



SECURE QR BASED POSTAL DELIVERY SYSTEM USING GOGLE FIREBASE APP MANAGEMENT MODEL

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Abstract: Privacy during the logistics of sending the parcel or post is always at stake. It is tedious to manually monitor the authentication of the parcel to be delivered. In addition to the privacy issue in postal system, ambiguous sender's address is a common issue that delays the overall process and usage of stamps is an age-old tradition to value the type of post delivered creates a sticky process. With digitization of government bureaucrats, the replacement of handwritten details on the envelope can be replaced with Quick Response codes known as QR code. This paper has developed a postal system that uses QR code and Firebase management model for a safe and secured delivery of the logistics through post.

Index Terms - QR code; Postal; Android; Java; Firebase

I. INTRODUCTION

Logistics transit happens through various modes. The Department of Postal (DoP) conveys all types of parcels through the means of speed post or regular stamp post. But the concern here is its authenticity. The sender's and receiver's details must be private and protected for many reasons. The parcel delivery system exposes the personal information as the details are widely open to anybody to see. During the logistics transit, there should be a process that protects the person's personal details, and this could avoid their personal information leakage [1], [2]. From the literature, QR codes have proven to be used for secured and safe transit of the logistics [3]. The advent of QR code for logistics transmission happened in 1999. Ever since, the private organizations have utilized QR code for secured transmission of their parcels for protecting the personal credentials. QR Code or Quick Response Code contains a barcode encodes a variety of information including URL, SMS, Email, Geolocation, Product identifier, Phone number, contact card, Payment information etc. It consists of black squares arranged in a square grid on a white background. The code value or the number can be decrypted by modern smartphones and special QR Code scanner devices. There are various types of QR codes such as Micro, IQR, Secured QR and Framed QR codes [4]. The QR code are domestically used for various purposes such as cylinders and commodities. The reading of QR code is possible using decoding device. In [5], the authors have proposed an enhancement technique using prospective projection to correct the distortion. Their approach has improved the decryption process of the QR code. Over the years, the encryption and decryption of the QR code has improved and performance efficiently when integrated with RFID or EAI technology [6] – [8]. In the year 2007, the authors developed TOPSIS model to integrate QR and RFID for evaluating and improving the logistics services. Their model has succeeded competitiveness in the market too [9]. The British Government in the year 2000, [10] licensed the postal security and enforced a law that every citizen must have the social security number. This created an awareness that the logistics information models must contain a special security number that does not disclose the information about a person. The authors in [11] and [12] have developed anonymous models to secure the terms and conditions of a particular person in logistics. The improvement of this model in [12] shows integrated system with android mobile phone that can instantly decrypt the QR number. In spite of this, there are some limitations such as compatibility issue and does not fully protect the privacy of the holder. The authors of [13] enhanced these models and developed the Logistics Information System (LIS). Their model has improved the service quality in efficiently transmitting the logistics. Also, their model improves the encryption process of QR, and they have made it compatible with the existing LIS. The table of related works is tabulated in Table 1.

II. METHODOLOGY

There are two steps involved in this project, one is to register the login credential with sender's addresses and the next is to scan the QR code with mobile phone to register the unique number for the receiver's address. The flow process of this project is shown in Fig. 1.

Table 1 Related works on usage of QR code for secured transmission.

Sl. No.	Ref. Paper	Methodology	Purpose
1.	X Zhang [4]	<ul style="list-style-type: none"> QR code techniques Types of QR codes Process to Encrypt and Decrypt QR Codes 	<ul style="list-style-type: none"> Safe Secured Transmission
2.	Lay KT [5]	<ul style="list-style-type: none"> Projection profile – calibration of camera matrix Enhancement algorithm to decrypt QR code 	<ul style="list-style-type: none"> Decryption of QR code from Cylinder
3.	Kahraman C [9]	<ul style="list-style-type: none"> TOPSIS model Integration of QR with RFID & EAI 	<ul style="list-style-type: none"> Secured transmission of logistics
4.	W. Qian [11] – [12]	<ul style="list-style-type: none"> Anonymous model for logistics security Integration with Android 	<ul style="list-style-type: none"> Secured transmission of logistics through express
5.	Zhang X [13]	<ul style="list-style-type: none"> QR encryption Hierarchy of mechanism 	<ul style="list-style-type: none"> To encrypt and decrypt the QR code without disclosing the personal information To improve the compatibility issue

