"IoT: Open Road Tolling, Automation in Highway Administration System"

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Abstract- The current highway administration system has some aws of human errors, late response to accidents and involves corruption, as there are liquid cash transactions. In our System our main aim is to reduce the traffic and accidents on highways and to reduce corruption in highway administration system by eliminating cash transactions. There is also a main advantage that we are providing security to the QR code by mapping techniques. The proposed system will be QR based digitization of toll plaza and highway rules validation in which the toll amount will be deducted automatically from the vehicle owner's account by scanning the Encrypted QR code which will be placed on the vehicle's front screen and the fine amount also will be deducted if user has violated any of the highway rules. User has to register his/her vehicle on our website so the system will validate the information and then the system will give password protected QR code for that particular vehicle , at the same time user also needs to register his/her bank account by providing correct banking information. This system will result into reduced waiting time on tolls as the payment method is much faster than what was the previous one, rules will be followed sincerely , as if the rule is violated fine amount is going to be deducted when the vehicle will arrive at any of the toll .It will result into reduced number of accidents. The system will also provide prepaid recharge option where the user just has to enter source and destination and the system will show the tolls between them, then user will get the option to pay the toll amounts in advance.

Keywords- RFID, QR Code, RTO.

I. BACKGROUND WORK

In current system, on toll plaza if there is a long waiting queue for toll payment then lot of time is wasted. Thus due to this there is more traffic on toll plazas. Currently toll plazas support toll payment by cash or cards(debit card, credit card etc.),for both ways people have to wait in queue for payment .Our invention helps in reducing the traffic on toll plaza's with help of QR code based payment due to this the unnecessary waiting time is avoided.

Another reason for developing this system is lot of accidents take place because of the heavy vehicles which are overloaded, and this contributes in death of innocent people. Therefore our invention helps in reducing these accidents at high extent; by checking the weight of heavy vehicles at toll plaza and letting they pass the barriers only if the weight of vehicle is appropriate.

The speed of vehicle also contribute in accidents on highways, for this purpose our invention involves testing the speed limit and charging appropriate fine if the speed limit is exceeded. Also the car owner/driver can pay the toll amount prior if he/she knows the correct destination.

The current toll payment on toll plazas also supports payment by using RFID TAGS (FASTAGS). This system is costly as the RFID tag deposit should be paid prior. The tag joining fee is 200rs in addition to this the tag should be recharged after some interval. Thus as compared to RFID, QR code is open source. It does not involve any cost of QR code generation.

Proposed System will use QR code (Quick Response code) which can be scanned much faster than the RFID and the main advantage of the system is QR code is open source , hence if it gets damaged by any reason it can be regenerated very easily . This is not same in the case of RFID tags.

II. CONSTRUCTION AND WORKING

1) Registration of vehicle.

Actual flow for registration of vehicle is there.

-Here the user has to register his vehicle by providing unique and correct information provided by RTO in form of "Smart Card" or "RC Book".

-The information will contain the following data:

1.Registration Number.
2.Registration Date.
3.Chasis Number.
4.Vehicle Number.
5.Engine Number.
6.Mobile Number Registered with bank.
7. Owner's name.
8.Email Address.

-All this data will be stored in cloud.

-Then if the information matches with the information present in RTO database then our System will provide QR code for that particular vehicle.

-Then the user has to take print of that QR code and paste it on the front glass of the vehicle on the top right corner.

2) Steps prior travel.

-User has to send SMS from Registered Mobile No (RMN), from which source to destination he/she wants to travel.

-On the basis of Source and Destination that QR code will be activated between those cities.

-The user should drive the vehicle in particular lane on the basis of type of vehicle on toll plaza.

3) Toll Amount Deduction on first toll plaza.

-When the vehicle arrives at first toll plaza, the QR code will be scanned and specific toll amount will be deducted from

vehicle owner's account on the basis of type of vehicle. If the vehicle is heavy vehicle, it is weighted to check whether it is overloaded or has appropriate weight. If the vehicle is overloaded then specific fine amount is deducted automatically from vehicle owner's account.

-Here at first toll plaza the speed of vehicle is not measured. From 1st toll plaza onwards the speed is calculated and fine amount is deducted from owners account if the speed is exceeded.

4) Toll amount Deduction from second toll plaza.

-On second toll plaza the same procedure as mentioned above in point 3 is followed for toll amount deduction and heavy vehicle weight calculation. In addition to these two, also the speed of vehicle is be calculated and fine amount is deducted from owners account if the speed is exceeded.

