QR CODE AND BIOMETRIC BASED AUTHENTICATION SYSTEM FOR TRAINS

Muthukumar B 1
Professor, Department of Computer Science & Engineering
Chennai Institute of Technology, Chennai, India
muthukumarb@citchennai.net

Albert Mayan J 2
Assistant Professor, Department of Computer Science & Engineering
Sathyabama Institute of Science and Technology, Chennai, India
albertmayan@gmail.com

Gokul Nambiar 3, Denil Nair 4
U.G Students, Department of Computer Science & Engineering
Sathyabama Institute of Science and Technology, Chennai, India
gokulcn1996@gmail.com, denil007nair@gmail.com

ABSTRACT: The utility of a QR Code, is plenty in terms of usage to identify a particular entity. They are barcode of sorts that can hold a certain data set. Biometric security measures are one of the safest security measures, with fingerprint based biometric security being a rather easy and efficient way. In this paper, we discuss a way to efficiently check-in to a seat, during train travel by using a QR Code and fingerprint-based authentication system. A Quick Response Code (QR Code) can be used to mark one’s attendance at their seat. Fingerprint authentication is the means to authenticate a person’s identity without having to carry any form of physical identity proof along with them, during travel. Given the present system to check tickets is rather redundant and time consuming, having to manually check the ticket and identity of each passenger. By using this system, we can create a more efficient and less time-consuming system, that has much lesser probabilities of human error to occur.

Keyword : QR Code, Biometric, Ticketing System, Smart Phone Application

1. INTRODUCTION

The current train ticket checking system comprises of many challenges that is the tickets must be checked manually by the conductor of the train, the passenger has to carry a physical identification proof of theirs, in their person, without which they cannot travel. The conductor of the train takes care of the entire process of checking tickets, and managing any vacancies of a seat that may take place in the course of the journey. In case of any contingencies during the travel, there is no alert system present, that can notify the respective passenger about the same. If any confirmed passenger does not board the train for the journey, their seat has to be manually reallocated to any passenger who may request for the seat, without either of the party getting any notification of the same.

With this paper, we intend on creating a system that allows for the passenger to check themselves into their seat, without having to check with the conductor. This checking in is achieved using a QR Code. This is more of a square barcode, that can be easily generated to and fed a certain data, which remains stored within the code. A QR Code can be easily scanned using any smartphone camera. On doing so, the values that are already stored in the code
are retrieved and is received on the device used to scan the code. Instead of carrying an identity proof, the passenger can simply scan their finger on a fingerprint reader, in their coach. Fingerprint is one of many Biometric security measures that are available today. Others include retinal scans, DNA based scanning etc. However, given that fingerprint based biometrics is a lot easier and effective, in comparison to the other security measures, we employ fingerprint based biometrics here. The system will send an alert to the user, prior to the train’s departure, and will also notify the passenger to acknowledge their presence in the train. However, if the passenger does not board the train, the system will automatically allot their seat to the very next person on the waiting list.

All the related reference work done with respect to this paper, is detailed further in Section II of this paper, followed by a detailed description of the overall system and each of the functional units, in Section III. Section IV illustrates the various pages displayed during execution, in the final android application. Section V concludes the paper with appropriate mention of the overall achievement made possible by using this system, with Section VI finally summing up the references and the authors, referred in this paper.

2. RELATED WORKS

SmitaPatil et al [1], has proposed that the biggest challenge faced today in the ticketing system is having to wait in queue for purchasing tickets. Their work is primarily intended toward booking suburban train tickets which is more of a challenge, in comparison to booking tickets for long journey, using the existing system. In their system, tickets are booked through a smartphone application and the ticket information is stored within a QR code. A time-based technique is used to automatically delete the ticket after a specific period of time, once the user reaches the respective destination. They employed a Cloud-based database to store all the information of every user, for security purpose which is not available in the current suburban railway system database for ticket checking. Also, the ticket checkers are given a QR code scanner, using which they were able to retrieve all the details of the passenger’s ticket. For generating the QR code, transition id was used. When this transition id gets scanned by the ticket checker, using the reader, a request is sent to the server, to retrieve the user’s data to the checker’s phone. In this way the checker can easily check the user’s ticket.