The usage of QR code in the postal system will be useful for the making a strong barrier to fraudulent conditions which questions the authenticity of the person's information. As there is a high rate of fraudulent cases in the logistic system especially when post is concerned, this kind of methodology will work for securing the information. The selection of the programming language is the vital role as it needs to be compatible with all Android users for smart phone. Hence, Java programming was used for security purposes of storing the data base of the customers, the firebase feature which is provided by google was used to develop the application model. This can provide all kind of sign in database like email, phone number, contact, address. It is a virtual abstract machine known as JVM (Java Virtual Machine) that can provide runtime environment in which java bytecode can be executed. JVMs are dependent on software that are available for many hardware and software platforms.

The Java compiler is also one of the fastest and efficient programming languages that can be compiled for the android app development. The google firebase which was known as google cloud managing is used as solutions for cloud managing for google solutions and web applications. The firebase authentication supports a service that can authenticate users using the client-side code. Firebase can provide real-time database and serve back-end process for storage of the database. The API which is from this service allows application data to be synchronized among the clients and stores on Firebase's cloud for application developers. The API uses the Server-Sent Events protocol, which is an API for creating HTTP connections for receiving push notifications from a server. Developers using the real-time credentials collected from the user can secure their data by using the server-side-enforced security rules.

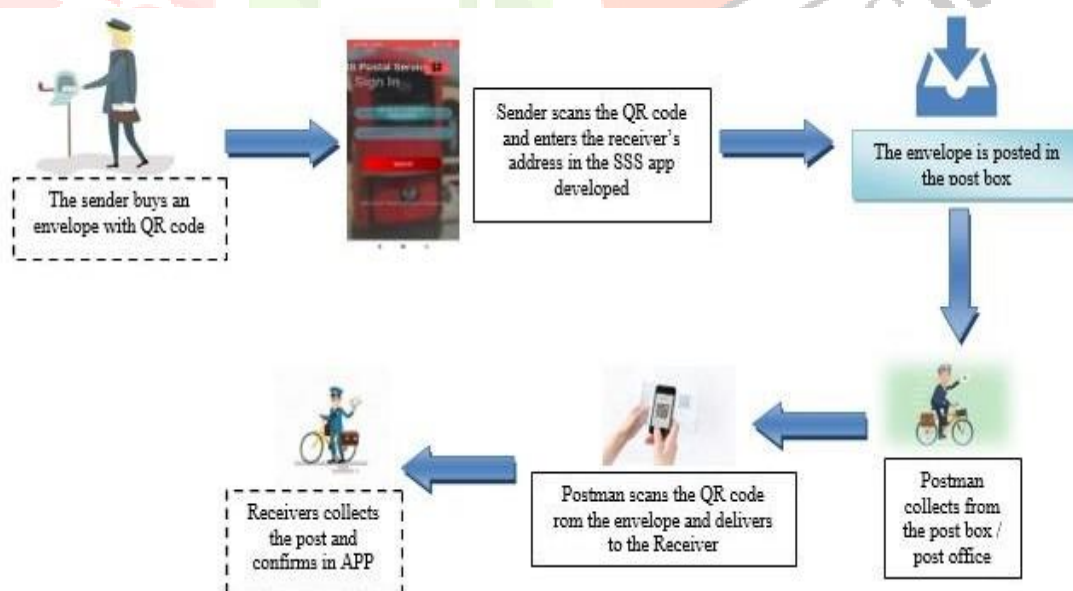


Fig. 1. General Process for secured postal delivery using QR code

III. PROCEDURAL STEPS

An application that renders to all the credentials of the sender as well as the receiver is developed using android development and java programming. The app is termed as Secured, speed and Safe (SSS). The procedural steps of creating the profile and registering the credentials to deliver a parcel or a post is as follows: 1. Sender registers the necessary credentials with the SSS app 2. The sender register's with valid email id, address of communication and phone number 3. The user data will be stored in firebase 4. After the registration, there are three navigation bars. Generate Scan Profile 5. In the generate option, the receiver's address and details must be registered along with QR code number. 