Metro Management System

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Abstract - *Metro plays a crucial role in transportation. But with the increase in number of users has made the administration less effective as in case of long queues for tickets, loss of assets (ticket, card, wallet, money), theft cases, etc. This paper state the new form of administration system that may effectively handle the users with high traffic of users. The Proposed solution uses user identification system, fraud detection system, and central administration to achieve the goal.*

Key Words: User Identification System, Central Administration, Fraud Detection System.

1. INTRODUCTION

Metro trains are one of the most used public transportations in India. These trains are for the utility of people, and people utilize metro daily in the best way possible. By 2022, metro services are operational in 11 cities of India namely, Kolkata, Delhi, Bengaluru, Gurugram, Mumbai, Chennai, Jaipur, Kochi, Hyderabad, Lucknow, and Ahmedabad. With such huge reach and popularity user traffic is also increasing and long queues can be seen for ticket buying and lots of cases of theft can be seen at the metro stations. With increase in number of users, cases of losing money, wallet, ticket, and card are common today.

All these problems can be solved by using a Metro management system, which uses a hybrid approach to include automation. For designing such system, we use user identification system, fraud detection system, and Central administration, which have been discussed below:

- *User identification system* uses several user identification technologies to uniquely identify the user. User identification techniques used here are face detection, fingerprint recognition, and QR Code Detection.

- *Fraud Detection System* uses user's history to predict the usual behaviour of a user. If a user shows a different behaviour than the usual fraud detection system based on some policies, determine the severity of the risk and take appropriate measures to handle the risk.

- *Central Administration* is approach for handling the administration. A central entity will govern all the active stations in the metro system and can cease or operationalize the functionalities of a Service in its domain.

In a Metro Management System, user enters the station and buys the ticket from vending machines or at the ticket counters. Then they enter the metro station premises through AFC Gates where users have to verify their credibility using their ticket or the Metro card, which is being issued by the metro. After the user's credibility is verified, the AFC gate opens and the user board the metro and deboard at the destination. At the destination station, users again have to submit their credit using their coins and Metro cards.

In this entire process, chances of losing or forgetting the credit are high enough. In fact, user can forget their assets or credits and thus being unable to travel using metro system.

Although, the mentioned situations are not common to everyone but with increase in number of users these cases have increased. Sometimes, the user may not have wallet or money to travel despite being in emergency.

With increase in usage of metro, thefts and fraud are also becoming common, which is becoming a challenge to the Metro administration.

2. LITTERATURE REVIEW

S. Priyanka at el. [1], describe how metro has gained its concern, with its elegant and smooth flow for transportation in the era of growing population, with which metro management has turn inefficient for which he has proposed a Smart Ticket System for Metro Train.

Abhishek Nair M at el. [2], describes the problem with traditional metro ticketing system and propose a Smart Metro Rail Ticketing System, briefing fingerprint biometric authentication to achieve the same.

3. PROPOSED SYSTEM

The proposed Metro Management System uses recognition technologies and centrally manage entire system to provide safe, secured and hassle free journey.

At metro station, users have to go through the traditional AFC gates where identification system will automatically recognize their identity. After the entrance, Fraud Detection System will ensure their activity and they will be considered to be logged in at the station. At the exit Station, similar procedure will follow and user will be considered logged out, and money will be deducted accordingly from his account. During the entire process, user's credibility will be the utmost concern. After the recognition of users, the same will verified from the user's side. Based on the previous history of users and the input from user's side, fraud detection system validates their credibility. Thus, in this way we ensure utmost safety to the user against any fraud activity. If the user still faces any problem, then he can talk to customer service at the station. In case of fraud, the fraud detection system will not login the user to the system and the user will not be able to logout at the exiting station and in order to exit from the station user need to explain it to the security guard and if he was fault of system then it will be rectified else he will be liable to pay fine for his illegal activity.

In Metro management system, everything is managed by the Administration and has complete control in its domain, i.e. users, station, etc.

- Stations regulate activities within their domain. It has complete control over gates, functionalities, etc.

- User has features to manage their given attributes status, recognition features, etc.

- Administration can block or functionalize the entire station, a person, gate, any recognition feature when required. Similarly, station can also block elements of it, like gates, recognition features, etc.

4. PROPOSED SYSTEM

Metro Management system consist of different types of functionalities. It consists of administration unit, which interact in an emergency as if user's face is not identified, login is not confirmed, or arrival of any unregistered person. This unit handles the breaks in the system so that rest of the system can work efficiently. User can interact with the administration unit with the help of customer service.

