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Automatic Toll Payment System Using QR Code Scanning

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Abstract- Recently we observed that the streams of traffic are increased at toll plaza on highways are congested and use manual toll collection system causing long queues of vehicles, the heavy traffic jam and the waste of time of travelers. To avoid such problems we are developing the system which automatically will reduce the toll amount registered with a vehicle at the time of vehicle registration. The user makes registration of own vehicle. In this system smart phone camera is used for capturing the QR code mounted on front side of the vehicle which will be sent to QR code decoding process, if the information is authentic which is already stored in central database, the amount will be deducted from the user wallet. The user will find petrol pump, hospital, school, all toll and restaurants in a nearby area. The user gets notified when reaches to a toll and user gets the details of credited and debited transaction history in the user wallet model also the operator notify that the transaction will be successful.

Keywords- QR Code, Toll plaza, Smart Phone, Camera, Wallet, Transaction

I. INTRODUCTION

Along with the increasing number of vehicles in major cities, Toll Roads is an option for smooth transportation to avoid congestion. The increasing use of toll roads will be followed by the increase in highway infrastructure to support optimum service to users [2]. Automatic toll collection system (ATC) is a technology enabling the automatic collection of toll payments. It is universally and rapidly accepted technology. This system is capable of determining if the vehicle is registered or not, and then informing the authorities of toll payment for the violations if any. The most obvious advantage of this technology is the opportunity to eliminate congestion in toll booths; especially during festive seasons or during week off when traffic tends to be heavier than normal, it also reduces operating cost for toll authorities, reduces fuel consumption. Other than this obvious advantage, applying ATC could also benefit the toll operators by better audit control of centralized user accounts. Toll collection can be done electronically by using various methods like RFID, Barcode, QR code technology etc.

The QR code can be printed on the number plate itself or on the inner side of the windshield. Quick Response code technology has fast readability and huge storage capacity. It storage the numeric data 7,089 characters, alphanumeric data 4,296 characters, 8-bit byte data 2,953 characters, Kanji data 1,817 characters [3]. QR Code is a type of matrix codes or two-dimensional barcode whose functions is to identify an object. The QR code consists of black modules (square dots) arranged in a square grid on white background, which can be read by an imaging device (such as a camera). The QR code is detected as a digital image by a semiconductor sensor and is then digitally analyzed by programmed processor.

Android, which Google released as an open source mobile phone operating system is a Linux based platform; it consists of the operating system, middleware, and user interface and application software. The advantages of android are the open source license so it is possible for anyone with an android programming ability to create develop applications to run on Android based gadgets. Mobile Toll Application is an automated electronic application whose function is to improve the efficiency of the transaction time at the toll gate, thus reducing queues of vehicles by utilizing the Android OS and the QR Code as media access automatically, so no need to use manual service at toll gates. Implementation QR Code later designated as the automation of the toll plaza so as to speed up service for prospective users of the toll gate. In this project, we focused on collecting toll, according to a vehicle and provide uniform toll collection system. The approach of automatic toll collection helps to avoid unnecessary delay in collection of toll and provide safe, secure, effective strong system in real world transport system. For an effective and fast collection of toll on toll plaza, we developed a QR code based toll collection system. QR code mounted on the vehicle used to read vehicle with the help of a QR code reader [2].

In this system when the vehicle reaches near the toll plaza, the camera captures the image; send it to a QR code reader for the decoding process. It will retrieve the vehicle database. Depending on this information appropriate toll tax will be deducted from the owner's prepaid account and boom will be opened automatically and the vehicle can pass without any delay. If the balance in the owner's prepaid account is low or if the vehicle is not equipped with a tag, then the owner has to pay toll manually.

II. LITERATURE SURVEY

Kasturi Shah, Prajakta Joshi, Dishaa Garg "Automatic Toll Collection Using QR Code" e-ISSN: 2395 -0056, p-ISSN: 2395-0072©2016 IRJET. In this survey Kasturi Shah, Prajakta Joshi, Dishaa Garg examined the Automatic toll
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collection Using QR code. In this study, he focussed on collecting toll according to a vehicle and provides uniform toll collection system. The approach of automatically toll collection helps to avoid unnecessary delay in collection of toll and provide safe, secure, effective strong system in real world transport system. For an effective and fast collection of toll on toll plaza, he developed QR code based toll collection system. QR code mounted on the vehicle used to read vehicle with the help of QR code reader [1].

