

A Novel Approach for Automated E-challan Generation using QR Code and OCR

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Abstract: During the past few years, traffic accidents & breaking traffic rules has increased enormously. This work aims at implementing a vehicle document check system where information is retrieved from the database by the traffic police using their smartphones and the physical documents are not needed to be carried along thereby saving time of filling details manually. QR code is the type of matrix barcode, which has become admired outside the automotive industry due to its fast readability and greater storage capacity compared to standard Universal Product Code (UPC) barcodes. Optical Character Recognition (OCR) is the electronic conversion of images of typed or printed text into machine-encoded text. This work takes an account of QR codes and OCR, at the front end, android application is created with which traffic police can scan the QR code or number plate using QR code scanner or OCR scanner respectively on officer's phone and all the details about the owner of the vehicle will be shown on the phone and accordingly E-Challan will be generated and sent to the vehicle owner through SMS. Thus, this work is an attempt to highlight the automatic generation of E-Challan using QR codes and OCR.

Keywords: E-challan, OCR, QR Code, Vehicle.

1. Introduction

Due to increasing number of user on road it is difficult to identify every vehicle uniquely and to monitor the vehicle manually is very difficult task.

The aim of this work is to automate the identification of the vehicle and make challan immediately. In today's time there are so many people breaking traffic rules and creating challan for all traffic offender manually is difficult. On a regular basis, police officer has to stop traffic rule offender's vehicle on the road. This not only wastes the valuable time of the driver but also of the police who takes time for making challan manually. This work includes generation and scanning of QR code and OCR for generating E- challan for the traffic violator.

QR code stands for Quick Response Code is the type of matrix barcode, which has become admired outside the automotive industry due to its fast readability and greater

storage capacity compared to standard Universal Product Code (UPC) barcodes. Optical Character Recognition (OCR) is the electronic conversion of images of typed or printed text into machine-encoded text. OCR is a technique aimed at the extraction and recognition of license plates using image processing techniques. Application created will be installed on

respective smartphone which contain QR code scanner and OCR scanner. All police officers will have independent login ID and respective password which will maintain the security of the system. This application will be created to record the violations committed by the particular offenders of particular area. This work proposes that the QRcode will contain information of the vehicle owner which will be mounted on the vehicle. So when the vehicle user violates any set rule, officer will scan the QR code or number plate with respective scanner (application) and will enter the offence of vehicle user which will be again stored in database against that vehicle user. The record of the same will also be send to the vehicle user via SMS. Deadline will be provided to the offender so than he can pay challan offline at respective RTO office.

2. Related work

- *Automatic penalty charging for violation of traffic rules, aditi dambe, upasana gandhe, varsha bendre:* This paper proposed an advanced technological solution to improve the traffic discipline. The system proposed in this paper automatically incur penalty to the car driver for violation of traffic rules. If car is standing on zebra crossing when the signal is red or crossed the speed limit zone or parked the vehicle in no parking zone or illegally signal has been crossed or PUC has been expired, then the penalty will be charged automatically to the car owner.
- *Trans-Seva: E-Challan System using QR-Code, Priyanka Bansod, Prof.Naziya Pathan:* This paper proposed an android application to help the traffic police to maintain the penalty information in the centralized repository. The application also consists of review part of traffic crimes based on which the higher authorities can take necessary actions regarding traffic discipline. All the work in existing challan system is done manually which is very time consuming and traffic police has to maintain challan books and sometimes the police issues the vehicle owner fake challan which leads to the corruption. Therefore, this work was an attempt to reduce the corruption and the time required to prepare the challan.
- *A Survey on Vehicle Document Check System, Shobha*

