

Automated Toll Collection System

Harish V¹, Assistant Professor
Electronics & Communication
Engineering Department
Nagarjuna college of engineering &
Technology
Bengaluru, India

S.Md. Shakeel Ahammed³, Student
Electronics & Communication
Engineering
Nagarjuna College of Engineering and
Technology
Bengaluru, India

Y. Siva Dinesh Kumar Reddy⁵, Student
Electronics & Communication
Engineering
Nagarjuna College of Engineering and
Technology
Bengaluru, India

S. Ravi Kishore², Student
Electronics & Communication Engineering
Nagarjuna College of Engineering and Technology
Bengaluru, India

S. Maneendra⁴, Student
Electronics & Communication Engineering
Nagarjuna College of Engineering and Technology
Bengaluru, India

Abstract:- Nowadays, due to increase in density of vehicles on highways, there is more traffic at the toll booths to pay toll fare. These vehicles have to pay toll at the toll plaza. A typical toll booth is manually operated. When user approaches toll plaza, he has to pay toll. This process on an average takes two to four minutes for each vehicle. When more number of vehicles approaches the toll plaza it takes more time to collect toll. This delay can be reduced by automating the toll collection process thereby enabling smooth traffic flow at such junctions.

This project focuses on toll collection system using radio frequency identification technology. This enables more efficient toll collection by reducing traffic. This increases the efficiency as RFID is known as a highly stable technology. This system is successful in reducing the logging of traffic near toll booth.

Keywords:- Radio Frequency Identification Technology.

I. INTRODUCTION

Automated toll collection system is a wifi technique to take utilisation payment or tax to automobiles using toll bridges, and toll gates. This is speedily different that is changing toll plazas, where automobiles should cease and chauffeur physically funds the tax with money otherwise a ATM card. In many scheme, automobiles make use of the technique are provided along an automated radio transmitter system. When the automobiles moves a highway side toll reader devices, a communication among the transmitter prompt the receiver, that sends back an recognise number that listing the automobile's utilise of road, an electronic tax system tariff the customer the toll. A crucial important is the chauffeur does nothing to stop, lessen jam delays. Automated tolling is affordable than a manually toll booth, decreasing transaction costs for government or personal road owners. The easy of differ the amount of quantity of the charges makes it simple to accomplish road blockage, pricing, as well as for high-placed lanes, toll lanes that bypass congestion, and metropolis wide congestion pays. The fee collection procedure normally requires customer to registration in

advance and load money into a declining balance account, which is debited each time they pass a toll point.

II. RELATED WORK

The first paper discussed about a system which is developed to provide following attributes:

- Decreases time for collection of tariff at tollbooth.
- Using RFID, the tags can be sensed at larger distances. The information present in the tag can be collected even when the tag and reader are 300 feet apart.
- When the subscriber's vehicle approaches the tollbooth, it transmits the data to the tollbooth. The system at the toll booth will calculate the toll and collects the amount on his/her wallet.
- In this design the vehicle can also pass the tollbooth without slowing down or stopping. So the driver will feel more convenient. As a result the flow of traffic will be improved which reduces the manual work needed at the tollbooth.
- The flow of traffic at tollbooth will be improved.
- Since the manual collection of cash is eliminated, it is more convenient to use this system.
- The cost for managing the system will be reduced.
- This design provides better and smooth service for the subscriber.
- It is easier to find the vehicle if it is stolen. This design makes use of RFID technology. RFID stands for radio frequency identification. This technology consists of an RFID receiver, RFID transmitter, and a computer.

This design consists of software which operates with two major sections. The first one is user interface(UI) and the other one is a database. The user interface and database are connected in this design. The user interface is front end where as the database comes under backend. The microcontroller and personal computer are tied-up using MPLAB. MPLAB is an integrated development environment. Therefore the software of this system has three main sections namely user interface(UI), database and MATLAB. The detailed explanation of flow chart is given below.

The implementation of the system is very simple as it is evident from the flowchart. In the flow chart there is only one decision to make and the remaining part of the flowchart is linear. If the user do not have sufficient balance in his wallet, and passes the tollbooth, the gate would remain closed. But the user would be unaware of the reason until he receives a message saying insufficient balance. This results in unexpected traffic jams. In reality this system is very stable and reliable because of RFID technology. This is concluded in second paper. The traffic density at the tollbooths will be reduced because of this system. [2]

The design of the system referred in the third paper focuses mainly on the time taken to make a transaction in manual methods and issues faced during the transaction. This paper discusses about the problems faced in the manual toll collection process and how this system will solve them.

The system proposed in this paper has the following major components:

- Tag: transponder
- RFReader: Antenna

Tag : For every subscriber the RFID tag is provided which is installed in the vehicle. The tag consists of transponder. This tag is of two types namely Active or Passive. Every tag has its own Tag ID. The tag consists of other information stored in it.

The RF Reader: The RFID tag contains information. This information is read by the component at the tollbooth which is known as RF reader. The details of various types of RFID technologies are discussed in this paper. This makes us more convenient to choose the correct technology required for our system.

The system mentioned in the third paper is different from the ones discussed in first and second papers. It is referred as Traffic Control System. This system is designed in such a way that it separates the cars to different toll gates. This system uses an algorithm called as Lane Allocation Algorithm. This algorithm is written in such a way that it allocates the oncoming traffic to different toll gates. This provides a better flow of traffic. This algorithm has to be designed with much attention because if this algorithm fails to distribute the vehicles, it may lead to traffic jams.