YudhiKristanto, BagusPriambodo “Application Design of Toll Payment using QR Code a Case Study of PT. JasaMarga” ISSN: 2231-2803©2016 IJCTT. In this study the YudhiKristanto, BagusPriambodo examined that the validity and reliability. The test application is the main process in the Android platform. This will test the application to make transactions on the QR Code interface and the results that come out will be recorded into the history menu automatically or not. In the QR Code interface, then we will fill the user data such as user ID, username, and the credit balance amount. However, the data to be entered into the history interface is user data after the transaction occurred such as user ID, location of toll gates, the amount to be paid and the date and time of the transaction [2].

Kinjal H. Pandya, Hiren J. Galiyawala “A Survey on QR Codes: in context of Research and Application” ISSN 2250-2459©2014 IJETAE. The author examined that it includes the basic understanding of QR code. It shows the comparison between one dimensional and two dimensional barcodes. Also it includes the various examples of the use of QR codes and all different techniques of diverse fields that have been proposed by using QR code for the research is mentioned [3].

Vinod Suryawanshi, Aditya Gosavi, Unmani Joshi, Sagar Suri “Automatic Toll Collection Using QR Code” ISSN: 2319-7242©2017. The authors declared the different types of methodology like QR Code Generation, QR Code Printing, QR Code Paste/Show, Recharge Money, Manage Vehicles, Check Deduction, and QR Code based toll payment system, Revenue Analysis etc [4].

III. EXISTING SYSTEM

Automatic Toll collection (ATC) system is specially designed for the smooth working of toll booths, which hold an important part of an intelligent transportation system. There are various technologies which are already proposed; each technology has its own principles, advantages, and limitation. Basically, two technologies are elaborated for ATC using RFID and Barcode Reader. Radio Frequency Technology (RFID) is used to read each vehicle with the help of RFID reader. Infrared Proximity Sensor is used to detect vehicles that arrive at the toll plaza. The controllers MSP 430 Launch pad is used to receive a signal that is received by IR receiver. The vehicle number is transmitted through the IR transmitter [1].

Automatic toll collection (ATC) is a technology enabling the electronic collection of toll payments. It is a universally and rapidly accepted technology. This system is capable of determining if the vehicle is registered or not, and then informing the authorities of toll payment for the violations if any. The most obvious advantage of this technology is the opportunity to eliminate congestion in toll booths; especially during festive seasons or during week off when traffic tends to be heavier than normal, it also reduces operating cost for toll authorities, reduces fuel consumption. Other than this obvious advantage, applying ATC could also benefit the toll operators by better audit control of centralized user accounts.

Toll collection can be done electronically by using various methods like RFID, Barcode, QR code technology etc. RFID is a term used to identify vehicles automatically with the help of radio waves which passes through the toll booth. A vehicle holds an RFID tag which contains a unique identification number assigned by RTO or traffic governing authority. Whenever the vehicle passes the toll booth, the tax amount will be deducted from his prepaid balance [1].

The system proposed in recent paper uses barcode reader technology in electronic toll collection (ATC) system. In this system, barcode tag that are mounted on the number plate of vehicles, or on the front side of vehicles. With the help of barcode reader, the embedded information present on the barcode is read. The proposed system eliminates toll authorities to manually perform ticket payments and collection of cash. The barcode system has a disadvantage of very low throughput and less storage. To overcome this disadvantage the ATC using QR code Technology we are developing. In the QR code technology, the QR code is mounted on the vehicle and the QR code reader scans that QR code, then it checks that the user and vehicle are registered or not if yes then it will automatically deduct the amount from user account if no then user have to register for their vehicle.

