

Entrizee- A QR based Digital Gate Security Management System

Ashwini Jarali^{1*}, Snehal Kodilkar², Shubam Tondare³, Ganesh Kudale⁴, Siddharth Patel⁵

^{1,2,3,4,5}International Institute of Information Technology, Pune, India

Corresponding Author: ashwinij@isquareit.edu.in

Available online at: www.ijcseonline.org

Abstract- Security management systems in colleges, flats and gated communities have forever been supported archaic pen and paper system. Security guards pay most of their time in holding the records. Entrizee is an intelligent Security Management for Gated Premises that automates and computerizes manual tasks at the main gate(s). This system will be designed to maximize the security by providing an app to assist in entering the details of the user, keeping the records and perform analytics on it, which would otherwise have to be performed manually. Remaining straightforward to grasp and use, the system will meet the user's expectations of minimizing the time required at the gates for physically entering all the details. It would also help the gatekeepers to keep a track of the people who are coming or leaving the premises after a certain specified time duration and take actions on them accordingly.

Keywords: Security, Blockchain, SHA-256, Apriori algorithm

I. INTRODUCTION

Security in gated centers is becoming a very great concern and an issue that seriously needs scrutiny for the residents today. Some of the most common problems that are faced by the security guards are maintaining the registers, difficulty in stopping the imposters trying to enter the complex, restricting the entry for the blacklisted people and many more list of such problems. With rapid urbanization happening across the majority of the cities in India, the current trend of people is moving into gated communities. Along with this rapidly growing shift towards the gated communities, we are surely achieving a sense of cooperative living but a sense of security is falling well short of expectations.

Also, with e-commerce, the entire dynamics of shopping has changed where one can sit in the comfort of one's home and order just about anything at the click of a button. This means that home deliveries have increased which has led to a substantial increase in the number of external footfalls, thereby again raising the question of security.

If you look at the security solutions that are available in the market today, they are in the form of access cards, biometrics, and car stickers and so on, but all the solutions provided by these entities are specific for the security of intended purpose and not cannot integrate directly with each other. All these solutions available can be used only for achieving security in a particular manner. But, there is no solution yet available that will secure the apartments or any other gated communities in a manner that is cost effective as

well as which will provide security considering different aspects.

Entrizee is a QR based digital gate security system which will help reduce the workload of the security guards as well as the various features available with Entrizee will help secure the premises in a more efficient manner.

II. LITERATURE SURVEY

Few of the systems that are already available in the market for managing the security of the gate of the premises are

- Gate pass Management System:

Gate Pass Management System is a software system application that administers the entry and exit particulars of the vehicle of staff and guests. Gate Pass Management System (GPMS) permits the users to administer all incoming and outgoing things from the workplace or any organization. It is incredibly straightforward to use and manage. Outlined as a gate pass security system, its main intent is to secure company from outside guests, contractors and also the departments, company vehicle security, material, traveller scrap information, contractor. Gate Pass Management System further helps the organization because the visitors to manage the Gate Passes. Incessant visitors to the organization have data entry in prime level to assist them cut back the time needed for the traversal of the information for looking out of the record [12].

- Time Management Systems:

TMS Access is a keyless entry system that enables you to track who comes in and who leaves the organization and

also the time associated with their entry and exit. The doors can be programmed to open and shut mechanically at the certain specified time. This helps in reducing the chance of not locking the doors properly at the time of departure from the organization. The rest of the time, the employees can enter and exit employing a programmed key fob or a card which can be swiped at the gate [10].

- MYGATE:

This is an application that is developed particularly for the residential buildings. It makes the residential place guarded and additional convenient for residents by authenticating the visitant that is coming into the building. The guard approves entry of the visitor. The app provides one in all the important feature for inviting the friends or guests. The guests that are planning to visit someone in the society can be sent an invitation using SMS feature of the app. Guest would receive a unique passcode with the invitation through SMS. Guest enters the passcode after arrival at the gate and gets seamless entry. This feature makes MyGate different from other systems [11].

The Real time databases for applications[1] is a thorough study regarding real time databases like Google firebase API, Mongo DB, Re think DB and their features. Real-time Database is a cloud-hosted database. Data is stored as JSON format and synchronized repeatedly to each associated client. When you build cross-platform applications with IOS, Android, and JavaScript SDKs, the larger part of the customers' demand is based on one Real-time Database instance and consequently getting updates with the most current data. A Database is an organized collection of data. Databases will be hold on domestically on your computer or will be hold on in cloud storages.

