QR Code Enabled Toll Collection With Encryption And Payment Gateway Integration

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Abstract- *Today, all most all toll plazas are operated manually. We often encounter traffic jams at almost all toll plazas due to this toll collection and the in-efficient training provided to the toll plaza workers. The time we spend at toll traffic is a waste of time. To avoid such delays we are developing a system using the latest technology QR code. This system will reduce the burden of collecting tolls and also reduces the man power required. In this system, scanners are used to capture the QR code and tag each vehicle as it passes through the toll gate. The QR code will be decoded by the central database and if validates the toll amount for the particular vehicle is deducted from the registered account of the user. The QR code is encrypted using algorithm. In the present day RFID (Radio Frequency Identification) has been used for this purpose. In order to overcome the issues of RFID tags QR code is proposed.*

Keywords- Toll Plaza, QR code, Encryption, RFID.

I. INTRODUCTION

A toll road which fee is assessed for passages have been implemented to recoup the money spends for construction and maintenance of the road. Transportation has become a human life daily routine hence there is a probability that everyone would encounter a toll plaza at one point of their life. Manual toll collection system became out-dated due to the manpower required and number of drawbacks.

Indian government has recently pushed for automatic toll collection using RFID technology this has several drawbacks. RFID uses radio waves to communicate with the receiver. An IR receiver is used to receive the pulse and a sends it to the controller, which transmits the vehicle through the RF transmitter located in the vehicle.

Some of the existing system uses RFID tags while others use the GSM module and INFRARED technology. We have designed the system keeping in mind to reduce the cost and also to find a solution to the existing traffic congestions at the toll booths. We suggested the use of QR technology for the *payment of toll gate processing*. Recent trends in the market have shown an increase in the use of QR codes than can be scanned and read by camera in a smartphone. The QR code allows storing data, numbers and even using it for payment and transfer of money.

Android based application is used for the usage of generating the unique QR code which is encrypted using the algorithm. The application allows for the user to register and login using personal information and generate QR code by providing the vehicle details hence a unique QR code is generated for that vehicle, any number of vehicle can be added which belongs to that person. The application *integrates a payment gateway* which is approved by the government hence enables an ease of transaction. We have included many additional features like *emergency SOS* call button, *SMS system* which regularly updates the customer On each toll passage along with the balance amount. *24/7 support and road side assistance* can be initiated within the application. With the payment gateway integration the user can recharge the wallet within the application hence enhancing the digital India scheme.

1.1 QR CODE

QR Code is a matrix barcode that can be used to store data. It consists of black modules arranged in a square grid which is then read by the camera. Data is extracted from patterns in both directions of the image. QR code offers numerous benefits such as [6]

- Cost effective
- Readable from distance
- Structured appending


Fig 1.1 QR Code

On a grid of 6x6 mask pattern is defined which is necessary to cover the whole symbol. Patterns in data area such as blank areas or misleading features that look like locator marks can confuse scanner, hence masking is used. QR code has become a focus of advertising strategy, since it provides a way to access a brand's website more quickly than by manually entering a URL.

1.2 ANDRIOD

QR Code based toll collection uses different system from the hardware components to the user component in this paper we assume that all the pre-defined hardware for the real world systems are implemented as we already have existing toll plaza only minor upgrades have to be done in order to fit the scanners. This paper talks about the android application. Android is a mobile operating system by Google. It is based on the Linux kernel and other open source software. Android is basically for the touch and type interface that can be implemented in a smartphone and other devices. Google has further developed android TV, Wear OS, and Android Auto that is used in cars. Android is designed to keep the processes consume the battery charge at a minimum rate. Android has enabled the market to be flooded with smartphones and hence opened up a whole new digital world to the different sections of the society. This revolution in smartphones has enabled more people to go online and use different technologies that are available to them hence it important to keep updating the technologies that can have a greater importance in people's lives.

1.3 PAYMENT GATEWAY

Payment gateway is a merchant service provided by an e-commerce application service provider that authorizes credit card or direct payment processing gateway may be provided by a bank to its customers, but can be provided by a specialised financial service provider as a separate service, such as a payment service provider.

A payment gateway like Razor pay that we are integrating with the application allows the user to securely transact their payment an HTTPS protocol based transaction take place. Virtual payer authentication is something that the acquirers, issuers and the payment gateways are backing to secure the process even more. PCI-DSS makes it secure enough to allow the user to store their personal data in the portal or gateway for recurring payments.

The most significant advantage of a payment gateway is the fact that it allows millions of users to use it at the same time, making it possible for you to purchase or sell goods and services whenever you want.