- M.S, Akash S, Aswin J.M, Anto Melvin K.F, Arkaprabho Roy Asst. Professor:* This paper proposed a vehicle document check system in which databases and documents are retrieved by the smartphones of traffic police. Initially in this system the authors have assigned the vehicle owner the unique identity numbers and has scanned their documents and stored them into the database at the back end, with the help of which QR Code was created and was stucked on the vehicle. The application was developed by which the vehicle owner details and the documents scanned earlier was retrieved from the database after scanning the QR Code. There was alternate choice if the scanner fails to work, the authors have made the driving license as unique identification. This work was also an attempt to detect the stolen vehicle using an alert message.
- *A Survey on QR Codes: in context of Research and Application, Kinjal H. Pandya1, Hiren J. Galiyawala:* The main purpose of this paper was on the basics of QR Code, applications of QR Code in day to day life and research areas related to it. The structural flexibility of QR Code has lead to wide research area such as for data capacity and security applications. This paper seems some experiments which have been done for the better recognition of the QR Code images that includes scratch removal techniques. Therefore, this paper was an attempt to highlight the research areas related to the QR Code.
 - *Automatic Number Plate Recognition Based On Connected Components Analysis Technique, Sarmad Majeed Malik, and Rehan Hafiz:* This paper proposed a system which is to be implemented on MATLAB for the recognition of license plates of the vehicles. The aim was to develop an efficient algorithm having high efficiency for the identification of vehicles. The system consists of camera which first detects and captures the snap of the vehicle and then the algorithm (which has three parts License Plate region extraction, segmenting the characters and comparing the characters for recognition) accordingly searches the license plate. Thus, this paper was an attempt to develop the algorithm that extracts and recognizes the number plate.
 - *Automatic penalty charging for traffic regulation, nikita prabhu, ameya vedpathak, nikita vedpathak, smita Kulkarni:* This paper proposed a system which will automatically incur penalty to traffic rule violator for committing the traffic offences. This system includes 3 units. One was a standalone system which was to be attached to the ignition mechanism of the vehicle, the other was a standalone system which was to be attached to the traffic signal points and the third was mainframe RTO unit. The driver has to place his RFID driving license card near to the reader for the car ignition. This was an attempt to reduce corruption, pollution, bribery and congestion in a city.
 - *Design & Implementation of Traffic Violation Monitoring System, Govind Prasad Arya, Durga Prasad Chauhan, Vishal Garg:* This Paper proposed a smart monitoring system to monitor the vehicle which has violated the traffic rules. The system will generate the detailed data at the time of incident and accordingly the data will be send to the RTO office and the officer can take further actions. This was an attempt to identify the culprit vehicle which is very difficult to do manually. Therefore, this system was proposed.
 - *Edge Detection Based Adaptive Traffic Control System, Prof. M. D. Ramteke, Hitesh P.Pote, AkshayUkey, PrashantUgemuge, SrushtiGonnade:* This paper proposed a system to control the traffic on the road with the help of the image processing. This paper has discussed the traditional traffic control system and the drawbacks of that system. The system captures the image of the road of which the traffic has to be controlled. Then that image will be converted in Grey scale image and then black and white image with the help of algorithm and then will compare the captured image with the image of empty road and the density of the traffic on the road will be detected by using some edge detection techniques.
 - *An Efficient Approach for Automatic Number Plate Recognition System Using Quick Response Codes, Bhupendra Moharil, Vijayendra Ghadge, Chaitanya Gokhale, Pranav Tambvekar:* The paper overcomes the problems associated with the ANPR (Automatic Number Plate Recognition System) by proposing the Quick Response Codes. The ANPR is technique which uses optical character recognition(OCR) on images to read vehicle number plates. But it has several disadvantages like misidentification, hazy images of number plate which fails to identify the vehicle. Therefore, this paper has proposed quick response code which is 2D bar code that provides easy access to the information through smartphones and which has several advantages over the ANPR.
 - *QR Based Advanced Authentication for All Hardware Platforms, Dipika Sonawane, Madhuri Upadhye, Priyanka Bhogade, Prof. Sanchika Bajpai:* This paper discussed that now-a-days QR based authentication is quite common and widely used due to its features such as high security, reliable secured transmission of information, easy to implement and also easy to use. The information stored is in encrypted form. QR Code is in the form of 2D image which encodes the digital data. Also when code is partially damaged it is readable and do not lose its data. Its main feature is its versatility which has made it popular as these can be

easily scanned through camera based mobile systems. Due to this it can be used for all hardware platforms.