Following features of firebase makes it more efficient to use:

- Authentication
- Hosting
- Messaging
- Analytics
- Storage
- Crash reporting

The further extension to the firebase is[2] how the firebase API can be used in android. Firebase is a Google provided API. It's principally used for database repository and it helps in using the database support for the applications developed for android operating systems, iOS or web application. A real-time database is one that stores data to database and fetches data from it very quickly but Firebase is not just a real-time database, it is much more than that. It additionally discusses numerous steps for including firebase in our android project.

QR codes[3] are intermittently employed in advertising to facilitate customers with URLs that have scanning facility

obtainable to the merchandise websites. Also, it can be employed in business cards, making resumes, code payments, product packaging, education, website login, socialization, virtual stores and covert applications. One uncommon characteristic of the code is that it has error correction ability that ensures competent decryption of QR code that can be done even when the image is blur, damaged or dirty. Another rare property of the QR code is its credibility from any direction. The generated QR codes are further saved in PNG format. QR codes have revolutionized the industry because of its larger storage capacity and high damage resistance than the traditional barcodes. The two dimensional barcode, Quick Response Code (QR code) is concentrated with the goal of high speed reading and encoding capacity compared to ancient barcodes. QR code as shown in has gained popularity over classical barcode because of several advantages like high capacity, reduced size, 360 degrees of reading etc. As compared to classic barcodes, QR codes can hold ten times more data in the similar amount of space QR code can cipher binary, byte, numeric, alphanumeric and kanji data (unlike 1D barcodes).

A blockchain, originally block chain, is a growing list of records, known as blocks, which are linked using cryptography. Each block contains a cryptologic hash of the previous block, a timestamp, and transaction data. [4] conducted a comprehensive survey on blockchain technologies. It arranged out underpinning ideas behind blockchains and analysed the state of the art. [4] discusses use of cryptographic techniques to confirm integrity of ledgers. By combining Merkle tree and hash pointers, blockchain offers a secure and economic data model that tracks all historical changes created to the global states.

To add any node to a blockchain it needs to get consensus from other nodes. In blockchain system nodes don't trust each other. Hence some nodes may behave in complicated manner, so to keep a check on it appropriate consensus protocol needs to be followed. One such most widely used protocol is proof of work (pof)

SHA-256 stands for Secure Hash Algorithm – 256 bit and is a type of hash function commonly used in Blockchain. A hash function is a type of mathematical function which turns data into a fingerprint of that data called a hash. [5] analyse the role of some of the building blocks in SHA-256. It shows that the disturbance correction strategy is applicable to the SHA-256 architecture and proves that functions (summation), (σ) are vital for the security of SHA-256 by showing that for a variant without them it is possible to find collisions with complexity 2^{64} hash operations. It investigate the limits of applying the disturbance-correction strategy that was introduced by Chabaud and Joux. It demonstrate the importance of the S-boxes applied in SHA-256.

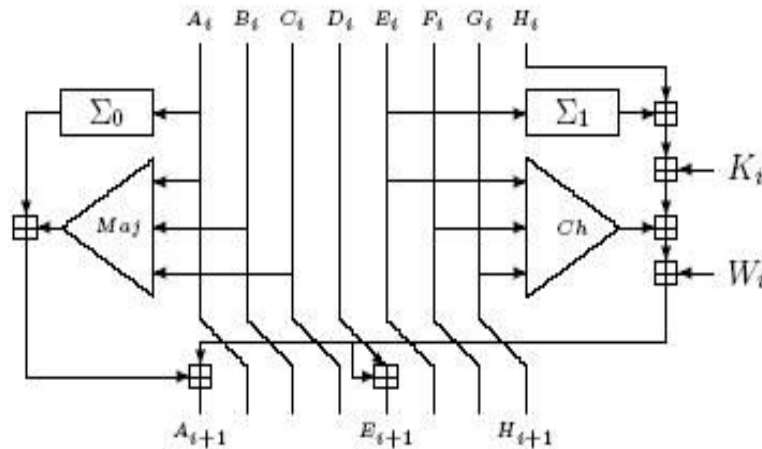


Figure 1: Basic working of SHA-0

The Apriori algorithm[10] is one in all the foremost powerful Apriori for mining association rules. The basic idea of the Apriori algorithm is to identify all the frequent sets. Through the frequent sets, derived association rules, these rules should satisfy minimum support threshold and minimum confidence threshold. [6] shows that the most important challenge of Apriori algorithm is that the computational efficiency issue. This paper shows that if we improve the mining efficiency of association rules in processing great amount of data we can achieve more efficient results.