1.4 SMS

SMS (Short Message Service) is a text messaging service component of most telephone, internet and mobile device systems. The protocols used in this service allow users to send and receive messages to and from GSM mobiles. SMS although commonly seen in the mobile to mobile services it can be expanded into technologies that offer services and support.

SMS is a stateless communication protocol in which every SMS message is considered entirely independent of other messages. In this system SMS is used to send alert, balance and other toll based reports directly to the user mobile. This enables the user to have a regular update on the main account balance of the wallet.

II. LITERATURE REVIEW

Automated toll collection and check post system using Radio Frequency Identification (RFID) and Global System for Mobile Communication (GSM) module. The recognition is succeeded with the guidance of passive radio frequency. In this paper [1], vehicle particulars like unique ID is saved in RFID tag which is attached in the vehicle. Image process and GPS is combined with RFID and GSM module to create the system a lot reliable and secure. The hardware design of the paper consists of transmitter and receiver module. Transmitter module is fixed in the vehicle as an active tag. Receiver is the automated check post and e-toll control. ATmega328 Arduino controller is a 28 pin arduino controller which has 32 bit natural working registers. The servo Motor SG90 type is used in this setup. The servo Motor is used for automatic gate operation whenever the motor receives the signal from the controller. SIM800 GSM is a communication device designed for global market. RFID uses radio wave to process the information from the devices. The bi-directional connection network with endpoints has been designed to use

RFID to produce an electronic product code. An experimental study result has also been given at the end of the paper.

In paper [2], the toll collection system is designed primary for the use by GSM and GPS systems. The GPS is used to find the position of the vehicle. The GPRS kit should be installed in the vehicle in track the vehicle. Each GPRS system has a subscriber identity module. This system also incorporates geo fences of the toll plaza to get the information regarding the location of the toll plaza. The GPS and GPRS are integrated into an ARM microcontroller. In order for the GPRS system to work the system requires 1 GB of data and a stable network connection which should be switched on all the time. The system also requires a mobile tower to be located at the toll plaza to process the information of the vehicle in the rage of the tower. The system compares the position of the vehicle and when the vehicle is within the 5 meter radius of the toll plaza the database is updated and the amount is debited from the user's account which will be immediately followed by an SMS to the customer. The position of the vehicle or the GPRS SIM module is compared using the haversine formula, and if the vehicle is within the range of toll plaza, amount will be taken from the account.

3D environment modelling for the toll collection which directly affects the decision making part, in paper [3] the new toll gate approach is divided into perception, decision making and motion control. A deep natural network is used in perception. Virtual lanes are generated from the 3D environment result and an optimal lane is selected. In motion control a collision free path is planned and transmitted to maneuver the vehicle. The automation driving vehicle receives the localization and mapping (SLAM) algorithm estimates the motion state of the vehicle. The traffic patterns are further understood and scanned to detect passable electronic toll collection gate. These virtual lines are generated only for the types of vehicle were this system can be implemented. Convolutional neural network (CNN) based algorithm is used for object detection to sense other vehicle, and ETC gates. YOLO algorithm a type of CNN with structure of GoogleNet, is divided into 24 convolutional layers with connected layers of 2. The determination of total queue length is calculated by first detect the neighbouring vehicle and correlate the distance of vehicle to the gate. The SLAM used to update or construct maps on an unknown environment. LSD-SLAM (Large Scale Direct Monocular) is applied to track and map by image intensities divided into three steps: tracking, depth map estimation and map optimization. The system takes a while to scan all the gates as the gates could be occluded by trucks or buses. The coordinates are interpreted and the best cubic coordinate origin and the ETC gate are selected. The motion control adopts an adaptive method. It receives a collision free trajectory data from path planning using curvature, yaw rate and velocity. In this approach LQR-PID algorithm is used. LQR can exactly pave a way to the optimum pole. LQR predicts an expectation as inputs to PID controller. PID is a classic control with strong adaptation and robustness. YOLO algorithm can detect most of the vehicles. ETC signs can also be detected using this algorithm. The proposed system is designed to be more universally usable, even without HD map and V2X. The V2X will make visual classification of ETC gate obsolete.

In paper [4], a proposed system is a web application and android application. The system is designed primarily for devices like smartphones, personal computers and all other devices which support web services. The main objective behind this paper is to design the application which provides an effective and easier way to payment of road toll. Keeping in mind the Indian condition the application contains QR code for recognition with centralized availability of data. Throughout the system it enables user to pay from the account created after reaching the toll booth. The system gives many advantages and assures and accurate collection of toll amount. This paper uses GUI for collection of toll, the real time monitoring and management is done. The architecture of the system uses user application to generate QR code which can be connected by GPS for the connection of toll plaza receiver. The data base of the system saves the details of the vehicle connected and other different toll collection. The server coordinates all the different activates of the application.