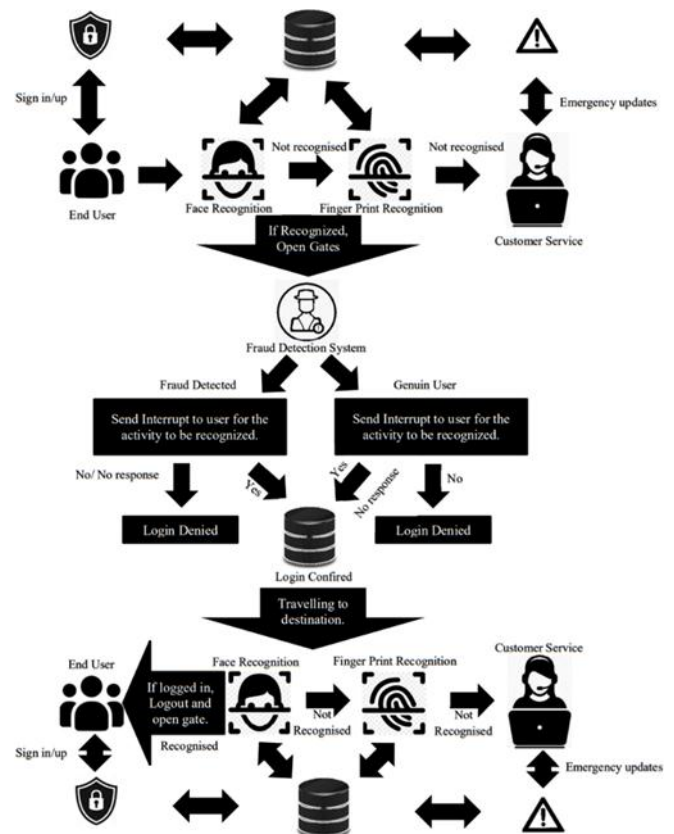Following is the flow chart (Chart -1) of actions:

Chart -1: User Management

Following is the systematic explanation for the actions (as in Chart -1):

- Entrance of User

At the entrance user has to pass through user recognition System at AFC gates, where user's identity is determined and if the user has credibility, i.e. is a registered user, then the gate opens and the user is allowed to enter the premise.

If there is any problem during login, then he can be helped by the of Customer service.

- User Login

Fraud Detection System detect the user's authenticity. With some course of response from the user, user's authenticity is confirmed and login is confirmed else login is denied.

- User Logout

At the exit station user again go through the identification system and if the user is logged in then the AFC gates open and the logout is confirmed else if the login is not found then user is considered to be fraud and proceed accordingly.

The system consists of the following units:

1) Administration System

2) User Management System

3) Authentication System

4.1 Administration System

Administration System is the part of Metro management system that regulates and monitor the activity of Metro stations. It has control over entire system. It issues guidelines and news about the upcoming events.

Administration system plays important role of communicating between the stations. It takes care of all events happening in the metro station.

Functioning of Administration System:

1) It can stop, halt or terminate the metro stations.

2) It takes care of interstation happening and their tracing.

3) It can stop any possible functionality in the system.

4) It can cease the rights of station

5) It can take over the control of station in case of emergency.

It exercises the function of administrating the rights of users and stations.

4.2 User Management System

User management system consists of security modules, which work in synchronization of authentication module, that works whenever some user and enters the station. This system generates a pop message to verify any activity of user. In this system user manages his/her data and verify the security related issues.

Components of User Management System:

1) User management:

User management component interact with the user directly. It is main element in the metro management system by virtue of which user can retrieve and manage their information like, profile, personal data, transaction history, settings, privacy control, etc.

All the interaction in user management is handle using web app.

2) Security interface

It is one of the main component from the aspect of security. This component interacts with user regarding user's security and authentication. It takes user's fingerprint and video to authenticate user (as shown in Fig-1).
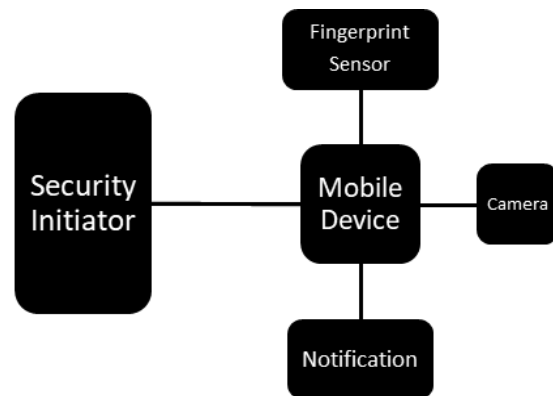

Fig -1: Security Interface

4.3 Administration System

Authentication system is responsible for user authentication. This authentication involve advanced security features in a cluster. These security features involve biometric authentication, one-time verification, and Human assisted verification also.

Authentication System consist of two parts:

i) User Identification:
User identification system identify the user via different means like, finger print, facial recognition, active and passive OR code verification.

ii) Fraud detection system:
Fraud detection system initiates security system, after receiving output from the security system it evaluates user to be authenticated or fraud.

5. SECURITY

Security system is implemented at every step in the system. If the system finds any abrupt change in the usage behaviour of the user, then it immediately sends security interrupts to the user for their approval. System does not allow users to use the services until their credentials are not verified by course of him. In this way, we detect fraud users.

Administration may block some features that are supposed to be vulnerable at times.

Security system is aimed to serve user the most, as they are most vulnerable part of the system.