This improvement over traditional Apriori algorithm is that the improved algorithm only takes the associations in consideration whose credibility is 100% which improves the mining efficiency, reduce the time and space complexity.

The main problem with data mining exponential complexity. [7] proposes a new algorithm named progressive APRIORI (PAPRIORI) that will work rapidly. This algorithm generates frequent itemsets by means of reading a particular set of transactions at a time while the size of original database is known.

Frequent itemsets discovered depends on value of parameters like support and number of transactions read at a time. Thus execution time of the algorithm depends on transactional datasets, minimum support value and value of K.

The proposed algorithm uses EF(Estimated frequent), EI(Estimated Infrequent), CF(Confirmed frequent), CI((Confirmed infrequent) to classify the associations.

In the past ten years, researchers planned totally different solutions in extending the standard techniques into uncertainty environment. In [8], a review was done on previous algorithms so associate degree improved traditional of frequent probability. The three most classic FIM algorithms are Apriori, FP-growth and Eclat.. Summarizing

the pros and cons of the above mentioned three existing algorithms, a new algorithmic program was proposed. There are three steps in the new algorithm. Firstly, supported the definition of probabilistic frequent itemsets, we tend to calculate the frequentness probability in a systematic manner. We calculate the variance of each itemset and then the frequent probability is gained by the standard normal distribution formula:

$$\text{Probability}(X) = \phi\left(\frac{N * \text{min_support} - 0.5 - e \text{ sup}(X)}{\sqrt{\text{var}(X)}}\right)$$

In this way, we calculate the frequent itemsets such as 2-frequent itemsets and 3-frequent itemsets. In the second step, we weigh the number of frequent itemsets based on the conditions of the special form of the Central Limit Theorem as well as the memory usage, and switch to exact probabilistic frequent algorithm adaptively if necessary. Otherwise, we continue the approximate probabilistic frequent algorithms, and test again after every two rounds of mining, until the frequent itemsets database is not large enough to satisfy the Central Limit Theorem. At last, since the approximate probabilistic frequent algorithms is not suitable in the following process, we prefer the dynamic programming algorithm to mine remaining (k+1)-frequent itemsets.

FP growth algorithm is an improvement of apriori algorithm [9]. FP growth algorithm is used for finding frequent itemset in a transaction database without candidate generation. FP growth represents frequent items in frequent pattern trees or FP-tree.

III. PROPOSED SYSTEM

Following is the architecture showing how the system works:

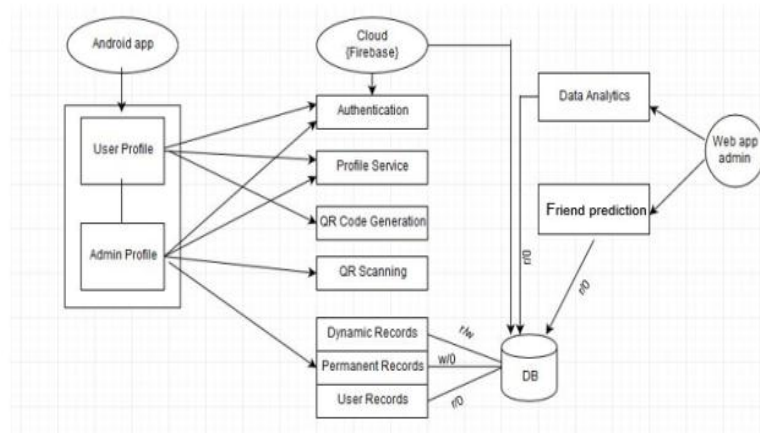


Figure 2: Proposed System Architecture

Modules that will be used:

Module 1: User Profile Module

Module 2: QR code Module

Module 3: Web based Admin Module

Module 4: Analysis Module

Module 5: Friend Prediction Module

Module 1: User Profile Module

The User Profile Module lets the user to view their profile and edit the profile i.e their personal information. Whenever the user goes to this module, data of the user is fetched from the database and it is displayed to the user.

The database would contain information of the user such as

{I1, I2,I3,I4,I5 }

I1 -> Name

I2 ->Date_in

I3 ->Date_out

I4 ->Time_in

I5 ->Date_out

All these details will be stored in the database in the json format.

