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Vehicle Fastag Development and Implementation

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ABSTRACT: The main aim of Electronic Toll Collection (ETC) is to decrease the time delay and service time. The Vehicle Fastag is mainly used to overcome manual toll collection. This system is mainly based on RFID technology. RFID technology consists of RFID tag and RFID reader. Every vehicle holds a unique RFID tag, each tag assigned with a unique identification number. The tag contains the user information. The RFID reader is placed at the centre of the toll gate. Whenever the vehicle passes through the toll collection center, the RFID reader scans the RFID tag present on the vehicle, the tax amount is debited from the prepaid account of the user. The balance is updated, if sufficient balance is not present, it notifies to update the balance. In a manual toll collection system, it takes more time, whereas a fastag takes less time. This is the major advantage for choosing fastag since it is time-saving and a fast process.

The vehicle can travel through the toll plaza without having sufficient balance in the fastag account. Whenever sufficient balance is not present, the amount gets debited and shows a negative balance. It can maintain the negative balance up to 1999. The amount exceeding 2000 has to pay double the negative balance. The vehicle doesn't get any fine up to 1999.

I. INTRODUCTION

Nowadays, transportation is the backbone of any country, so there should be a proper transportation system for goods trading and travelling. As increasing vehicles led to traffic congestion, so highways have been established by the government. In order to construct the highways, budget is required. So, they introduced the toll collection system to collect money. As the road taxes are collected near the toll plaza. The toll collection system was implemented by NHAI (National Highway Authority of India). In the previous system, tax was collected manually, but in this system, automated toll collection is introduced for collecting road taxes. The automated toll collection is developed using RFID technology. In the previous technology, heavy traffic congestion occurred at the toll gates, to overcome this problem, fastag is introduced.

As we know, India is the second largest country in the world. Out of the total stretch of 5.4 million km of road network, almost 97,991 km is covered by national highways. The National Highways Authority of India (NHAI), Ministry of Road Transport and Highways is responsible for the maintenance and the expansion of the highways. Customers are required to pay the tax while travelling on the state/national highways roads called toll tax. NHAI collects the taxes for road usage on the maintenance of the road so drivers can travel comfortably. In previous days, tax was collected by cash method, but now it is made automatic way for toll collection system using FASTag with RFID technology.

In previous technology, there is a loss of nearly Rs 40,000 crore per year due to delays in transportation. The delays led to consumption of fuel worth Rs 90,000 crore. To overcome the drawbacks of the toll gate system, National Highways Authority of India (NHAI), a nodal agency of the Ministry of Road Transport and Highways, by introducing "FASTag" which employs Radio Frequency Identification (RFID) technology and provides for seamless movement of FASTag affixed vehicles at toll plazas.

II.FASTAG

FASTais simple reloadable tag which used for automatic deduction of toll charges without staying long time at the toll plaza for making the payment. The tag is fixed on the windscreen of vehicles and works based on the Radiofrequency Identification (RFID) technology. The user can create FASTag account by paying a one-time fee of Rs.200 near the point of Sale (POS) location at toll plaza. The FASTag account is activated by making a payment through online through credit or Debit card or by Net banking. The FASTag account can have a maximum limit of balance of Rs.1,00,000. By recharging the FASTag account passenger can travel by their vehicle through toll plaza of FASTag lanes and the tax amount will be automatically deducted from their FASTag account.

Working

The RFID tag fixed on the wind shield of the vehicle, where every vehicle contains a unique RFID tag that allows to make toll payments directly from the prepaid account linked to it. When a vehicle passes the toll plaza, the money will be automatically deducted from the customer's account linked to the FASTag. Whenever the vehicle passes the toll plaza, the RFID tag is scanned by the RFID reader, which is placed at the top of the toll plaza, so the amount is debited from the prepaid account of the passenger. So the customer needs to adequately fund the account which is linked to the FASTag. The FASTag is used as a top-up recharge process. Whenever a customer makes a toll transaction, they receive an SMS with requisite details to the registered mobile number. A periodic statement of account may also be obtained on the website of the Issuer Agency after registration by the customer.

III.LITERATURE SURVEY

T. ARUN, PRASHANTH, "Smart toll collection using card"[1]: In this system for toll collection, a card is used as the payment method. This is a fast process as compared to the previous method, so payments can be done using an ATM card and a swipe machine. The amount will be debited from the card. Here the card is the main component used for toll payment.

Passenger must carry an ATM card while traveling at a toll plaza, as these payments can be done fast and this is a time-saving process. Approved 2014-12-15. The limitation of the invention is, in this system, a card is used for the payment of toll collection near the toll gates with the swiping machine. It requires a card and a little bit of time-taking process.

