Stolen Vehicle Detection and Automated Toll Collection System Using QR Code

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Abstract- **Road transportation is the backbone of any country's economy. Improvement in transportation will lead to lifestyle characterized by extraordinary moments of people, immense trade in manufactured of good. Developing countries like India needs a significant improvement in infrastructure such as Roads or Highways. Construction of these highways is a costly affair, which can't be invested by the government alone. Normally Public private partnerships are made to construct such a huge project. The money spent on these projects can be regained by collecting toll from the passengers who use the roads. The toll collection system, especially in India faces some problems such as long queue lines, escaping from toll plazas etc. These systems can service only 300 vehicles per hour, and if more than that number of vehicles arrives at that plaza, server traffic jams may occur. [1]**

With the increase in the number of vehicles on road, there has been a marked increase in the number of crimes involving vehicle theft. In spite of several stringent laws being in place and security measures taken by car manufacturers, thieves still find a way to remain one step ahead and vehicle theft is still among one of the most reported crimes worldwide. Due to the expensive nature of motor vehicles, there is ample incentive for petty thieves to attempt thefts.[2]

Manual toll collection system contain many drawbacks, like it needs collector to collect the amount at a toll booth, delay in time, traffic congestion, more fuel consumption, longer queue of traffic. To solve these problems we propose QRCode base toll collection and stolen vehicle detection system. QRCode is generated at the time of registration of vehicle in our proposed system. On toll collection booth we collect toll as well as identify vehicle is stolen or not. Propose toll collection system is cost effective, it provides better experience to peoples, less delay of time, shorter queue of traffic, less fuel consumption.

Index Terms- **QR-Code, Electronic toll collection, Toll Authorities , stolen vehicle detection.**

I. INTRODUCTION

If you are driving an extended distance and try to induce there as quickly as potential, you may most likely move highways and interstates that permit you to travel quicker and have fewer, if any stops. Of course, sure varieties of roads have occasional stops wherever you have got to pay cash to travel on the road. These varieties of roads are referred to as toll roads. Generally they additionally blow over alternative names, like toll-way. To travel on a toll road, you have got to pay a fee — referred to as a toll. Generally you have got to prevent each therefore usually to pay extra tolls to stay traveling on the toll road. Most roads are engineered with native, state or national government cash raised from taxes. Tolls are sort of a tax that applies only to the users of the toll road. Toll roads permit new roads to be designed and maintained without raising taxes on the overall public. A toll road does not forever keep a toll road forever, though. Generally tolls are removed on roads once the price of construction has been recovered from the tolls collected. you may know you are on a toll road when you encounter a toll plaza. A toll plaza could be a gated space wherever you have got to slow down or stop to pay a toll to continue traveling on the road. There are typically many available lanes with toll booths to keep traffic moving as quickly as possible. Some lanes could have individuals working the toll booths, so you'll pay with modification or money. These lanes have gotten slower and slower day by day as a result of variety of vehicle get increase rapidly. To resolve this problem we are planning to use QR Code. [3]

QR is short for fast Response Codes. They're wont to take a bit of knowledge from a short-lived media and place it in to your telephone. You will before long see

QR Codes in a magazine advert, on a billboard, an online page or maybe on someone's T-shirt. Once it's in your telephone, it's going to offer you details about that business (allowing users to search for close locations), or details about the person carrying the T-shirt, show you a address that you'll click to ascertain a trailer for a picture, or it's going to offer you a coupon that you'll use in a native outlet. the explanation why they're a lot of helpful than a typical barcode is that they'll store (and digitally present) far more information, together with address links, geo-coordinates, and text. [4]

In our project we are planning to use QR Code to store all data of car as well as vehicle owner. QR Code can contain vehicle owner name, address, mobile variety, email id, owner driving licenses number, vehicle number, vehicle type, user type like pass holder/ non pass holder, etc. toll collector can scan the QR Code to vehicle authentication and toll collection.

