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SQRC-based Vehicle and ID-address Proof Verification System

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Abstract ---Due to increase in population and comforts, majority of people use own vehicles thusroad traffic has becomeunmanageable. This also increases the workload of police men to maintain and manage the traffic and also verifies the licensed driving. The public are in a need to maintain all the documents and update them regularlyby keeping track of renewal date. Adding to it, the volume of automobile crimes has been on the increase and many new crime detection techniques have evolved on its account.High-speed car chases, automobile thefts are now-a-days very common. The best way to keep track of the cars is their registration numbers. There are issues such as number plates often get corroded and the detection process becomes erroneous. Our contribution is the usage of SQRC (Secure Quick Response codes) on the automobiles to fine-tune all these process. It is to store both private and public data in a single code where the public data can be accessed by anyone with a smart phone while the private data which is password protected need special device with software installed specially to scan that data is needed. The proposed approach provides quick response, overcomes the noise issues in image processing and at the same time fine tunes the detection technique.

Keywords— SQRC,Licensed driving,number plates,address and identity proof

I.INTRODUCTION

It is popular to use mobile phone daily in modern life. A QR code is the abbreviation for quick response 2-D code, which is a machine-readable optical label with information on the associated item or product. Compared with 1-D codes, 2-D codes can hold a larger amount of data in a smaller space and other feature comparisons are mentioned in TABLE I. In barcodes, information is coded in one direction or one dimension only. On the other hand, in a two-dimensional code, which the QR code is, information is coded in two directions: horizontally and vertically. A QR code uses four standardized encoding modes to efficiently store data. The QR Code conveys information by the arrangement of its dark and light elements, called "modules," in columns and rows as in Fig 1. [1]

Fig 1.Bar code to QR code

The QR Code was designed with special position-detection patterns located in three corners of each symbol. Reading a QR code is simple. One option is to use a reading device such as a hand scanner, hand terminal, or fixed scanner. The most common and convenient devices for reading QR codes are smartphones or tablets equipped with a camera. Generating QR Code is also much easier.

TABLE I.COMPARISON OF QR CODE AND BAR CODE

Features	QR code	Bar Code
High capacity	Upto 77089 numeric digits	10-20 digits
Durability against	Reading is possible(upto 30%	Reading is impossible

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damage	damaged)	
Reduced Space	40 digits numeric	10 digits numeric
360^{o} degree	Supports 360^{O} reading	Horizontal reading
Language supported	Numeric, Alphanumeric ,Kanji, Kana etc	Numeric, Alphanumeric

QR code has a number of features such as large capacity data encoding, dirt and damage resistant, high speed reading, small print out size, 360 degree reading and structural flexibility of application. A single QR Code symbol can contain up to 7,089 numerals. A QR Code can hold the same amount of data contained in a 1-D barcode in only one-tenth the space. The QR Code's powerful error-correction capability is achieved by adding Reed-Solomon codes, a widely used mathematical error-correction method, to the original data. This allows a QRCode symbol to be read even if it is dirty or damaged. Typical applications of QR code include marketing, warehousing and logistics, retailing and healthcare, life sciences, transportation, office automation and advertising.

To protect personal, private, secret, confidential data from the device that scan QR Code, SQRC(Secured QR Code) was developed. SQRC is developed to meet the growing demand for the secured transportation of the data with the product. In SQRC Confidential data is code key encrypted and combined with the QR Code. The protected and encrypted code is only accessible by using special device with secure code key. This code is being used in many applications. One such application is that it can be used for vehicle identification where the license plate is displayed as SQR code along with which the license details and other identity proof details are coded securely as a part of private data in SQR code.

The remaining of the paper is structured as follows. The next section gives the basic idea of how SQRC handles data and section IIIgives the Advantages of SQRC and Section IV explicitly explains its application in vehicle and identity proof verification. SectionV provides the special features of this application and the future work. Section VI is the conclusion derived from this work.

II.BASIC CONCEPT OF SQRC

To protect personal, private, secret, confidential data from getting read through QR Code scanners a new technology called Secure Quick Response Code (SQRC) has been developed by a Japanese firm called DENSO WAVE which is the latest generation technology that helps in prevention of counterfeiting and forgery. With SQRC, it is possible to store 2 control levels of information in one code.