Module 2: QR Module

This module lets the users to generate their unique QR code. The QR code generated is dynamic i.e. it needs to be generated every time it needs to be used by the user.

This module also includes QR scanning which helps the user to scan the QR code generated.

Every user contains a unique ID in the database associated with them.

This module lets the users to generate their unique QR code at the user interface. The QR code generated is dynamic i.e. it needs to be generated every time it needs to be used by the user.

This QR code contains user id and current time, so that any fraudulent activity can be avoided like taking screenshots or QR code and using it for entry.

This module also includes QR scanning which helps the user to scan the QR code generated.

Audio QR:

Audio QR is the technology that uses sound to pair your device with another nearby device. We can use it in exchanging user id for verification/authentication. Audio QR works on almost every smartphone. All we need is a smartphone with a speaker and a microphone.

Module 3: Web Based Admin Module

This module lets the users (admin) user to view everything happening in application. It provides various features such as:

1. Checking the users and their details
2. Performing analytics on dataset collected
3. Use friend prediction module

The web based Admin module is present at the admin side only. It will contain a website which can be accessed through the URL. Upon opening of the website the admin will be given various options for performing analysis on the stored data.

It will also contain a option for displaying the details of the users already registered with Entrizee. Besides getting the user details, the admin will be able to perform analysis on the data and also check the friend prediction which is one of the most interesting feature of Entrizee(explained in the analysis and friend prediction modules respectively).

Module 4: Analysis Module

This modules takes the required dataset from the database and perform various analytics on it.

Suppose the admin wants to know the details of the person who visited the organization a specific number of times. This can be done by maintaining the count of people visiting the premises using inbuilt python functions.

Also, if a particular person checks-in the premises after 10.00pm, he/she will be warned for three times. If the same behaviour is found to be repeated again, the person might be subjected to appropriate actions. This feature proves to be very useful in the premises which has residents living in it

especially on rent basis i.e. in hostels or in places where the paying guests are hired, where an eye is to be kept on the check-in and check-out timings of the people residing in the premises.

The input can be simply the details of the person or resident entering the premises. An algorithm is applied on the input which compares the check-in time of that person with specified time for e.g. 10.00 pm. The number of times the time limit is violated is maintained in the database. If the count exceeds three, a warning message is sent to the resident.

The admin can also check for the people who haven't checked-out yet. As two separate databases are maintained, this can be easily done by scanning the temporary database.

Module 5: Friend Prediction Module

1. Join Step :- To find (L_{K+1}) candidate K-itemsets is generated by joining (L_{K+1}) with L.
2. PruningStep :- Any (L-1) itemset that is not frequent cannot be a subset of a frequent k-item set.
3. Approach :- All the items will be grouped together based on the Date attribute. For each group the frequent itemset for a particular item will be searched from a (+5,-5)minutestimestamp(Time_in,Time_out). Based on the timestamp the frequent itemsets will be generated from All itemsets.

Pseudo Code :-

C_k :- Candidate Itemset of size K grouped by Date Attribute

L_k :- Frequent Itemset of Size k

$L1$:- {Frequent Itemsets}

For($k=1$; $L_k \neq \text{NULL}$; $k++$) do begin

C_{k+1} = Candidate set generated from L_{k+1}

for each transaction t in database do

check all candidates in C_{k+1} based on the date grouped by (+5,-5) timestamps(in_time and out_time).

If candidates are present then increment the count.

L_{k+1} = candidates in C_{k+1} with min_support

End

Return $U_k L_k$;

Working and flow of the system:

The user will be provided with a dynamically system generated QR code which will contain the details of the person entering into the organization which are taken from the details provided at the time of signup. The QR code could also contain the time taken from the system of the person. This time will be compared to current time of scanning device (security guard's android phone). This unique feature of dynamic creation of QR code and comparing the time contained in the QR will help reduce the threats and security breach problems to the system which could have been done by simply carrying the screenshot of the QR code every time the person visits the gate of the premises.

- The user will be required to scan the QR code at the time of entering the premises.
- The details about the person will be stored in the temporary database along with the in_time which is available in the scanned QR code.
- At the time of leaving the premises the user is again required to scan the same QR code.
- The out_time of the user will now be stored in the database against the previously entered record and the record will be moved from temporary to the permanent database.