II. PROBLEM STATEMENT

The most common approach for collecting tolls was to have the driver stop and pay a toll collector sitting in a tollbooth. A manual lane can process approximately 100 vehicles per hour. So there are multiple lane on toll booth. These increase the labor cost, fuel consumption, required time, financial loss. To find the stolen vehicle police need to search separately.

III. LITERATURE REVIEW

According to literature survey after studying different IEEE paper, collected some related papers and documents some of the point discussed here:

Automated toll collection system using GPS and GPRS [5]. Published by Sudheer Kumar Nagothu propose system in that they describe following. Developing countries like Asian nation wants a big improvement in infrastructure like Roads or Highways. Construction of those highways may be a pricey affair that cannot be invested with by the government alone. Commonly Public personal partnerships area unit created to construct such an enormous comes. The cash spent on these comes may be regained by collection toll from the passengers who use the roads. The toll assortment system, particularly in Asian nation faces some issues like long queue lines, escaping from toll plazas etc. These

systems will service solely three hundred vehicles per hour, and if quite that range of vehicles make that plaza, server traffic jams could occur. To unravel this we have a tendency to area unit proposing to form geo-fences mistreatment GPS by giving latitude and great circle of the corner of the tract. By comparison the position of the vehicle and tract, the owner of the vehicle may be charged from the account.

Automated toll collection with complex security system [6] published by P. Kamalakannan; M. Balaji; A. Avinash; S. Keerthana; R. Mangayarkarasi. In this paper, author propose automatic toll assortment system mistreatment the active RFID tags; vehicles area unit created to experience a device system that's embedded on the road simply before the toll bar. The system can electronically classify the vehicle and calculate the precise quantity to be paid by the vehicle owner, guaranteeing no larceny of the toll quantity. Vehicle house owners, who oftentimes experience tollgates, area unit needed to possess a paid smartcard, which is able to deduce the suitable quantity, by mistreatment an automatic positive identification reader [1]. A small controller consists of a robust electronic equipment tightly let alone memory RAM, read-only memory or EPROM), varied I / O options like Serial ports, Parallel Ports, Timer/Counters, Interrupt Controller, information Acquisition interfaces-Analog to Digital Converter (ADC), Digital to Analog Converter (DAC), everything integrated onto one microchip. The Microcontroller is connected with laptop computer through RS232 information adapter.

Automated fault detection in violation enforcement cameras within Electronic Toll Collection systems [7]. Publish by Anurag Ganguli; Ajay Raghavan; Vladimir Kozitsky; Aaron Burry. Author describes Electronic Toll Collection facilities offer travellers the ability to pay toll electronically, most commonly via Radio Frequency Identification (RFID) transponders placed within the vehicle. ETCs are complex systems comprising of a multitude of sensing and electronics equipment. To prevent violation, photo enforcement cameras are used to capture license plate images of the violating vehicle. To ensure adequate image quality and integrity of these cameras, it is standard maintenance practice to manually review camera images on a periodic basis. The manual review process can be expensive, error prone and may involve only a fraction of the images

actually captured. To address this problem, we present algorithmic tools that can be used to automatically review images to detect any potential camera faults, thus, reduce human workload and increase maintenance efficiency. Wherever possible, we use no-reference or reduced-reference approaches for fault detection.

Secured short time automated toll fee collection for private group transportation [8]. Published by Jayapriyaa CT; Y. Bevish Jinila. This paper presents automated toll fee collection system in more efficient, faster, low cost and in very secure manner. Normal cameras are used to capture vehicle number plates and vehicle numbers are retrieved. Using the retrieved conveyance id the main points of the owner and joined bank accounts are collected from info. The toll fee is deduced from checking account if quantity is obtainable else manually paid. If over one vehicle happiness to a selected organization is gift near toll then these vehicles are clustered to cut back the amount of transactions created. One vehicle is elective as a cluster head associated this vehicle represents all the cluster members and an ID primarily based multi signature theme is employed for authentication. Experimental analysis and analysis shows that the cluster primarily based theme performs higher compared to non-cluster approaches. Open road tolling in India by pattern recognition [9] published by Dipti Jadhav; Manoj Sabnis. The system discussed in this paper is a full automated toll collection system. Number plate recognition is used increasingly nowadays for automatic toll collection, secure parking and law enforcement. Open Road Tolling uses video evidence to identify vehicle usage of a toll facility without the use of toll booths for toll collection without having to stop or even slow down to pay the toll. The application utilizes image processing and pattern recognition methods for Open Road Tolling. This paper presents Open Road Tolling (ORT) using number plate recognition. The proposed Number Plate Recognition (NPR) techniques consist of two modules: histogram based number plate localization and number plate recognition using template matching. This approach has an advantage of being simple & faster. This has come up in a large way in foreign countries, but not in India to that extent here it is still at the level of idea.

