vehicles is reduced. In active RFID technology using GSM, a message is sent to the vehicle owner about the details of payment after crossing the toll plaza.

II. BLOCK DIAGRAM AUTOMATIC TOLL COLLECTION SYSTEM: SYSTEM

![Block Diagram](image)

**Figure 1**
III. PROPOSED SYSTEM

In this system we focus on automatic toll collection system. Every vehicle will be attached with a RFID tag which contains a unique ID of user. The RFID tag continuously transmits the information in each 3 seconds when vehicle reaches at the toll booth. Then the RFID reader read the given signal. And pass over to the controlling device. i.e. microcontroller then by the programming microcontroller 328 works, it first check the authority of the vehicle or user if the vehicle is authorized then specific tax for particular vehicle is automatically deducted from moving vehicle, which is pass through the toll plaza. Here it is assume that the owner maintain a ID for deduction of money.

The Microcontroller stored all the required information of the user in database and, then after the deduction of money a user receives an SMS on his/her mobile about the detail of payment then also toll gate will be open by using active RFID. We reduced the time consumption at toll plaza also reduced the vehicle congestion at toll plaza.

IV. FLOW CHART

![Flow Chart](image)

Figure 2

V. HARDWARE COMPONENT

1) RFID Tag: RFID stand for Radio frequency identification. The RFID tag is mainly divided into two type, active tag and passive tag. Active tag comes with internal power supply and passive tag required UID (unique identification) code to RFID reader when they are comes in contact with each other.

2) RFID Reader: A radio frequency identification reader (RFID reader) is a device used to gather information form an RFID tag. The concept of radio are used to transfer data form the RFID tag to RFID reader can read multiple tag at once.

3) GSM : In this system we used SIM 900 GSM module it is used to send the message of amount deduction on the registered mobile number, when the vehicle crosses the toll plaza.

4) MICROCONTROLLER: It is the most important component in over system. In this system we used AT Mega 328 Microcontroller. It is single chip Microcontroller created by Atmel in the mega AVR family the power consumption of this microcontroller is very low and Arduino Uno is used as development board for this controller by using we can easily dump a program in Microcontroller.

5) MOTOR DRIVER: In this system motor driver is used to open and close the toll gate, after the authentication of the vehicle. We used L293D motor driver IC in this system L293d can drive small and quit big motor as well. Motor driver are basically a current amplifier which takes a low current signal from the microcontroller and gives out a proportionally higher current signal. This can control and drive the DC motor.
VI. SOFTWARE USED:

1) PCB Artist:
For designing a PCB layout we used PCB artist software PCB artist is just one of many PCB layout software tool. This freely available on internet. We used this software, has a version of 3.1.

2) Arduino IDE software
The Arudino software is a programming tool. The program written using Arduino software are called sketches. We used Arduino IDE software has a version 1.6.10. it is connect to the arduino.

Advantages:
1) Communication through Radio wave so, line of sight is not required.
2) RFID reader read multiple tag signals at once.
3) Every tag has unique identity.

Application:
1) Automatic collection of vehicle toll tax.
2) This system also used in advanced vehicle parking.

VII. CONCLUSION

After implementing this system we easily detect the vehicle identity. By utilizing this system in toll plaza it will reduced the complete processing time by few second which is very important as well as help to reduce vehicle congestion at toll plaza.

VIII. REFERENCES