The use of two databases, temporary and permanent database allows the admin to easily keep the track of the users who haven't checked-out yet. This will reduce the time required for the analysis done in the analysis module.

One of the most interesting feature that Entrizee will provide is of friend prediction. Use of data analysis algorithms such as Apriori algorithm will return us the details of the friend with whom the person is mostly found to check-in and check-out from the premises. This will prove very beneficial when a certain person is tend to found to be missing in the premises of the organization.

IV. CONCLUSION AND FUTURE WORK

In this paper, we have come up with an easy yet efficient solution to replace the primitive pen and paper system in security management systems in colleges, apartments and gated communities. Security guards spent most of their time in maintaining the records and verifying the identity of the person. Our app is automating and digitalizing the manual task at gated premises.

Future work on Entrizee includes

• **Blockchain Module**

Along with storing data on cloud, we will be storing the personal records of users and the transaction data on the blockchain. This ensure high security to our data. Since there is a huge market for data collection, we will be able to collect high quality data which can be trusted and used for analytics.

- Involvement of features such as GPS tracking of the user.
- It can also be extended to addition of SMS feature which can be used as an alert in case of friend prediction module.
- Use of audio-QR instead of normal QR code.
- The process of Entrizee can be made completely automated by using RFID tags and readers which will remove the human intervention and provide more security.

REFERENCES

- [1] Sonam Khedkar¹, Swapnil Thube², “Real Time Databases for Applications”, International Research Journal of Engineering and Technology (IRJET), June -2017
- [2] Navdeep Singh, “Study of Google Firebase API for Android”, International Journal of Innovative Research in Computer and Communication Engineering, September 2016
- [3] Nivedan Bhardwaj, Ritesh Kumar, Rupali Verma, Alka Jindal and Amol P. Bhondekar, “Decoding Algorithm for color QR code: A Mobile Scanner Application”, 2016 Fifth International Conference on recent trends in information technology
- [4] Tien Tuan Anh Dinh, Rui Liu, Meihui Zhang, Gang Chen, Beng Chin Ooi, Ji Wang, “Untangling Blockchain: A Data Processing View of Blockchain Systems”, IEEE transactions on Knowledge and Data Engineering
- [5] Florent Chabaud and Antoine Joux. Differential, “Collisions in SHA-0.”, Springer 1998
- [6] Libing Wu, Kui Gong, Yanxiang He, Xiaohua Ge, Jianqun Cui, “A Study of Improving Apriori Algorithm”, National Natural Science Foundation of China.
- [7] Shilpa, Sunita Parasher, “Performance Analysis of Apriori Algorithm with Progressive Approach for Mining Data”, International Journal of computer applications, October 2011.
- [8] Xiaomei Yu, Hong Wang, Xiangwei Zheng, “New Adaptions for classification algorithm for mining frequent itemsets from uncertain data”, IEEE
- [9] Yongmei Liu and Yong Guan, “FP-Growth Algorithm for Application in Research of Market Basket Analysis”, IEEE 2008
- [10] Jugendra Dongre, Gend Lal Prajapati, “The Role of Apriori Algorithm for Finding the Association Rules in Data Mining”, IEEE 2014
- [11] Hendra Gunawan, Evizal Abdul Kadir, “Integration Protocol Student Academic Information to Campus RFID Gate Pass System”, IEEE 2017.
- [12] HE Yaru, JIANG Yingzi, “The design and implementation of residential parking spaces management and information issuing system”, 2013 Fourth International Conference on Digital Manufacturing & Automation
- [13] Ryan Ercel O. Paderes, “A Comparative Review of Biometric Security Systems”, 2015 8th International Conference on Bio-Science and Bio-Technology.

Authors Profile

Mrs. Ashwini Jarali is working as an assistant professor in the Department of Computer Engineering of International Institute of Information Technology (I²IT), Pune.



Ms. Snehal Kodilkar is pursuing her degree in Bachelors of Engineering (B.E.) in Computer Science from International Institute of Information Technology (I²IT), Pune



Mr. Shubam Tondare is pursuing his degree in Bachelors of Engineering (B.E.) in Computer Science from International Institute of Information Technology (I²IT), Pune



Mr. Ganesh Kudale is pursuing his degree in Bachelors of Engineering (B.E.) in Computer Science from International Institute of Information Technology (I²IT), Pune



Mr. Siddharth Patel is pursuing his degree in Bachelors of Engineering (B.E.) in Computer Science from International Institute of Information Technology (I²IT), Pune