Applying QR Code Technology to Facilitate Hospital Medical Equipment Repair Management [10]. Published by Li-Chuan Chu; Chen-Lin Lee; Chang-Jer Wu.Auther present applications of QR code in a hospital medical equipment repair management system. The main goal was to enable equipment or facility engineers to rapidly obtain detailed equipment information and return the medical equipment to normal operations. The experiment results indicate that method developed in this study can significantly improve the efficiency of medical equipment repairs, ensure engineers receive the correct information, shorten the Web site process time, and highlight the significance of solving such problems. The research in its actual state will be full support tool for the repair of medical equipment management. The results of both tests allow stating that from the point of view of efficiency and saving cost, the new system is fast and economical, making it highly competitive with exiting repair management system.

A QR Code-Based on-Street Parking Fee Payment Mechanism [11]. Published by Wen Chuan Wu. Auther proposes an on-street parking fee payment mechanism based on the QR code of an E-bill. People can regard the code as a bill to pay their parking fee, where the parking information is recorded into a remote server by the fee collectors. The main idea of this mechanism is to save on resources such as reducing paper consumption. Simulation results showed that the proposed mobile application provides a new mode for E-bill payment for on-street parking in Taiwan.

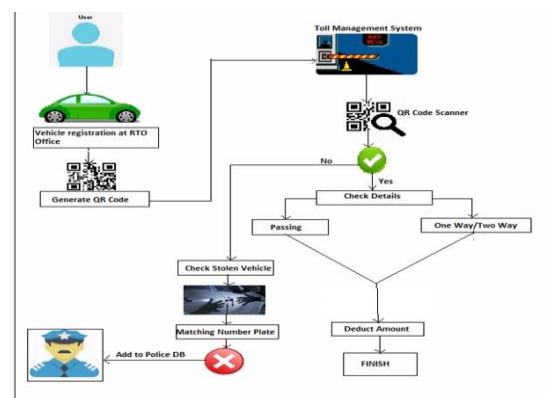## IV. SYSTEM ARCHITECTURE

Fig: System Architecture

V. ACHITECTURE EXPLANATION

In above architecture diagram user register himself/herself in to system. With his/her personal details as well as vehicle details. After successfully registration system generate QR-Code separately for every user. If user renew monthly pass then system will generate new QR Code. Toll collector scan QR Code to collect toll. After scanning QR Code system check vehicle is stolen or not by its number plate. If vehicle found as stolen then system will inform to police station. If vehicle is non stolen then system check user is pass holder or non-pass holder user. If user is pass holder then system will allow user for further gurney. If user is non pass holder then system will ask for one way ticket/ two way ticket. According to ticket type and vehicle type toll is calculated. Then toll is paid by online transaction.

VI. MODULES

There are three main modules in propose system. First is user module in that user register into system. At the time of user registration user provide his personal information as well as vehicle information.As per user and vehicle information system generate QRCode and send to user's registered email id, each and every QRCode is unique. Second module is toll collector, toll collector is person who scan QRCode on toll booth. Toll collector has QRCode scanner to scan users QRCode. Third module is system which generate QRCode, these QRCode send to registered email id. System also verifies user and vehicle after scanning QRCode.

VII. ALGORITHM

❖ AES Algorithm

The following AES steps of encryption for a 128-bit block:

1. Get the set of round keys from the cipher key (Encrypted).
2. Get initialize the state array with the block data (plaintext).
3. Add the initial round key to the starting state array.
4. Perform nine rounds of state manipulation.
5. 5.Perform the tenth and final round of state manipulation.