IV. PROPOSED SYSTEM

The purpose of this system is to develop and implement a payment of the toll road system based on Android application development. Several parameters are used for paying the toll roads is QR Code and Reader. Utilization of QR Code is payment function in real time without any delay, while the Reader sensor used to capture the QR Code on Android Smartphone which is then processed in a database [2].

A recent trend among small businesses is the growing use of QR (Quick Response) codes. QR codes can be scanned and read by a camera-equipped Smartphone. QR code on an item scans it with your Smartphone and immediately has access to a lot of information electronically. QR Code on a business card might contain a V-card (digital business card) that you can save without having to manually input the card on user information. E-payment by doing this pre-banking Tollgate transaction processing the drivers will have QR code as a proof in the mobile phone or V-card to

move to the concern location without any waiting time in tollgates. To use two types of application for E-payment web application (PC) and Android application (Smartphone) finish the payment processing automatically QR code generates on giving a mobile number. After generating the QR code our payment is completed and when reaches the tollgate to show the QR code in front of the QR code reader (it scanned our data as digital) and leave from the tailgate without waiting time [3].

In this project there are two types of android application and one admin panel. The first application is Toll User, in this application user need to register with own details and user also add multiple vehicles and manage vehicle. The QR code generated with the details of added vehicles and prepaid account.

The first vehicle owner needs to download the application and has to register by giving basic details such as username, vehicle details and then registering an account pertaining to the owner either prepaid or postpaid. During the registration, the owner needs to deposit a certain amount in his account [1].

The registration provides QR code to the vehicle. The second module is toll management. The gate needs to register for the various toll amounts levied on different vehicle types that approach a toll gate. As the vehicle approaches the gate, QR code reader captures the QR code and decodes, authenticates and the respective amount will be deducted from the owner account.

V. WORKING METHODOLOGY

5.1. Toll User

It is an android base application, in this application user need to register with user details like username, password, email Id, mobile number. After registration, user can be logging in the application by our registered mobile number and password.

5.2. Add Vehicle

In this module the user can add or register multiple vehicles by entering the vehicle details like vehicle name, vehicle number and selecting a vehicle type like 4-Wheeler, heavy etc.

5.3. Start Journey

To get easy, turn-by-turn navigation to places, use the Google Maps app. The maps will show you directions and use real-time traffic information to find the best route to your destination. So that we are using the Google Maps API in this project to navigate our current location, nearby toll notification, nearby restaurants, nearby hospitals, nearby school, nearby petrol pumps etc.

5.4. Wallet

In this project, the user has a prepaid account for paying the toll amount online. The user needs to deposit a certain amount in his account at the time of registration in this application. The wallet can be recharged by the Credit Card/ Debit Card or Net banking. The toll amount is deducted at the time of vehicle passing through the toll booth.

5.5. QR Code

The user selects options based on his choice of journey and frees them to system. Input data include vehicle identification, journey type and owner identification details. QR code for input data is generated using input data. Generated QR codes may be saved into system and printed when possible. This is beneficial for users without a smart phone.

5.6. Toll Operator

This is the second application of this project; this application is used by the toll operator for collecting the toll amount of an online. This application has QR code scanner for decoding the user QR code and collecting toll amounts from user wallet.

5.7. Scan QR Code

Printed QR Codes can be pasted onto windscreen or side screen or Generated QR codes can be scanned by toll operator application. They will be scanned by the QR code scanner and their data will be used for processing user requests.