S. VEENKATESH, J. PATAIL "Toll Plaza Payment using QR Code"[2]: It is very difficult to control the heavy flow of traffic using manual collection, so a QR system is introduced to avoid this problem. In this system, a phone and a QR code are required for toll payment. This payment is made securely by the user by using a login ID and password. When the customer passes through the toll plaza, they make the payment using a phone to scan the QR code, so this takes less time for payment at the toll plaza. Approved 2016-05-1. The limitation of the invention is, in this system, the user needs a smart phone and a proper internet connection.

B. Buvaneshwar, M. Sumithra "Toll collection using GPS and GPRS"[3]: It is necessary to stop or slow down for each and every vehicle for tax collection at a toll plaza. This consumes time and fuel. This proposed system, the user does not need to stop or slow down the vehicle for paying the toll fee at the toll plaza.

This system consists of a Raspberry Pi microcontroller and different modules such as a GPS module, LCD module, speaker, wireless Wi-Fi router, modem, and a wireless Wi-Fi adapter, which are incorporated and integrated with the microcontroller to perform a few specific functions. So in this system, the payment process is done using GPS, which is a fast payment process. Approved 2017. The limitation of the invention is, the project is assembled with more components, which becomes complex and time-taking process.

KAVITHA, SRIVIDHYA, R. PAVAN "Electronic toll collection"[4]: It is an automatic toll collection system controlled and maintained by the National Highway Authority of India [NHAI]. This system employs Radio Frequency Identification (RFID) technology for making road tax payment directly from the prepaid or saving account linked to it.

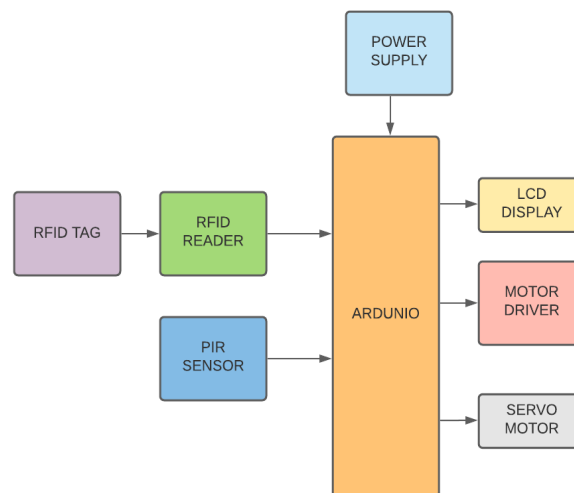
The components used in this system are a Raspberry Pi as a microcontroller, an RFID tag, and a reader. So this method makes toll payment fast and consumes less time for the payment process. Approved 2018. The limitation of the invention is, in this system, a Raspberry Pi is used as the microcontroller as the data receiver. The cost of building the circuit is high.

IV. PROPOSED SYSTEM

The project gives the simplified method to users for making payments at the toll plaza by using automatic collection. By using this technology, time can be consumed, reduction in the fuel consumption vehicle theft detection, tracking speed of the vehicle. This project developed by using RFID technology were it consist of RFID tag and RFID reader. RFID tag placed on the windshield of the vehicle, RFID reader placed at the center of the toll which identifies the RFID tag. RFID tag is nothing but the unique identification given to each and every vehicle. RFID tag consist of user information which is linked to the prepaid account.

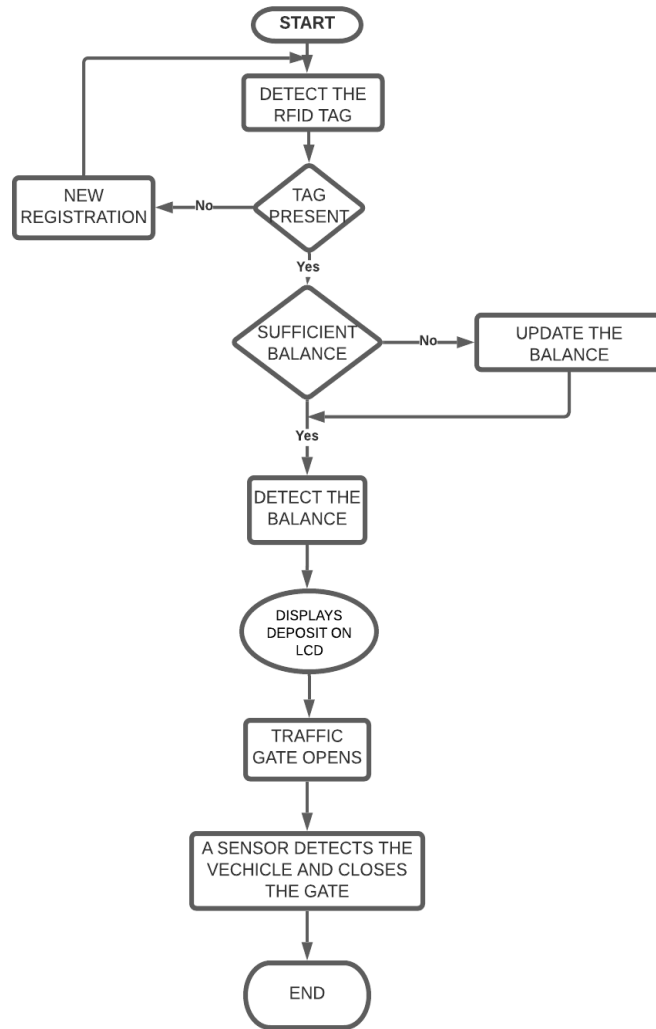
In this proposed system gates are not required, vehicles can pass toll plaza directly without stopping. If sufficient balance is not present in the account, it shows negative balance in account. Even though user has insufficient balance user can pass the toll plaza upto the limit of RS.1000 and user has to pay within 24 hours otherwise the user will get fine of double the negative balance. As compared with previous technology, in previous technology he has to wait until the transaction completed, but in this method there is no need of waiting.