6. Copy the final state array out as the encrypted data (cipher text) (result)

❖ KNN Algorithm

K-nearest neighbor (Knn) algorithm pseudocode:
Let (X_i, C_i) where $i = 1, 2 \ldots \ldots, n$ be data points. X_i denotes feature values & C_i denotes labels for X_i for each   i.
Assuming the number of classes as 'c'
$C_i \in \{1, 2, 3, \ldots., c\}$ for all values of i
Let x be a point for which label is not known, and we would like to find the label class using k-nearest neighbor algorithms.

Knn Algorithm Pseudocode:
1. Calculate "$d(x, x_i)$" $i = 1, 2, \ldots., n$; where d denotes the Euclidean distance between the points.
2. Arrange the calculated n Euclidean distances in non-decreasing order.
3. Let k be a +ve integer, take the first k distances from this sorted list.
4. Find those k-points corresponding to these k-distances.
5. Let k_i denotes the number of points belonging to the ith class among k points i.e. $k \geq 0$
6. If $k_i > k_j \; \forall \, i \neq j$ then put x in class i.

❖ Haversine algorithm to calculate the distance from target point to origin point

1. R is the radius of earth in meters.
Lat_O = latitude of origin point, $Long_O$ = longitude of origin point
Lat_T = latitude of target point, $Long_T$ = longitude of target point
2. Difference in latitude = Lat_O-Lat_T
Difference in longitude = $Long_O$ -$Long_T$
3. Φ =Difference in latitude in radians
Λ =Difference in longitude in radians
O= Lat_O in radians.
T= Lat_T in radians.
4. A= $\sin(\Phi/2) * \sin(\Phi/2) + \cos(O) *\cos(T)*\sin(\Lambda/2)*\sin(\Lambda/2)$
5.B= $\min(1,\mathrm{sqrt}(A))$
Distance = $2*R*B$

VIII. TECHNIQUE USED

❖ QR Code Generation

QR code (abbreviated from Quick Response Code) is the trademark for a type of matrix barcode (or two-dimensional barcode) first designed for the automotive industry in Japan. A barcode is a machine-readable optical label that contains information about the item to which it is attached. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte/binary, and kanji to efficiently store data; extensions may also be used. The Quick Response (QR code) system became popular outside the automotive industry due to its fast readability and greater storage capacity compared to standard UPC barcodes. Applications include product tracking, item identification, time tracking, document management, and general marketing. A QR code consists of black squares arranged in a square grid on a white background, which can be read by an imaging device such as a camera, and processed using Reed–Solomon error correction until the image can be appropriately interpreted. The required data is then extracted from patterns that are present in both horizontal and vertical components of the image.