For users we have defined following set of protocol to detect the unusual activity:

• If a user does an activity which he never does, then it is considered as activity of highest risk.

• If a user does an activity, which he rarely does, then it is of high risk.

• If a user shift to another usage pattern then it is considered to activity of intermediate risk.

• If a user does an activity which he regularly does, then it is considered to genuine and no risk.

Based on risk following actions are taken:

- Highest: User has to positively verify his activity with biometric service like fingerprint or video.

- High: User has to positively verify his activity.

- Intermediate: User should not verify it negatively.

- No: No user verification is required.

In any case, if the above mention criteria fail then the credibility of the person will be denied.

The domain of activity includes:

1) Travelling
2) Recognition Technique
3) Payment Methods
4) Login

For evaluating security of station, number of boarding, deboarding, fraud activity and risk are analysed.

Based on the vulnerability level following features of a station can be blocked:

• Facial recognition – If facial recognition frauds has increased
• Fingerprint Recognition – If finger print recognition fraud has increased.
• QR code recognition- If QR code recognition fraud has increased.

Administration based on the security threats increased can even halt the station until evaluation.

6. OPERATIONAL HIERARCHY

In metro management, system operations are organised from top to bottom.

Hierarchy of organization as follows (bottom to top):

• User- Users of Metro Management

• Station- Metro Stations

• Administration- Central Administration of the Metro system.

Each level of hierarchy has following attributes, which can be set by the entities.

Attributes of entities:

1) User:

    i)   Status- active, halted, terminated
    ii)   Facial Recognition- active/ inactive
    iii) Finger Print- active/ inactive
    iv)   Active QR- active/ inactive

    v)   Passive OR- active/inactive

2) Station:

    i)   Status: active, halted, terminated
    ii)   People- Entity Attributes
    iii) Gate-

             a. Status- active, halted, terminated
             b. Facial Recognition- active/ inactive
             c. Finger Print- active/ inactive
             d. Active QR- active/ inactive
             e. Passive OR- active/inactive

    iv)   Facial Recognition- active/ inactive
    v)   Finger Print- active/ inactive
    vi)   Active QR- active/ inactive
    vii) Passive OR- active/inactive
    viii) Customer Service- active/ inactive

3) Administration:

    i)   Status- active, halted, terminated
    ii)   Station- Entity Attribute
    iii) People- Entity Attribute
    vi)   Facial Recognition- active/ inactive
    vii) Finger Print- active/ inactive
    viii) Active QR- active/ inactive
    ix)   Passive OR- active/inactive

Table 1: Attributes of Entities in Operational Hierarchy

Following point are valid for the entire hierarchy in Table 1:

    1) Entity Attributes is directly inherited.
    2) Entity can set the attributes for entities in its domain.
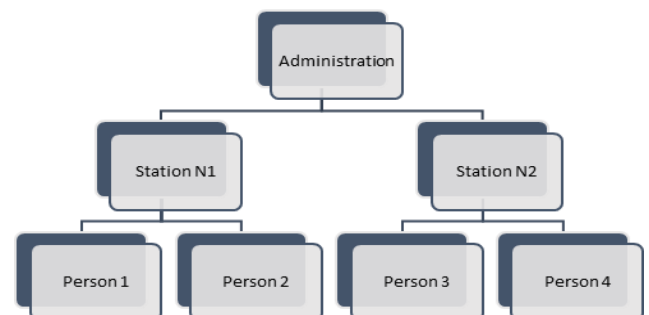

Fig -1: Security Interface

Operational Description:

-In Metro management, system everything is managed by Administration and has complete control in its domain, i.e. users, station, etc.

-Stations can regulate activities within its domain. It has complete control over gates, functionalities, users, etc.

-User has features like to manage their given attributes like status, recognition features, etc.

-Administration can block or functionalize the entire station, a person, gate, any recognition feature wen required.

-Similarly, station can also block elements of it, like gates, recognition features, etc.

-People can set their functionality based on the attributes provided to them, like termination, halting account, activation any of recognition service.

For understating detailed functionalities of an entity, refer Table 1.

7. CONCLUSIONS

The Metro Management System we get is a hassle-free system, which provide free flow of users with utmost ease.

8. FUTURE WORK

-Metre management system can be integrated with new recognition technologies like biometric signals that arise out of human brain for easy and more accurate recognition System.
-Integration of management of Metro train and their route and schedules

ACKNOWLEDGEMENT

REFERENCES

[1] S. Priyanka1, R. Abhishek2, Ameen Pasha3, M. Chandramouli Bhat4, Darpan D. Raj5, "Smart Ticket System for Metro Train", International Journal of Research in Engineering, Science and Management Volume-3, Issue-6, June-2020

[2] Abhishek Nair M, Smit Taunk, Panyam Gangadhar Reddy, Parveen Sultana H, "Smart Metro Rail Ticketing System", INTERNATIONAL CONFERENCE ON RECENT TRENDS IN ADVANCED COMPUTING 2019, ICRTAC 2019