- *Review Paper on Automated Number Plate Recognition Techniques, Dinesh Bhardwaj, Sunil Mahajan:* Automated Number Plate Detection is an embedded system which identifies the numbers and characters from an image of vehicle number plate. It includes an algorithm which work on the principle of image processing and helps out to recognize the main part of vehicle number plate i.e., numbers and character, which helps to determine the identity of the vehicle with respect to pate number. This system is used in modern surveillance system as it reduces most of the monitoring work of the officials.
- *IoT-Driven Automated Object Detection Algorithm for Urban Surveillance Systems in Smart Cities, Ling Hu and Qiang Ni:* This paper proposed a unified and distinct method (algorithm) to recognize a particular part of an image as per the requirement of user. This algorithm can be used to determine or cast out vehicle number plate or a whole vehicle out image captured in camera. Also as the main required objects are determined and taken out of image then other useless data can be deleted which leads to saving big data volume needed to be stored in urban surveillance system.

3. Methodology

The aim of the present work is to propose and experimentally evaluate an automated system, called Challan System and vehicle verification. In this we create an application for traffic police officers to scan the QR Code which will be present on the vehicle. So, they can verify the vehicles easily just by scanning the QR code that required minimum time for the process.

QR codes have already been overtaken the popularity of classical barcode in many areas because of several advantages like increase in capacity, reduced size, etc. Combined with the diversity and extendibility offered, it makes the use of QR code more imploring than that of the barcodes. Statistically, QR codes are capable symbolizing same amount of data in approximately one tenth the space of a traditional barcode. Information such as URL, SMS, contact information and plain text can be enclosed into the two dimensional matrix. Moreover, with the volatile increment of the trend to use smartphones has also played an important role in the popularity of QR codes.

A. Architecture

QR code is a two dimensional i.e. matrix type symbol with a cell architecture organized in a square. Figure 1 shows the QR code architecture. QR codes consists of different areas that are reserved for specific purposes. Finder, separator, timing patterns and alignment patterns comprised of function patterns.

Function patterns shall not be used for encoding data. The finder patterns located at three corners of the symbol intended to facilitate in easy location of its position, size and inclination. The encode procedure of QR Code include following steps. Firstly, input data is encoded in according to most efficient mode and formed bit stream. The bit streams are divided into codewords.

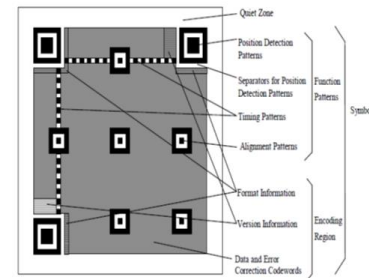


Fig. 1. QR Code architecture

Then codewords are divided into blocks, and add error correction codewords to each block. All these codewords are put into a matrix and are masked with mask pattern. Finally, function patterns are added into the QR symbol. A QR Code symbol is formed.

1) Basic characteristics:

- Encodable character set:
- Numeric data consists of 0-9 digits.
- Alphanumeric data consists of Digits 0 -
- upper case letters A-Z; nine other
- characters: space, \$ % * + - . / :
- Representation of data: A dark module is a binary one and a light module is a binary zero.
- Symbol size (not including quiet zone): 21 21 modules to 177 177 modules. Versions 1 to 40, increasing in steps of 4 modules per side.
- Data characters per symbol: Maximum allowable data capacity for maximum symbol size version 40 and minimum error correcting level L:
- Numeric data: 7,089 characters
- Alphanumeric data: 4,296 characters

B. Proposed system

1) Traffic police officer's end

This side of the application is only restricted to the use by the traffic police and the government authorities. The application is not available for the use of public. In short the officer can issue challan, check the details of the vehicle, alert other officers or the police department about any theft of vehicle or any crime attempt by a vehicle.

On Logging in the officer get a menu

- *Vehicle Check:* The vehicle check contains further sub options to check owner details, an issue challan option.
- The camera of the mobile can scan the QR Code. Therefore, the QR Code that will be provided to owner

at the time of registration has to be available on the vehicle. So that the police officer can scan and take input.

