



Toll Collection System by using RFID and Cloud Computing

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Abstract— ATCS usually known as “Automated Toll Collection System” is a new technology for collecting toll in a faster and more efficient way. It is a great alternative to long waiting at manual toll plazas. In order to overcome the wastage of time and fuel at same time we have come up with a concept of RFID and cloud computing based automated toll collection system using microcontroller. RFID stands for Radio Frequency Identification; these cards are unique identities provided to every vehicle by Registration Office at each city. Whenever a vehicle with such Unique ID reaches the toll plaza, the RFID card reader attached on the toll plaza gate reads the card and transfers the unique ID to microcontroller. Accordingly, the processor works and deducts a fixed money from the prepaid card. If the card's ID is valid and has sufficient balance, the processor will command the motor to start and open the gate, letting the vehicle to pass. On passing from the gate the screen will show the deducted and current balance of the card. If the card is not valid or low in balance, it will prompt to move the vehicle to manual toll collection lane. Furthermore, a message will be sent to the owner's registered mobile number with the same details along with the location of the toll booth.

Keywords— ATCS, RFID, Toll, RFID Card, Microcontroller, Cloud Computing.

INTRODUCTION

In this century, people live a life which is solely dependent on technology. New innovations are made to make out life less demanding, calm and more agreeable. The primary goal of advancement has been to extend capability and diminishing effort. In the present scenario, the world is continuously moving towards automation. Automation is the use of various management systems for running instruments such as-machinery processes in factories, boilers, and heat treating ovens, change on telephone networks, steering and stabilization of ships, craft and different applications and vehicles with possibly reduced human interventions and better accuracy. This system is capable of determining if the car is registered or not, and then informing the authorities of toll payment violations, debits, and participating accounts. The information housed on the cloud is often seen as valuable to individuals with malicious intent. There is a lot of personal information and potentially secure data that people store on their computers, and this information is now being transferred to the cloud. This makes it critical for you to understand the security measures that your cloud provider has in place, and it is equally important to take personal precautions to secure your data. According to the survey of Karnataka Government, in September 2012, they have proposed to get the annual toll collection about 2500 crores per year. But in the present situation they are able to collect only 900 crores of the toll value. Means there is loss of 600 crores due to human errors. So, in this situation we have to control this leakage. Now, with the present system which we have with us on the highways takes 1 minute to complete the toll collection process for one vehicle which is a long time to stay. With this proposed automatic process, it will take less than a minute. to complete the whole process. As there is reduction in time for completion of the process so indirectly there will be no traffic as such & as there is no traffic so no fuel wastage will take place & the purpose of designing the system is achieved i.e. reduction in journey time & money loss.

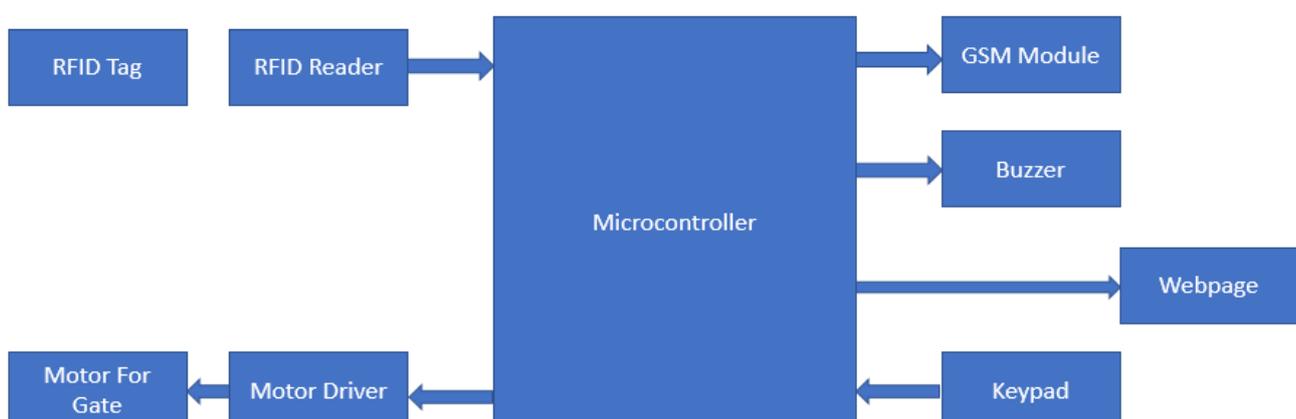
I. LITERATURE SURVEY

Digital toll based collection system has also been found in developed countries like Canada which is known as Canada 407 Express toll route (ETR). In this system they introduced optical camera with Optical Character Recognition (OCR) which captures images and recognizes license plates without any tag. In Gujarat, a state of India there is electronic toll collection system using radio frequency and tag operates commercially on expressway where all needed equipment were supplied by Mitsubishi Heavy