Ravi Subbanet al [2], has further done research in their paper, about the viability of fingerprint as a biometric security technique. Fingerprint of any individual does very well serve as a unique way to identify the person’s identity, in order to authenticate who they are. Fingerprint identification is also a very popular biometric security technique, as it is relatively much easier to acquire, and also the sheer availability of plentiful resources in comparison to other biometric security techniques. The plentiful resources mentioned earlier is nothing but a reference to ten fingers for an average human being, and to their established usage. Their paper further summarizes all the research that was done in the fingerprint matching techniques, their recognition methods and also the detailed performance analysis.

Xiong Wei et al [3], has described in their paper about a system that handled the problem of recording the attendance of a given set of audience, using smartphones. The system they proposed is a combination of two applications, one of it is for generating a QR Code by entering the student details and the second application is for taking the attendance for the QR Code and generating the attendance sheet in CSV or XLS format. The teacher had to scan the student’s QR code in order to confirm their attendance. Their paper details about how the system verifies each student identity in order to eliminate false attendance registrations. Their system deals with managing and evaluating the attendance of all students. A student’s QR Code was presented to the professor for marking their attendance. The respective professor, handling the subject was in charge of marking the attendance for all students of their group or class. The attendance that was marked, were in the form of binary 0 or 1, where 0 is for absent, and 1 is for present. This attendance value gets stored in a database of the particular student row in the respective table. The final attendance sheet was generated in CSV and XLS sheet for any further reference.

3. PROJECT DESCRIPTION

An android mobile application is developed through which ticket for trains can be bought online. The system consists of the travel details and a Quick Response code (QR code). If a user buys a ticket through this application,
the details of the seat that is booked, like the seat number, coach number, etc. are stored against this user’s credentials in the database. The user will have to register their name, mobile number, unique identification number, etc., while signing up for the application. The train seat will also contain QR code printed for each seat. The user has to scan the QR code on seat using a camera on their phone, through the application, and punch their fingerprint in a fingerprint reader, which is installed in each coach. The details of the seat fetched while scanning the code, is cross-checked with the stored seat details within the application, for the purpose of verifying the seat. The seat will be allotted if both the values, from the scan and those that are stored in the application match. This allocation is marked as attendance at that seat and is reflected on the database. Through this admin will know about the user’s presence on the seat. Fingerprint of the passenger can be scanned by them through the fingerprint reader. We use fingerprint as it is one of the best and most efficient means of authentication, used all over the world. Their use for human identification is based mainly on two premises: (a) permanence, and (b) uniqueness or distinctiveness. Thus the entire system is broken down into the following functional units:

3.1 **ANDROID APPLICATION:**

Client-side interaction is implemented by means of an Android application which is created and installed on the User’s Android Mobile Phone. We develop this application using Android Studio. Once we design the page we have to write the code for each functionality, within the application. Once we have created the full mobile application, it will be generated as an Android Platform Kit (APK) file. This APK file is installed in the User’s Mobile Phone as an Application. User has to register their details within the mobile application along with their Aadhar number.

3.2 **SERVER:**

The Server will maintain the User’s information in the database and verify them when required. It will also monitor the User’s information, for any changes made, within the database. Also it has to establish the connection to communicate with the User. Furthermore, it will update each User’s activities in its database in real time like the transactions being done by the user, etc. The Server will also authenticate each user before they access the Application, by means of a login password that the user had entered while registering. Thus the Server can prevent any User without authorization, from accessing the user’s credentials.

3.3 **TICKET BOOKING AND MOBILE WALLET:**

The user will have to book their ticket to travel on train through the application. While booking a ticket, system will show how many seats are available at that time in train. The passenger will book their ticket and the amount for ticket will be debited to their mobile wallet on their mobile phone. We use a mobile wallet to carry our credit or debit card information, in digital form and use this to pay for the various transactions done. This is a minimal, secure, and a more efficient way to process money transactions on the go.