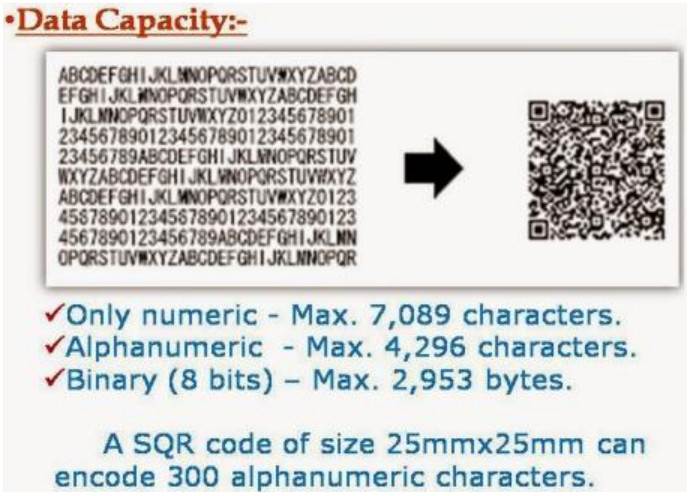

Fig 2.Data Capacity of QR code

SQRC is a new QR code with data reading restriction. SQRC Code is capable of handling all types of data, such as Numeric and Alphabetic characters, Alphanumeric,

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Symbols and Binary characters. 25 mm x 25 mm size SQRC can be inbuilt with either 7089 numeric characters, or 4296 Alphanumeric characters, or with 2953 Binary characters unlike QR code of which can encode only 300 alphanumeric characters of the same size as shown in Fig 2. The SQRC code has two areas of readability as shown in the illustration. They are called public data and the other one is Private data. The private data area which is locked is readable only by a permitted SQRC special scanner as shown in Fig 3.

No other scanners can read SQRC, and therefore it is possible to encode personal information and confidential information. The private data is encoded with a password that can unlock the information. While the QR code can be read by general devices like mobile phones, camera enabled PDA devices & scanner, a proprietary scanner is needed to scan the password and reveal the encrypted data. The password can be changed as needed

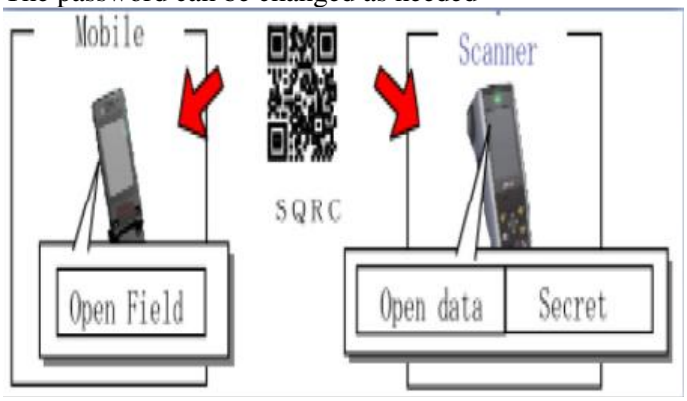

Fig 3.Public and Private Field in SQRC

. Outwardly SQRC & QR Codes both look alike in appearance and while any QR code reader can read the public data of SQRC the password protected data in the same code can be read only with a special device that has special software inbuilt in it and the characteristics of SQRC as in TABLE II.

TABLE II.CHARACTERISTICS OF SQRC

Parameters	SQRC
Definition	Printed information on labels in 2D matrix along with security function.
Status	Dynamic printingwith large information & additional security function.
Equipment	Normal printing by Thermal Printer
Cost of Printing	No Impact on cost with additional Information
Cost VS Info & Size	Cost remain unaffected and size unchanged even with for larger information.

. Stickers with SQRC printed codes can be used in remote areas that do not have computer infrastructure and network connectivity. The authentication can be got done through Government servers or sending SMS.Any QR Code enabled device can read QR Codes therefore SQRCs were developed to meet the growing demands for the secure transportation of data with the product as the confidential information is code key encrypted and combined in the QR Code as shown in Fig 4. QR codes are easy to generate and are also used for phishing attacks.