Working Flow of Application

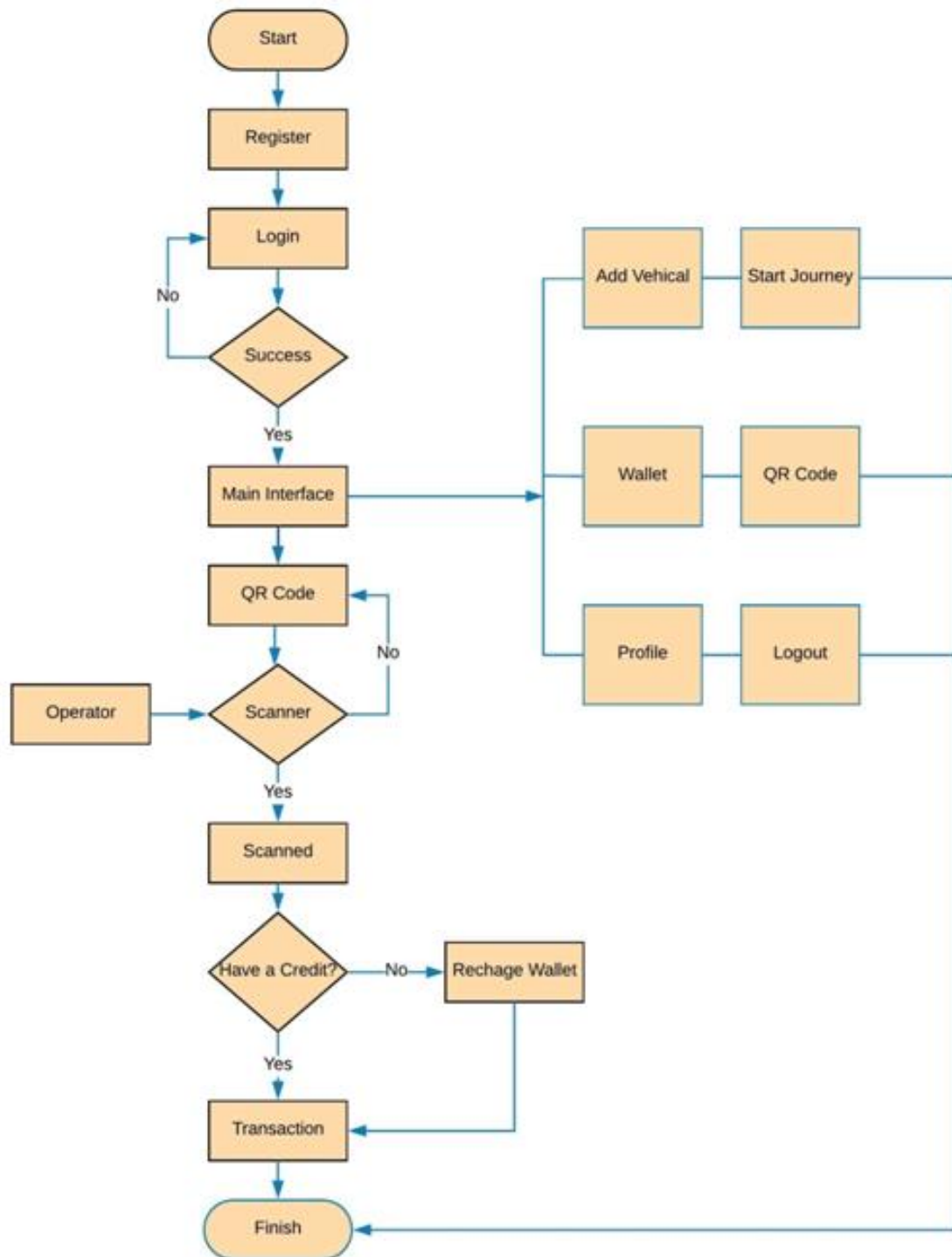


Figure 1. Working flow of Application

VI. ADVANTAGES

1. Reduction of fuel consumption as no stopping is required at the toll.
2. No Traffic congestion as the process is fast and does not allow congestion of traffic.
3. As fuel consumption is less it reduces air pollution.
4. Reducing the number of personnel required for toll collection.
5. Making the process easier and faster.
6. Fewer and shorter queues at toll plazas by increasing toll booth service rates.
7. Better audit control by centralizing user accounts.

VII. CONCLUSION

Here we develop a new approach of automatic toll collection using QR code which is easy to use and versatile. The code itself stores huge amount of information vertically and horizontally that is easily scanned and stored. It stores the information in small space which helps not only to eliminate the manual data entry but also inspires for automatic toll solutions. This system saves time, manpower and reduces traffic congestion at toll gates which ultimately reduce the waiting time of travellers and fuel consumption. It gives toll authorities to set variable pricing for toll services and thus a fair policy of tax collection can be followed.

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