3.4 **QR CODE:**

QR code is a type of matrix barcode, or two-dimensional barcode. This code is a machine-readable label that contains related information about whichever item it is attached to. A QR code uses numeric, alphanumeric, binary, and kanji format, to efficiently store data. Here we are using a QR code to store seat number, coach

![Fig 1: Architecture Diagram](image-url)
number and train number. This is a permanent QR barcode which is attached to a seat. While people book ticket to travel, the same three values from the ticket are also stored in the application. When the user scans QR code, it will retrieve the stored values within the QR code and compare it with the values in the booked ticket. If they match, it will allot that seat to the passenger.

3.5 **Fingerprint Authentication:**

User has to scan their fingerprint before they sit by means of a fingerprint reader in each coach. System will have a set of stored fingerprints from prior scans pulled from the Aadhar database. When the user scans their fingerprint, the system will cross-check this print with those stored prints and authenticates the user if they match.

![Sequence Diagram](image)

Fig 2: Sequence Diagram

3.6 **Checking Availability of Seats:**

Admin will have an application to check the availability of seats. In the application there are two views on the status of a seat - one is available, the other one is occupied. While checking for availability of seats, if any seat is unoccupied, admin can allot this vacant seat to any passenger requesting for it.

4. **RESULT**

We develop the application through Android Developer Kit, available in Eclipse IDE. The registration page is followed by the main menu as shown below in Fig 4. The user can then choose from a variety of operations. The operations include booking a new ticket, e-wallet transactions details, user’s personal information display page, view ticket page, and logout. Fig 3, illustrates the “Apply Ticket” page that is opened from the main menu.

![Main Menu After Login](image)

Fig 3: Main Menu After Login
Also from the Main Menu, user has an option to view their personal account details, through “User Information”. This User details page is illustrated in Fig 4. User has an e-Wallet available within the application, through which they can make payments to book their ticket.

Fig 4: Ticket Booking Page

The user can also recharge their mobile wallet account, view the available balance, and check transaction history of their wallet, from the “Wallet” page of the main menu. This E-Wallet transaction page is as shown in Fig 5.

Fig 5: User Details

Fig 6: E-Wallet Transactions

After having boarded the train with a confirmed ticket, the user has to scan the QR code at their seat, followed by scanning their fingerprint using the fingerprint reader, on the coach. If both the fingerprint as well as QR code match
to their corresponding identity and seat, respectively, the ticket is validated. The valid message displayed to the user’s screen is detailed in Fig 7.

![Fig 7: Fingerprint validation And QR Confirmation](image)

5. **CONCLUSION**

Thus we implement a secure travel system by enabling each passenger to check themselves in, to their allotted train seats, by means of QR code. Also, a hassle-free means of verifying their identity is implemented by means of a biometric based authentication system. Furthermore, we provide an efficient means to book train tickets for the purpose of train travel. By this system, we are providing an easier way for verifying the occupants of the seat in the train, at a given instant. Finally we are also able to implement an automated system that allocates any vacant or absentee’s seat to the next set of passengers on the waiting list, from the start of the list.