❖ Google API

The Google Maps API allow for the embedding of Google Maps onto web pages of outside developers, using a simple JavaScript interface or a Flash interface. It is designed to work on both mobile devices as well as traditional desktop browser applications. The API includes language localization for over 50 languages, region localization and geocoding, and has mechanisms for enterprise developers who want to utilize the Google Maps API within an intranet. The API HTTP services can be accessed over a secure (HTTPS) connection by Google Maps API Premier customers.
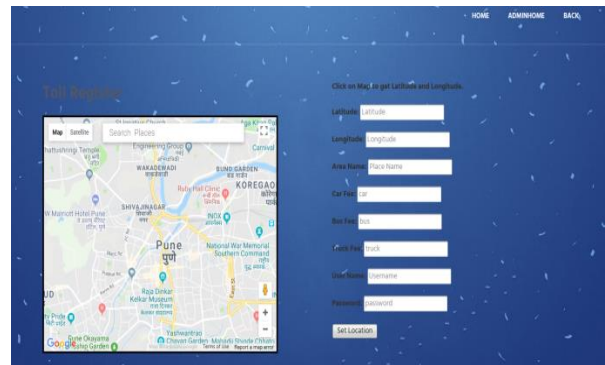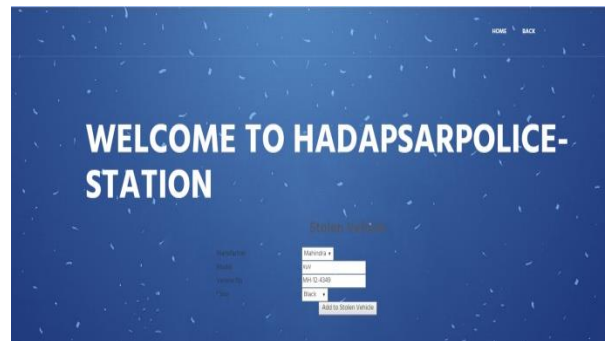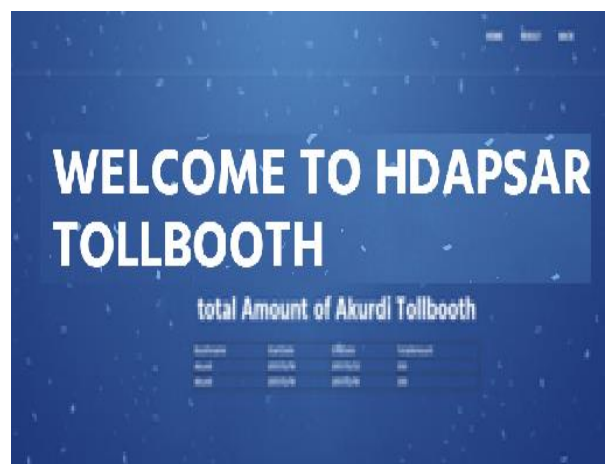
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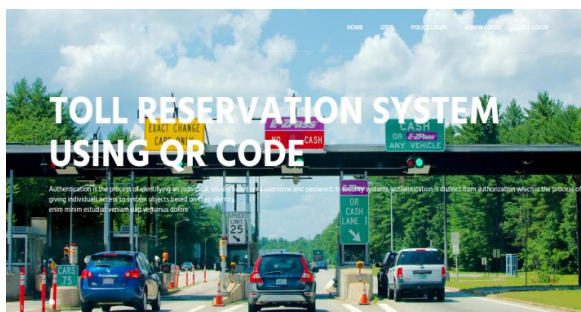
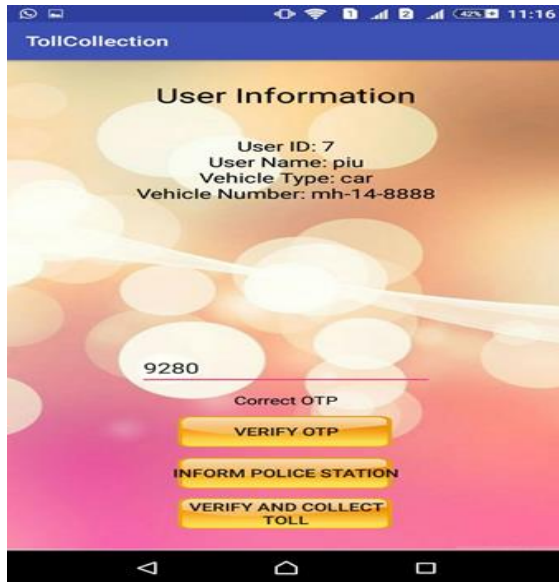
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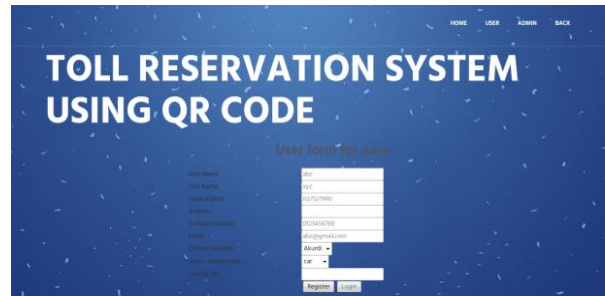
User Registration Form