The system discussed in this system is unique from the systems mentioned in first and second papers because this contains traffic speed controller. This system consists of an Electronic Computer Unit(ECU). The ECU provides access to the tag installed in the vehicle. When the car is approaching the tollbooth at higher speeds, then the ECU decreases the speed of the vehicle. If the user is moving at high speeds and the reader is unable to identify the tag, then

it would be a major fault in the system design. This also results in financial losses.

This paper conceptualised the use of automated toll collection. The design is easy and convenient. The system proposed in this system is ATCS stands for Automated Toll Collection System reduces the financial losses for government. The ideas proposed in the paper had an edge over another electronic methods due to its flexible nature and easy implementation. [4]

Automated Toll Collection System used for collecting tax automatically. The radio frequency helps in identifying the vehicle. A vehicle will be installed with an RFID tag. This tag is represents the unique identification number of the vehicle. Reader will be installed at toll collection centre. Whenever the vehicle passes the toll, the tax amount will be collected. Whenever the vehicle passes the toll the tax amount will be deducted from his prepaid balance. [5]

III. METHODOLOGY

When the vehicles reach toll plaza, they have to pay the toll manually, which takes time. In present system the highways takes about a minute or more to collect the money from user in vehicle. If the traffic density is more, then there is a chance that the traffic is jammed to a long distance. In this scenario it is better to have a system which can automate the toll collection. Hence we decided to automate the collection of toll at toll plazas, toll bridges and toll tunnels. Automation means to remove the human effort and replace it with machines. In this system we assign each user with a unique RFID. The user has to recharge his wallet with minimum balance. Whenever the vehicle reaches the toll the transmitter attached to the vehicle transmits its identity to the receiver at the toll. Now the system sends the identity to the microcontroller. After checking the identity it checks whether the vehicle is on two way journey. If the vehicle is on its first trip, the system deducts the amount as per the tariff. If the vehicle is on its return trip it does not charge the amount. Hence the time taken to complete the transaction is reduced. The advantage of this system is it reduces traffic and decreases the fuel wastage. It also reduces the time taken for journey and the money loss will be reduced.

IV. WORKING

In this project there are two sections. The first one is Vehicle section and the other is Toll section. The vehicle section contains an encoder and RF transmitter whereas the receiver section consists of decoder and RF receiver. When the user comes to the tollbooth it transmits the data to the toll section via RF medium. The toll section, after receiving the signal decodes the data and deducts the amount from user account and opens the gate. If the user do not have sufficient balance the gates will not be opened. This process continues as long as the power supply is supplied.

V. CONCLUSION

This system has characteristics of less cost, more security and more efficiency. It is an essential standard to decrease tariff and fare. This system also reduces noise and pollutant emission at toll plaza. RFID is not displacement of Barcode, However this is new technique offering various aspects. RFID provides most reliable data assemblage in harsh environment. RFID technique can offers new competence as well as essential procedure to assemble, control, circulate, save and analyse data this is not only for removes manual data entry but also stimulates new automation solution. It basically changes how processes are managed and how businesses operate. RFID’s attribute’s gives highly automated tracking competence than trending techniques, and thus create the opportunity to decrease abhor, develop inventory management and creates the better market intelligence, leading to lesser operational costs and increased revenue generation.

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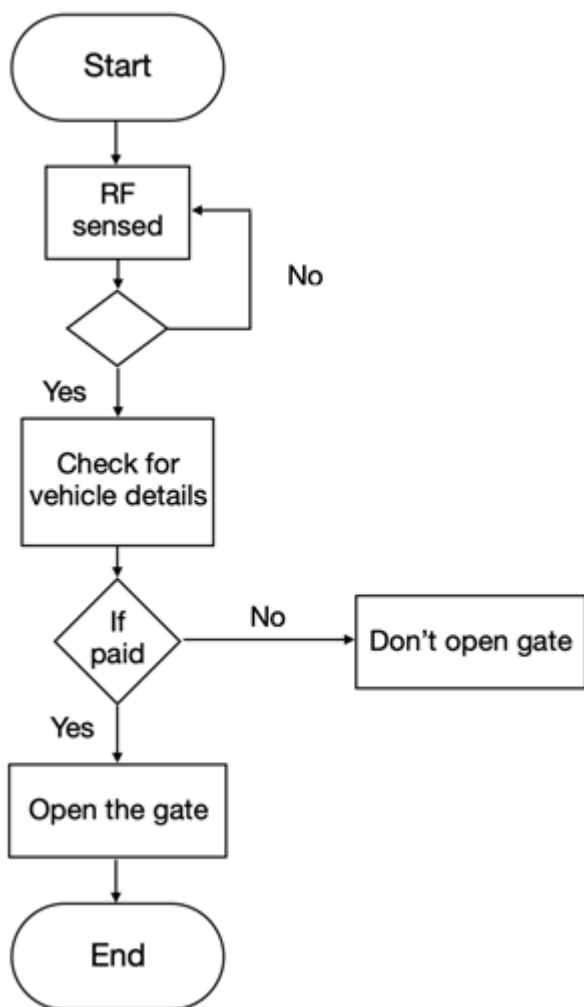


Fig 1

Implementation of this technology will dramatically decrease the traffic at toll junction.