**REFERENCES**

1. SmitaPatil, ShrutiDesurkar,DipaliSanas; "An Intelligent Ticket Checker Application for Train using QR Code"; International Journal of Computer Applications, (2016), pp.15-20
2. Ravi Subban and Dattatreya P. Mankame; “A Study of Biometric Approach Using Fingerprint Recognition”; Lecture Notes on Software Engineering, Vol. 1, No. 2, May 2013, pp.209-213
3. Xiong Wei, AnupamManori, NandgopalDevnath, NitinPasi, and Vivek Kumar; “QR Code Based Smart Attendance System”; International Journal of Smart Business and Technology Vol. 5, No. 1, (2017), pp.1-10
4. Jabez J, Gowri S, Vigneshwari S, Albert Mayan J and Srinivasulu S (2018)," Anomaly Detection by Using CFS Subset and Neural Network with WEKA Tools", Smart Innovation, Systems and Technologies,Vol.107, pp. 675–682.
5. S. Istyaq and M. S. Umar, "Encoding passwords using QR image for authentication," 2016 2nd International Conference on Next Generation Computing Technologies (NGCT), Dehradun, 2016, pp. 818-823.
6. Y. G. Kim and M. S. Jun, "A design of user authentication system using QR code identifying method." 2011 6th International Conference on Computer Sciences and Convergence Information Technology (ICCIT), Seogwipo, pp. 31-35.
7. Albert Mayan J , SharmilaLatha T , Kislay Sinha , " Security Analysis of Three Factor Authentication Schemes for Banking", ARPN Journal of Engineering and Applied Sciences, Vol:10, Issue 8, pp: 3504-3509,2015.
8. A. S. Shinde and V. Bendre, "An Embedded Fingerprint Authentication System," 2015 International Conference on Computing Communication Control and Automation, Pune, 2015, pp. 205-208.
9. A. L. H. Jin, A. Chekima, J. A. Dargham and Liau Chung Fan, "Fingerprint identification and recognition using backpropagation neural network," Student Conference on Research and Development, 2002, pp. 98-101.
10. S. Karthick. and A. Velmurugan., "Android suburban railway ticketing with GPS as ticket checker," 2012 IEEE International Conference on Advanced Communication Control and Computing Technologies (ICAC CCT), Ramanathapuram, 2012, pp. 63-66.
11. Sankari.A,AlbertMayan.J,"Retrieving call logs and SMS by messaging services",International Journal of Pharmacy &Technology,Vol. 8 , No.4 , pp.22951-22958,Dec 2016.
12. G. M. D'silva, A. K. Scariah, L. R. Pannapara and J. J. Joseph, "Smart ticketing system for railways in smart cities using software as a service architecture," 2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC), Palladam, 2017, pp. 828-833.
13. Le Hoang Thai and Ha Nhat Tam; “Fingerprint recognition using standardized fingerprint model”; IJCSI International Journal of Computer Science Issues, Vol. 7, Issue 3, No 7, May 2010; ISSN (Online): 1694-0784; ISSN (Print): 1694-0814.
14. Kamalesh M. D., Albert Mayan J., Felix Y., Sumanth B. S., & Sai Tej B. (2018), "Magrisys: A Smart And Ubiquitous Controlled – Environment Agriculture System “, 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) , pp: 1-5 , 2018
15. RishabhDudheria; "Evaluating Features and Effectiveness of Secure QR Code Scanners”; 2017 International Conference on Cyber-Enabled Distributed Computing and Knowledge Discovery.
16. M.Ramya, Mrs.M.JayaSheela; “VLSI Implementation of Hybrid QR Code Generation System”; 2014 International Conference on Electronics and Communication System (ICECS -2014).
17. Asha P. Albert Mayan J, Canessane A (2018),"Efficient Mining of Positive and Negative Itemsets Using K-Means Clustering to Access the Risk of Cancer Patients”, Communications in Computer and Information Science ,JCSCS 2018, Kollam, India, 2018,pp.373-382.
18. Lei Fu; “Design of QR CodebasedMall Shopping Guide System”; International Conference on Information Science and Technology: March 26-28, 2011 Nanjing, China.
19. Muthukumar B, Praveen Kumar R, and Nagarajan G. (2015),“Hybrid Intrusion Detection System for Private Cloud: A Systematic Approach”,Procedia in Computer Science, vol 48, pp. 325-329
20.Yovan Felix A, Jesudoss A, Albert Mayan J (2017) , "Entry and exit monitoring using license plate recognition ", IEEE International Conference on Smart Technologies and Management for Computing, Communication, Controls, Energy and Materials (ICSTM), pp.227-231.
21. B.Bharathi and Mahesh kumar (2016), ‘Non invasive BG scrutinizer system’, Global Journal of Pure and Applied Mathematics, vol.12, No: 8, pp. 5123 – 5125
22. Albert Mayan J, AntoPraveena M D ,Telkar Bharath Rao , Urvakonda Uday Sagar (2018), "Optimized test data generation over suspicious implementation of oracle problem", International Conference on Power, Control, Signals & Instrumentation Engineering , pp.2559-2563.
23. Muthukumar B and Jabez J. (2015),“ Anomaly Detection System in Determination of Heavy Metal Pollution using K-medoid Algorithm”, Journal of Pure and Applied Microbiology, vol. 9, no.4, pp. 1-4