5) Speed Limit Checking Mechanism.

-'A' and 'B' are the two toll plazas.

-The distance is 60 kilometres and the speed limit is 60 km/hour. Therefore the vehicle should travel the distance between two tolls within an hour. If the vehicle reaches toll B in less than one hour then somewhere in between it has not followed the speed limit rules which means the speed limit is exceeded somewhere.

-System will record the time of arrival of vehicle at toll A. It will also record the time of arrival at toll B.

-Then the difference will be calculated and on the basis of this result the system will check if speed limit is exceeded or not.

6) Prepaid Toll Payments.

-Here the user need to visit the website and scan QR code then enter the Source and Destination then the system will show tolls in between those cities .

-System will show total amount to be paid. User will get option to pay the amount of all tolls on single click.

-This option is better to use when user knows the perfect destination where he/she wants to travel.

III. FUTURE IMPROVEMENT

- We can calculate the air pollution caused by particular vehicle by checking the smoke emitted from the silencer. If it is causing air pollution then specific fine amount for that will also get deducted from that vehicle owner's account.

IV. Methodologies/Algorithm

1. Generic Algorithm

Generate the QR-Code.
Stick the QR-Code on the vehicle's windshield.
Run the server side program then client side program.
After vehicle detection and validating the QR-Code deduct the amount from owner's bank account.
Check the speed from two toll plaza if the speed limit exceed then reduce the extra amount from owner's bank account.

2. Server Side Algorithm

Import socket library and create the socket by using port number and ip address.
Bind the socket to address and port number put the socket into listening mode.
Establish the database connection.
Establishing the connection with the client send the data to client.
Perform the amount deduction operation on the database. Check that rules violated or not.
If rules not violated then extra amount not deducted from owner's account.
If rules violated then extra amount deducted from owner's account.
React the amount deduction changes to the database and also insert vehicle arrival time near toll plaza into the database.
Send the email receipt to the registered mail address.

3. Client Side Algorithm

Import socket library and create socket by using the port and ip address.
BY USING connect () system call connect the socket.
Receive the data from server.
Initialize the voltage value of solar cell. Define the following condition.
If voltage level is below the range the vehicle detected.
If voltage level is above the range the vehicle not detected.
If the vehicle detected then camera get on and capture the image.
This image stored into the tmp file and performs the image processingoperation for scanning the QR-Code code.
After scanning the QR-Code send the data to server for amount de-duction and checking the rules violation.
Server sends the amount deducted message to client.
Again repeat the same step 4-to 8 when new vehicle arrive.

V. DEPLOYMENT AND MAINTENANCE

- Installation and un-installation
- Install Intel Edison on Toll Plaza
- Make Connection From Camera to Edison Board
- Make Connection From Edison to Power Supply
- Turn on Edison Board
- Connect It With Internet through wifi

VI. USER HELP

- Be Ready with RC book / Smart Card
- Enter all the correct information of vehicle on our website
- Enter all correct information of bank account on our website
- Enter all correct personal information on our website
- Create QR Code
- Paste it on your vehicle on front windshield

System Description:

Input: O1, O2, F1.
O1: Input taken from User Related to Vehicle Information (RC Book or Smart Card)
O2: Input taken from user related to bank information
F1: Image Containing QR code from windshield of vehicle
Output: Out1, Out2 , Out3
Out1: Weight Checking of Heavy Vehicles and fine deduction if overloaded.
Out2: Speed checking between tolls and fine deduction.
Out3: Toll Amount Deduction on the basis of vehicle type.

Functions: F1, F2, F3
F1: Calculating toll amount on the basis of toll no and type of vehicle.
F2: Scan QR code from windshield of vehicle
F3: Sending Socket Information after Scanning the QR code.
F4: Deducting Toll Amount from the owner's bank account.
F5: Weight checking and fine deduction if any.
F6: Speed checking and fine deduction if any.
Success Conditions:
QR Code Scanned Successfully and toll amount deducted from owners bank account.
Speed Checking done over toll plaza.
Weight Checking done on toll plaza.
Failure Conditions:
Weak Wi-Fi Network.
Camera Position.