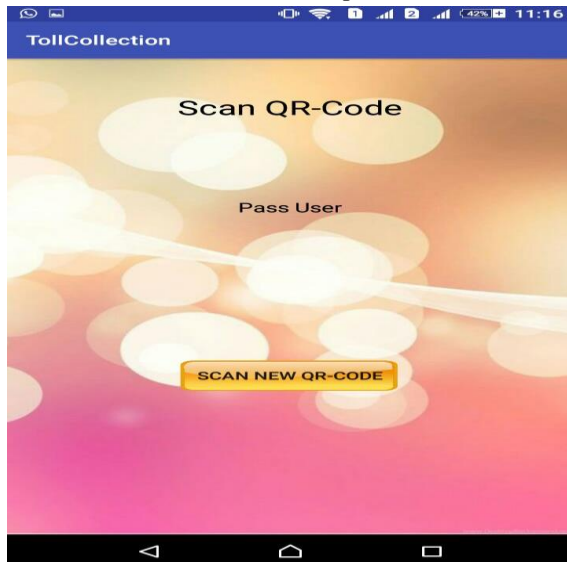
Tollbooth Registration Form

Insertion Of Stolen Vehicle

Toll Collection summery

Toll collector options

After Authentication

X. CONCLUSION AND FUTURE SCOPE

QR-Code is effective way to store information also effective way to handle stored data. We propose effective and transparent toll collection system. Toll collector just need to scan QR-Code; all other operations are done automatically. Automation toll collection reduce the time required for toll collection. Also propose system is capable of identify vehicle is stolen or not. This feature will track stolen vehicle.

ACKNOWLEDGMENT

REFERENCES

[1] H. Vogt. Efficient Object identification with passive RFID tags. In F.Mattern and M. Naghsinesh, editors, International Conference on Pervasive Computing. Volume 2414 of Lecture Notes in Computer Science, pages 98-113, Zurich, August 2002. Springer-Verleg.

[2] Cheol Oh, Stephen G. Ritchie Jun-Seok Oh, R.Jaykrishnan, "Real- Time Origin-Destination [OD] Estimation via Anonymous Vehicle Tracking", September 2002 The IEEE 5th International Conference on Intelligent Transportation Systems - Singapore

[3] Muhammad Adnan Elahi, Yasir Arfat Malkani and Muhammad Fraz," Design and Implementation of Real Time Vehicle Tracking System", 2nd International Conference on Computer, Control and Communication, Pakistan, 2009

[4] P. Salunke, P. Malle, K. Datir and 1. Dukale, "Automated Toll Collection System Using RFTD", lOSR 1. of Com put. Eng., vol 9, issue 2, pp. 61-66 (January-February. 2013).

[5] Sudheer Kumar Nagothu, "Automated toll collection system using GPS and GPRS", Year: 2016 Pages: 0651 - 0653, DOI: 10.1109/ICCSP.2016.7754222

[6] P. Kamalakannan; M. Balaji; A. Avinash; S. Keerthana; R. Mangayarkarasi "Automated toll collection with complex security system", 2010 2nd International Conference on Education Technology and Computer, Year: 2010, Volume: 4

[7] Anurag Ganguli; Ajay Raghavan; Vladimir Kozitsky; Aaron Burry, "Automated fault detection in violation enforcement cameras within Electronic Toll Collection systems", 16th International IEEE Conference on Intelligent Transportation, Systems (ITSC 2013)

[8] Jayapriyaa CT; Y. Bevish Jinila, "Secured short time automated toll fee collection for private group transportation", 2015 International

Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS)

[9] Dipti Jadhav; Manoj Sabnis, "Open road tolling in India by pattern recognition" 2015 International Conference on Technologies for Sustainable Development (ICTSD)

[10] Applying QR Code Technology to Facilitate Hospital Medical Equipment Repair Management, Li-Chuan Chu; Chen-Lin Lee; Chang-Jer Wu, 2012 International Conference on Control Engineering and Communication Technology

[11] A QR Code-Based on-Street Parking Fee Payment Mechanism, Wen Chuan Wu, 2014 Tenth International Conference on Intelligent Information Hiding and Multimedia Signal Processing