RFID is a dependable technology in paper [5], the RFID automatic toll gate system can automatically discover the vehicles of the identities, reading items in motion and tracing of the vehicles can be done by accurately by RFID. In this paper they have executed a framework which will punish for infringement of toll entryway and they believe it will prompt to a fastidious activity. The framework developed will help in reducing the number of mischance. The framework integrates the RFID, AVR microcontroller, the database creation and GUI outline. RFID tags are fixed and attached and through this the reader reads the data. The main aim of this paper is addressing the prevention of motorists and toll authorities manually perform ticket payments and also check driving without documents. This system proposes to identify theft vehicles. When the gate is automated it requires minimum human intervention hence efficiency can be improved. The framework expands wellbeing. The paper also looks at the adequacy of toll stations and the road developments that limited to the toll road. RFID technologies implemented in the system adopta kind of frequency chips which authenticates and authorizes protocol model used to guarantee system security. Accordingly, electronic toll

collection system deserves deeply research whether from technology, economy or environment protection.

III. CONCLUSION

In this paper, we proposed the approach of automatic toll collection using QR code that was seen as new age technology and allows us to greatly reduce the manpower and reduces traffic congestion. QR code allows for the toll collection system to be much better than the RFID tags used in today's vehicle. QR code gives authorities to set variable pricing for toll services and allows for a fair tax collection. Due to the technology, the QR code is generated after recharge and allows to get the QR code can be shown if the scanner is unable to scan the code. Due to the encryption algorithm used we try to integrate a payment gateway into the android application. This technology has high securable and low amount of speed cost. The messaging system build into the application allows for a regular update within the usage of toll. The implementation of this technology takes very little money and allows for updated driving dynamics as different toll gates will have different scanners that will tag each and every vehicle which very efficient as there are multiple scanners placed at regular points that tags the vehicle hence the scanning can never be avoided. The android application supports the QR code in building a strong network of commuters that help to keep the Indian roads less congested by the traffic.

REFERENCES

[1] KBalamurugan,Dr.S.Elangovan,Dr.R.Mahalakshmi,R.Pavithra**"**Automatic Check-Post and Fast Track Toll System Using RFID and GSM Module with Security System**"** *International conference on Advances in Electrical Technology for Green Energy (ICAETGT)*2017 978-1-5386-2138-7/17/$31.00 ©2017 IEEE

[2] Sudheer Kumar Nagothu **"**Automated Toll Collection System Using GPS and GPRS**"***International Conference on Communication and Signal Processing* 978-1-5090-0396-9/16/$31.00 ©2016 IEEE

[3] ZhonglinXu, Xinhui Di, Houming Wang, Jun Xu, Rolf Adomat, Chen Zhang **"** Automated Toll Gate Passing**"***Intelligent Vehicles Symposium(IV),Changshu* 978-1-5386-4452-2/18/$31.00 ©2018 IEEE

[4] Machindra Vetal, Pravin Gore, Nikhil Pathil, Kiran Sapate, Manisha Singh **"** Android Based Smart Toll System Using QR Code**"***International Journal of Innovative Research in Computer and Communication Engineering*, Vol.5,Issue 9,2017 ISSN:2320-9801

[5] K.Gowrisubadra, Jeevitha.S, Selvarasi.N **"**A Survey on RFID Based Automatic Toll Management**"***International Conference on Signal Processing, Communications and Networking(ICSCN)*2017,978-1-5090-4740-6/17/$31.00 ©2017 IEEE

[6] Rahul Raj C. P, SeshuBabu Tolety, Catheine Immaculate, **"**QR code based navigation system for closed building using smart phones,**"** 978-1-4673-5090-7/13/$31.00 ©2013 IEEE.

[7] Kasturi Shah, Prajakta Joshi, Dishaa Garg **"**Automatic Toll Collection Using QR Code**"***International Research Journal of Engineering and Technology(IRJET)*,Vol.3,Issue 10,2016 ISSN:2395-0056-reference

[8] R.Latha,C.Sivaraj,V.Sivaranjani,S.Vimaleeshwari **"**E-Payment for Toll-Gate Processing using QR Technology**"***Journal of Chemical and Pharmaceutical Sciences(JCHPS)* Issue:3,2017