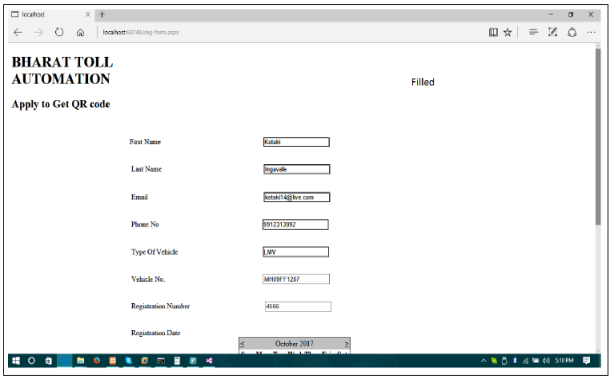

Fig.1: Create QR Code

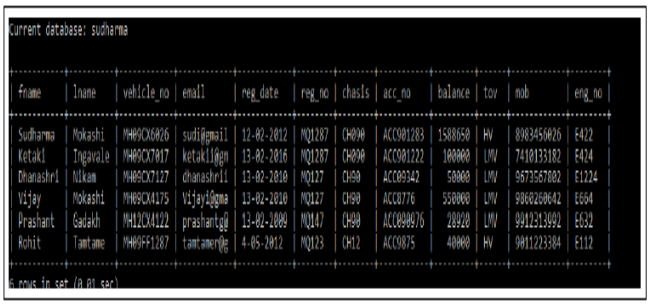

Fig.2: Database before Transaction

Fig.3: Client Execution

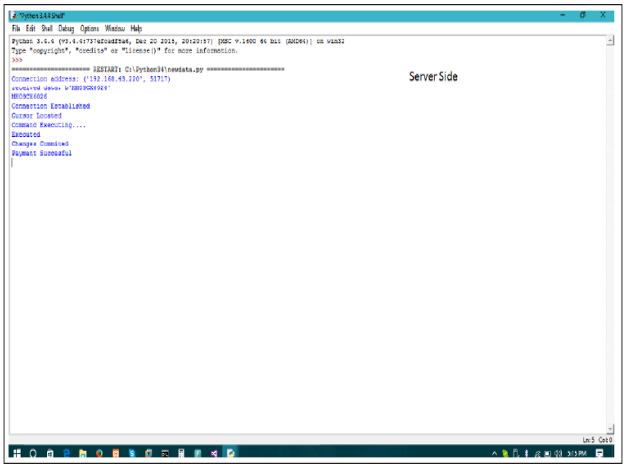

Fig.4: Server Execution

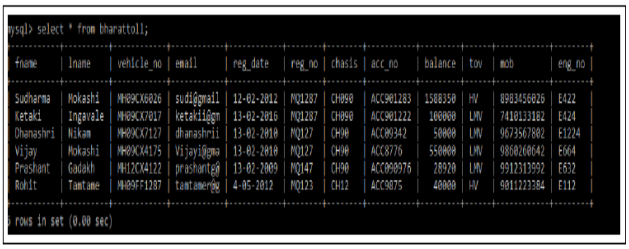

Fig.5: Database After Transaction

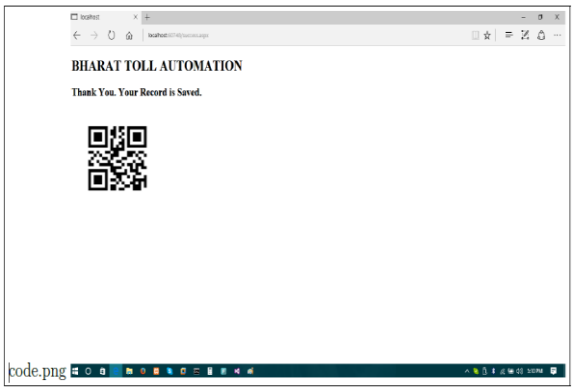

Fig.6: QR Code

VII. CONCLUSION

Our idea is to develop QR based smart toll .Where we will use QR based payments which are currently supported by government's BHIM applications as well as m-VISA by VISA and some private companies like PAYTM, Free charge from India. In addition to this with the help of QR code we can detect and track the car which raises its speed on highways. We will also check if the heavy vehicles are overloaded. All these operations are based on QR code. QR code is Quick response code. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte/binary, and kanji) to efficiently store data; extensions may also be used. 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. The current system is based on FASTag (RFID tag). FASTag is reloadable tag which enables automatic deduction of toll charges and lets you pass through the toll plaza without stopping for the cash transaction. FASTag is linked to a prepaid account from which the applicable toll amount is deducted. The tag employs Radio-frequency Identification (RFID) technology and is affixed on the vehicle's windscreen after the tag account is active.

VIII. REFERENCES

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