- *Check Owner Details:* The officer has option to check owner of the vehicle where full detail about vehicle as well as the owner is given.
- *Issue challan:* The issue challan option lets the officer issue fine against the vehicle in case any rule has been broken.

In the issue challan option the officer check the check-boxes against the rule broken. Then selects the ‘submit and send to owner’ button which will generate a receipt and will be sent to owner’s mobile number.

2) *QR code*

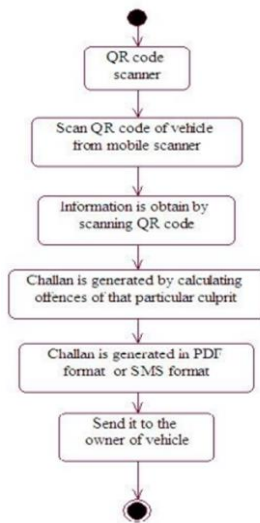


Fig. 2. Verification of vehicle using QR Code

3) *Vehicle owner’s end*

The owner has to register himself to acquire QR CODE which is to be mounted on his vehicle. The RTO also issues a QR Code Sticker for the vehicle.

4) *Automatic number plate recognition*

The optical recognition technique is performed at the remote computer level and consists of the following algorithms:

- *Plate localization:* Isolates the number plate from the snapshot.
- *Plate orientation and sizing:* The isolated number plate is then resized and rotated as per the requirements of the recognition software.
- *Character Segmentation:* Each character on the number plate is separated by drawing vertical and horizontal edges and thus forming rectangles around the character as shown in the Fig. 3.
- *Normalization:* After character segmentation the brightness and contrast of the image is adjusted.
- *Character Recognition:* Each character is then recognized by the software. The software implements the technique of pattern matching to detect the

characters, thus matching the characters with the stored samples. The characters are then combined together to form the number plate.

- *Syntactical analysis:* Checks characters and positions against country-specific rules.

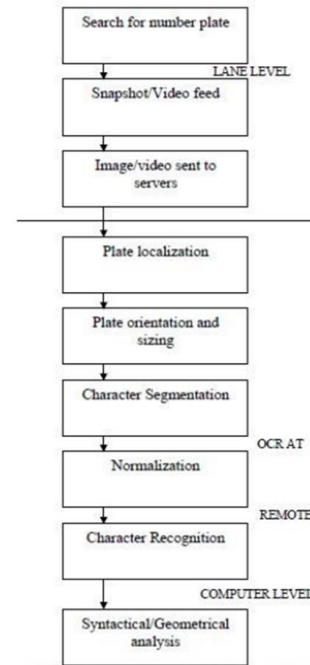


Fig. 3. Verification of vehicle using edge detection

C. *Working*

The image of the number plate taken through application(scanner) will be in JPG or PNG format, which cannot be edited. This can be converted into text format using OCR algorithm using Image Processing. The numbers of the number plate are taken in frame, then it is converted to RGB combination which is then converted to the grayscale. Individual segmentation of each character is done through edge detection algorithm. Converted data and the data in the database is matched, vehicle number is selected and accordingly the rule violator’s information is retrieved from database. The application will consist of list of violations and officer will need to only click on violated rule and accordingly acts of laws and penalty will imposed. And the challan will be generated and send as a text message to driver as well as the RTO office. The data of challan generated will be updated in database.

4. Conclusion

This work discusses the features to be implemented for the working of the E-challan system. The QR code mounted on the vehicle and Automated Number Plate Recognition can be further oppressed for vehicle owner identification, vehicle model identification, traffic control and E-challan generation. It can provide various benefits like traffic safety enforcement, security- in case of suspicious activity by vehicle, easy to use, immediate information availability- as compare to searching

vehicle owner's registration details manually. In multiple vehicle number plate images are considered for Automated Number Plate Recognition while in most of other systems offline images of vehicle, taken from online database. Thus with an implementation of this system which will automatically incur penalty for violation of traffic rules and in turn will lead to a disciplined traffic in our country. This will help in minimizing many problems related to challan which brings disturbance to the whole system.

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