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Fig 4. Reading of private and public data field

SQRC can hold 200 times the data of conventional 1D code and therefore has high storage capacity within a small printing area. Unlike the Bar code Technology and Hologram, this technique has locking arrangement that prevents unauthorized personnel getting access to the hidden private data. Unless the unlock code in the form of a password is applied, this marker cannot be read by anyone. This makes the authentication foolproof and reasonably beyond doubt.

The SQRC mark is printed like any other Print mark on labels used for affixing on the cartons or printed directly on other medium with ordinary printer, or printed on a printing machine by the inkjet printer. However all these need to be attached to the computer which generates SQRC. This will NOT require special ink. There are two software applications associated with the use of this code. While a special SQRC Maker is designed to create the codes for printing. The another program called the SQRC setting which is used for reading the printed SQRC. This SQRC setting is required for inserting the secured key in to the reading scanner for reading the SQRC.

III.ADVANTAGES OF SQRC

Though the QR and SQR code mostly looks alike, SQRC has number of advantages comparatively. Data moves with product or document, Dynamic changes in data can be coded, i.e. not static like a hologram, Private data is protected ,Public can see public data ,Only an authorized person can access private data ,Anywhere, anytime usage - using desktop, handheld or mobile scanners ,User defined data can be used to generate a unique code each time .

Easy to integrate SQRC into existing processes and applications without disrupting existing operations and other specialized equipment. It Can also be used in remote areas that do not have computer infrastructure and network connectivity ,Eliminates technical errors and glitches due to malfunctioning of equipment or lack of connectivity Instantaneous scanning with SQRC results in faster service ,High data capacity and reduced space requirement, Supports multi-directional scanning at high speed .[4]

It can scan even from curved or irregular surfaces Error recovery feature enables reading of soiled or partially damaged codes ,Can be used with nano particle inks for enhanced security printing ,Can be enhanced to support images/photographs in SQRC form ,Can be printed on different surfaces like paper, metal, wood, fabric, ceramic, plastics, vinyl, rubber, glass, etc. SQRC Enables automation of authentication of documents or products ,Provides electronic proof of verification/authentication ,Facilitates tracking and traceability of critical items ,Cost effective means to combat fraud, counterfeiting and diversion .It is a Combination of software and hardware features makes SQRC a secure application.

SQRC USAGE OVER QRC

QR codes, while being immensely useful in quickly digitizing data, can also be an insecure form of relaying information. They are usually placed in public where

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anyone can access the data using their smart phones. While this is great for distributing information, it also makes information too available to everybody [5]. It is difficult to control access to information or check the validity of the code. SQR codes are cheap and easy to generate, so they are sometimes used by scammers for counterfeiting products such as certificates and tickets. They are also used for phishing attacks.Stickers with SQR codes can be created and placed on top of existing legitimate QR codes in posters and other advertisements. Because humans cannot read them directly. SQR codes can hide information that can cause privacy and security issues. Comparison of SQRC with QR code is shown in TABLE III.

TABLE III.COMPARISON OF QRC AND SQRC

PARAMETER	QRC	SQRC
SECURITY FUNCTION	No	Yes
DATA CAPACITY	**Code** Numeric: 7,089 Characters Alpha numeral: 4,296 characters Binary (8 bit): 2,953 characters	**Code** Numeric: 7,089 characters Alpha numeral: 4,296 characters Binary (8 bit): 2,953 characters
READABILTIY	Yes	Yes
DURABILITY	Yes(Max. 30%)	Yes(Max. 30%)
IMAGE FILE GENERATION CODE	BMP. TIFF. PNG.WMF. EMF.GIF. JPG.	BMP. TIFF. PNG.WMF. EMF.GIF. JPG.

IV.VEHICLE AND ID PROOF VERIFICATION

This property of SQRC can be used in future for vehicle and identity verification systems. The system will be designed as follows where SQR code is used for Authentication.

Vehicle owner end

The owner has to register himself with the following details –· Vehicle Registration(VR) Number and also the details mentioned in the Registration Certificate (RC) like Vehicle type, details of Insurance of vehicle,· PUC details,· Owners Personal information – name , address , contact information and other emergency information as blood group, any diseases or infection.Post registration.an appointment page will appear where theowner selects an available date and time for verification of thedocuments with the RTO.Post selection of the appointment timing and date, the owner gets anappointment number on his mobile. Owner visits the RTO to verify thedetails. The original documents have to be carried for verification.After Verification the RTO issues a temporary password, the user namewill be the Vehicle Registration number (i.e., the number on the vehicle'snumber plate).