BLOCK DIAGRAM OF VEHICLE FASTAG



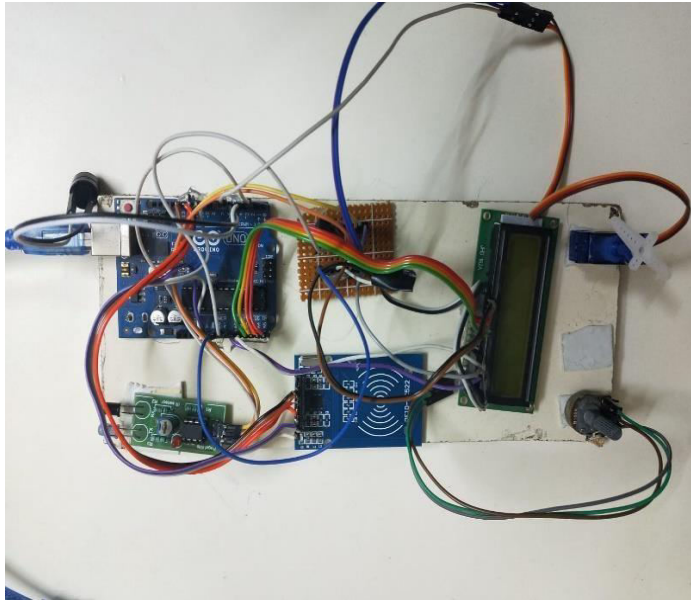
According to the circuit Arduino places the key role where it connects with all the components and manages the task to complete. PIR sensor detects the vehicle incoming and outgoing. Every system gets driven by the power consumed from the battery. It contains Arduino Uno, a microcontroller for processing and maintaining the input and output peripherals. It processes the commands from the user and controls the elements connected to it. The RFID reader and RFID tag give input to the Arduino and also use PIR sensor as input. Block diagram contains LCD display and servo motor used as output connected to the Arduino.

FLOW CHART OF VEHICLE FASTAG



When the vehicle passes the toll plaza the RFID reader detects the RFID tag present on the vehicle, if RFID tag not present user has to make the new registration. Next it checks the user has sufficient balance or not, even though user has insufficient balance they can pass the toll plaza but within 24 hours user has to pay the negative otherwise user has to pay double the negative balance. So when user has sufficient balance then amount is detected from the prepaid account of user, then the lcd display amount debited or not. In next step traffic gate opens when the payment done by the user, otherwise the gate will remain close. By using sensor the vehicle detect and close the gate after passing out of toll plaza.

V.RESULTS



The project generally used for road tax collection near the toll gates at national highways. It is developed using RFID technology. Here IR sensor is used to detect the vehicle, based on IR sensor servo motor is used to rotate the gate whenever vehicle is detected and access allowed. When the power is supplied to the kit it displays welcome on the LCD display. When the RFID tag is placed on the RFID reader it displays access allowed money deducted. Whenever wrong RFID is placed the buzzer gets activated and it displays access not allowed. When the access is granted the servo motor gets activated and rotates and gets closed after few seconds.

VI.CONCLUSION

In previous process toll plaza are manually operated, the toll tax was collected as cash from the user and provide a receipt by operator person so this is slow process and heavy traffic jam at toll plaza on highways and fuel consumption. To overcome this process introduced a fastag for toll collection at toll plaza. The fastag is developed by using RFID technology, so this is a automatic toll collection system. By using this system traffic jam can be reduced and speed collection of tax at toll plaza. The main aim of the project is to reduce the time consumption, fuel consumption and fast process.

VII.FUTUR SCOPE

In future we can update the project by implementing Automatic Vehicle Identification: It helps to determine the identification or ownership of the vehicle so that the toll will be charged to the corresponding customer. Moreover, in future, additional features such as over speed detection and prevention, overload indication and prevention in bridge, tracking vehicle which is stolen or involved in any accident etc. can be added in the system which will make the transportation system smarter and more secured. Thus, the proposed model can contribute to build a digital and smart road transportation system.

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