Industries.[1] Automated toll collection system has helped a lot in reducing heavy congestion which has caused in front of the bridges of busy cities of the world. It is also the easiest method to control heavy flow of traffic. Digitally it captures the radio frequency by means of RFID technology. In this method a RF tag along with a unique code will be attached to the vehicle which emits RF signals. Every owner has to have an account with RFID tag attached to their vehicle. Whenever the vehicle reaches nearer to the entrance toll gate the signals will be detected and passed to the controlling device. If the vehicle owners are found with sufficient amount of balance in their account, only then they will be allowed to pass.[2] India has got its first interoperable RFID based electronic toll system in Ahmadabad- Mumbai National Highway which enables automobiles having electronic tags operates at frequency of (850-950 MHz) with distance up to 90 feet where response time is 10 milliseconds. This system can be considered as cost efficient but the driver has to get the receipt and pass through the gate. Furthermore, an institution named Active wave Inc. has come up with a system which monitors active tagged vehicles.[3] Another proposed model of digital toll collection has been developed in Poland which has got a combination of GSM and satellite based global positioning system [4]. Here the system has got sensors and camera which captures and detects number plate. In addition, it captures the distance, evaluates the fees and rates transmitting them to the System Centre. An institution named Active wave Inc. has come up with a system which monitors active tagged vehicles [5]. These automobiles have active wave ranging 30 meters operating (916-917 MHz) for operation transmit and (433MHz) for receiving the link. Here, in form of blinking LEDS and beeping sounds the signals are observed. Moreover, the user interface has been designed using Microsoft .NET Framework. The tag uses car battery for power and two modules through RF modem transfer signals among themselves over the ISM frequency range of about (902-928) MHz.[6] “Development of a GPS-based highway toll collection system” by Jin Yeong Tan, Pin Jern Ker in 6th IEEE International Conference on Control System , Computing and Engineering in 2016.[7] The necessity for vehicles to stop or slow down for toll fee payment results in traffic congestion and reduces fuel efficiency. Hence, a system that enables road users to pay the toll fees without stopping or slowing down was proposed and developed. Hardware and software designs were carried out to develop a Global Positioning System (GPS)-based highway toll collection system. This system was developed using a Raspberry Pi 2 microcontroller. Different modules such as GPS module, Liquid Crystal Display (LCD) module, speaker, wireless Wi-Fi router modem and wireless Wi-Fi adapter were incorporated and integrated with the microcontroller to perform a few specific functions. In general, the system utilized coordinates to detect whether a vehicle passed through predefined locations in the database and the travel details were recorded. The Raspberry Pi 2 microcontroller was configured as a personal cloud server to allow online access of travel logs. This developed system presents a different approach for highway toll collection which eliminates travel delays and construction of expensive gantries or toll booths.[8] An automated electronic application which makes easy for user by the help of Android and QR code as media access automatically without manual service. User register to get own login id and password and using the login id and password the user can enter in to the application. The current location i.e. will be automatically generated by map using GPS locator and the destination address will be selected by the user. Then the vehicle registration can also be done in the add vehicle page .the user can add as many number of vehicles desires.[9] In details page the vehicle detail, duration for the travel, number of tollgates present in that route, amount to be paid will be displayed. The payment can be done in the payment session by the use through online. The QR code will be generated after the user pays so that it is used as gate pass for user to cross the tollgates. QR code is designed to speed up services for users in toll plaza. Administrator will scan the users QR code and it will generate information of payment details. The most crucial stage in achieving a new successful system is that it will work efficiently and effectively.[10]