6. The registered QR code will be update at the post office. 7. The scan navigation decrypts the received QR code either in a parcel or a post. The algorithm of the procedure is shown in Table 2.

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Table 2 Algorithm of SSS application

ALGORITHM	
1.	fetch details of logged user and add it under sender details
2.	go to new screen and use the sender + receiver details and format into a single long string
3.	encode the complete string into a QR code
4.	use exception handlers (try/catch) for encoding into a QR code using Multi Format Writer, Bit Matrix, Barcode Encoder, Bitmap classes
5.	Multi Format Writer, Bit Matrix to encode the string into a QR code type of custom dimensions
6.	Barcode Encoder to create a Bitmap out of the generated QR
7.	Bitmap to convert the Bitmap generated by Barcode Encoder into Image type for displaying it in Image View
8.	button click triggers the above set of instructions and new screen gets redirected with generated QR code for further usage

The step-by-step process of registering the details and the app developed using the Android Firebase is shown in the fig. 2

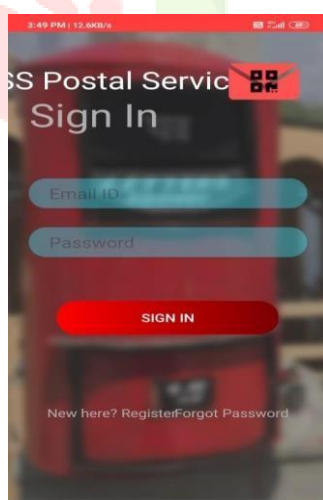


Fig. 2 (a). Opening page of SSS app

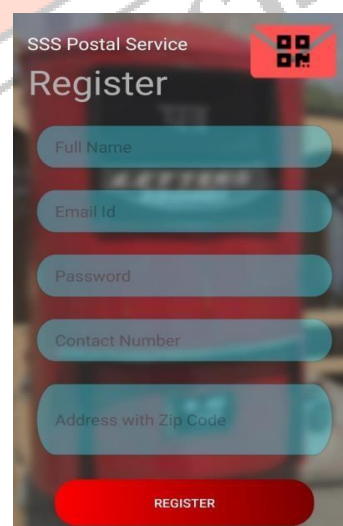


Fig. 2(b). Registration page of SSS app

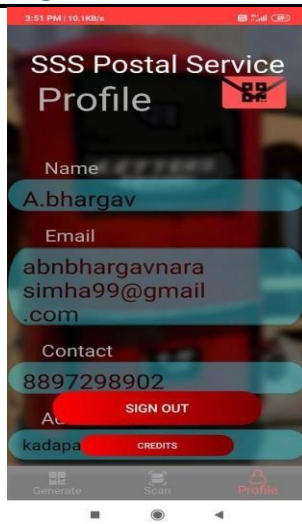


Fig. 2(c) Registering the sender's details

IV. CONCLUSION AND DISCUSSION

The SSS postal service application lets one to send their posts and parcels in most secure way. There is no worry about the handwriting and the paper and glue utility used for stamps also reduced by the work described in this paper. Hence firstly the person must download the SSS postal service app' in his/her mobile phone and must register an account and then the person has to login to it by providing the basic details. The sender address will be automatically generated every time when the person wants to send a post or parcel just enough to enter the receiver name and details. The job of the sender is over. Then based on the pin code the machine will segregate the letters / parcels based on the distance, then the post man will scan the QR code with the help of scanner in his mobile application, then the address is visible to he will deliver it to the receiver.

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