The RTO also issues a SQR Code Sticker for the vehicle.The sticker has two data in it. One is public data, which is the vehicle number and emergency details of the person such as blood group, contact number. The private data has all the registered proof of vehicle such as VR number, RC, PUC and other vehicle related details. This private SQR Code is forthe convenience of the Traffic Police Officer.There is yet another data in SQR code that when owner scans the code he is directed to a secure page where he is authenticated with his user name and password. This page is the menu page which consist of options available for theowner.The menu consist of the following options -

A.Pay Challan: Payment mode is online or direct payment at agovernment registered office.

B.Update Profile: Updating PUC information in case it has expired thesame can be done with the insurance information.This feature lets the owner update the name and Driving License (DL) number of the users of the vehicle apart from the owner. Owner can enter the name of his family member or the driver or some friend followed by the DL number.

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C.Outstanding Challan : This lets the owner know if any challan is notpaid and so the challan can be paid as soon as possible.

D.Challan Detail : Many times a person is not aware of certain trafficrules and also about the fine that is charged against breaking of anytraffic rule. Therefore this option will open a detailed description ofthe traffic rules, various challan and their amount of fine that will becharged. Therefore a transparency will be created among the publicand the government regarding traffic rules and regulation.

E.Notification bar: The notification bar will display the date of expiryof insurance,PUC, License if they are near to the date of expiry.

Traffic police officer's end

This side of the application is only restricted to the use by the trafficpolice and the government authorities. The application is notavailable for the use of public.In short the officer can issue challan, check the details of thevehicle, alert other officers or the police department about anytheft of vehicle or any crime attempt by a vehicle by scanning the QR code in his identity card. The code takes him to an authentication page whereOn Logging in the officer get a menu of two options shown.

1. Alert: The alerts will have sub options where officer alertsother officers and police department about any theft ofvehicle or crime committed by a vehicle.The other option will let the police officer view the alerts thathave been triggered by other officers.

2. Vehicle Check: This option helps in verification of vehicle details by canning the SQR code in vehicle. He will have special software installed to read the private messages in the code. So that the police officer can scan and take input.

1. Check Owner Details: The officer has option to check owner ofthe vehicle where full detail about vehicle as well as the owneris given.

2. Issue challan: The issue challan option lets the officer issuefine against the vehicle in case any rule has been broken.

Outstanding challan: The outstanding challan option willdisplay the existing challan in case it is not paid.In the issue challan option the officer check the check-boxes againstthe rule broken. Then selects the 'submit and send to owner' buttonwhich will generate a receipt and will be sent to owner's mobilenumber. The owner can further pay the challan using the applicationat his end or by visiting the RTO.

In case of emergency or accident, anybody can use his mobile phone and scan the code and get the emergency details as it is kept public to all. Along with these, QR code can be created with all the original identity and address proof documents and it can be issued by the government. So that the public need not carry documents everywhere .Instead the code which is always public can be accessed for bank verification and thaluk office, railway ticket reservation etc.

V.FEATURES OF THE APPLICATION AND FUTURE WORKS

This application is to reduce the work of traffic police and for the comfort of the public. The public need not carry all the documents every time and also when going for bank or Registration office he need not take all his original id proof. He can take a single card with the QR code that has all the id proofs coded in it. The person can access the code and use it for verification. It reduces the strain for the commoner.In this application everyone who owns a vehicle must register and get the SQR code for it and he must have a personal card with all the Identity proof coded as normal QR code as SQRC need special device to read. Also SQRC can be used very efficiently for handling emergency. The system must be improved further to provide proof when a licensed person drives a third party vehicle.

VI.CONCLUSION

This idea can be implemented successfully because in today's datethe mobile industry has reached to greater heights and there iswide use of smart-phones. There aremore than 67 Million users in India. Apart from that the use ofInternet on the smart-phones has also increased. And therefore considering the future the reach of smart-phones will have no limit.This system can be beneficial in many ways. Firstly, this willgenerate a transparency between the

government and the public.Secondly, it will reduce the efforts of the traffic police and thepublic user. It is helpful for quick reaction to emergency situations such as accidents. Thirdly, it will save valuable time of the trafficpolicemen and the public. This work will be useful for both public and the government.

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