II. METHODOLOGY

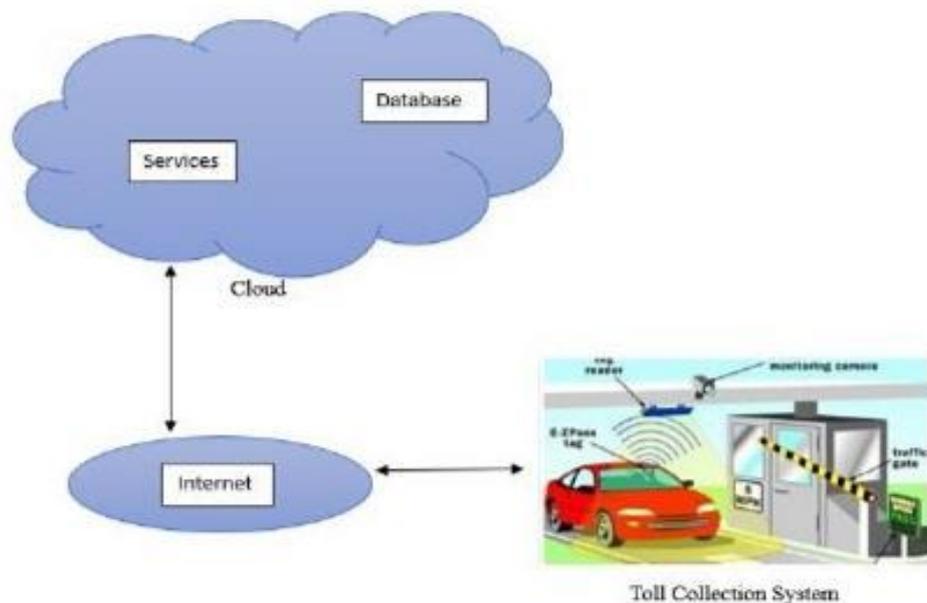
a. Block Diagram:



B. Methodology

In the proposed system the use of embedded system has been done thus the application of microcontroller is prominent. When a vehicle with a passive RFID Tag approaches the toll booth, the RFID Tag Reader reads the data from the tag and sends the Unique ID to the main system i.e. the microcontroller device that checks it from its database, and thus responds to it by displaying whether it is a registered vehicle or the opposite. If it is former, the microcontroller alarms the led and the buzzer to turn green twice and beep simultaneously. The system then asks the toll gate to open by powering up the motor connected to it for a certain period of time. As the vehicle passes away the gate is closed. As all this happens, a certain toll fee also gets deducted from the user's account in a certain bank that is connected to the database of the system. There are two such conditions that fall under this process: The first being ample amount to deduct the fee, if yes, the vehicle is allowed to pass whereas not meeting the same leads to the second condition where the cash being less in the account; the vehicle is asked to move for the manual toll collection. If at first the reader passes the ID and the microcontroller signals that the vehicle is unregistered, the vehicle is asked to move to the manual toll collection. Apart from all this, when a registered user/vehicle passes a toll booth/ toll plaza the GSM Module connected to the toll plaza sends a message to the user's registered mobile number and mail id giving details about the amount deducted from the account for the registered vehicle number along with the toll booth that the vehicle just passed.

III. RESULTS AND DISCUSSIONS



In this project, a system that collects toll automatically using electronic devices has been proposed. Since, our conventional methods for collecting toll fees or roadways taxes are not very efficient and reliable so there was a need for a new advanced system that eliminates most of the drawbacks of the current system in use. This technology is not very familiar in most of the countries. Since, it requires a highly efficient infrastructure and needs to be well maintained. Also, the cost of providing these RFID cards to each and every vehicle is not very cost efficient. As in present modern era, the number of vehicles has increased rapidly. But, apart from these shortcomings of the system there are no major flaws that may give us a thought to drop the idea or lower our interests in such systems. The benefits of the proposed system are- Time saving, fuel saving and reduced traffic.

IV. CONCLUSIONS

The conclusion that came out is that, to implement modern system of toll collection i.e. ATCS embedded systems were used and a new technique RFID came into light. The RFID safety is a key important thing about this project. Strong and verified designs were kept in the project which is good and reliable. RFID technique was used for authentication and authorization of vehicles. This project is reliable and easy way to collect toll comparing to manual one. ATCS proposed system will significantly improve travelling through highways by reducing wastage of time and fuel. This system can easily collect toll from people without even making them stay at the toll booths. This is achieved by using wireless technique of data transfer from vehicle to microcontroller and from microcontroller to vehicle.

V. REFERENCES

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