

Biometric Ticketing System for Railway

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Abstract-This paper discusses a possible, automated, modern Biometric System for Metro Railway Ticketing System, Which consists of entrance and exit gate based on the biometric recognition. The passengers who travel on Metro Railway, they do not require to carry some tickets, tokens, or smart cards (for multi user). Each and every person carries a lot of unique identification. For example Various Biometrics: DNA, Face, Ear, Facial infrared thermo gram, Fingerprint, Gait, Hand, Finger geometry, Iris, Keystroke, Palm prints, Signature, Voice. Here we take the finger prints for our biometric system. We proposed a biometric System for ticketing with a centralized, well manageable database which reduces the no. of ticket counter as well as metro railway employees.

Keywords – Biometric System, Finger Print, Ticketing System, Database, Multi Rider.

I. INTRODUCTION

Biometric recognition, or simply biometrics, refers to the automatic recognition of individuals based on their physiological and/or behavioral characteristics. Biometrics can be used to identify the person as person. One of the world's largest fingerprint recognition systems is the Integrated Automated Fingerprint Identification System, maintained by the FBI in the US since 1999. The IAFIS currently contains fingerprints of more than 60 million persons, with corresponding demographic information, providing both latent-print search for crime scene investigation and 10-print ID for suspect identification and general-population background checks. In 2008, the FBI began updating the IAFIS to the Next Generation Identification (NGI) system, which will support other biometric traits such as palm print, iris, and face. Other ticketing systems are RFID based ticketing system. Problem with RFID based systems is that passengers have to carry RFID cards and also the RFID detectors are required to be installed.

The fingerprint is the dominant biometric trait in these applications compared to other common traits such as face, iris, and voice, and new emerging traits, including gait, ear, and palm-vein. The main reasons for the popularity of fingerprint recognition are

- its success in various applications in the forensic, government, and civilian domains;
- the fact that criminals often leave their fingerprints at crime scenes;
- the existence of large legacy databases; and
- the availability of compact and relatively inexpensive fingerprint readers.

A *biometric system* is essentially a pattern recognition system that operates by acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing this feature set against the template set in the database.

II. BIOMETRIC SYSTEM IN RAILWAY TICKETING PERSPECTIVE

The Biometric System may easily be applicable to Railway Ticketing System Management in three ways: First, It takes an image of fingers (image of 5 fingers of right hand) by the finger print scanner machine. Second, it keeps the image as record in an easily manageable database. Lastly, when the passenger come in front of the biometric gate

and touch the front panel of the finger print, it tries to identify and recognizes the finger print from the previous database.

A. *Single Rider*

The automated biometric ticketing system is very easy to use. Before entering the station premises, the rider has to pay the fare charges from the starting station to destination station which is all ready given in the fare chart table. The working process of this biometric system is as follow:

Step 1: Insertion of Fare charge: Just the rider has to insert the amount of the fare which is multiple of 5 Rupees coin. Say, the fare is Rupees 15, the rider has to pay 3 no. of 5 Rupees coin in the definite place of insertion of coin. After inserting the coin, it calculates the total amount of fare and displays the usable distance for move from the station.

Step 2: Readiness of the Scanner for finger print: Now the touch panel is activated and ready to the image of fingers of that rider. The machine asks the rider to touch the particular section to take the images (5 fingers of the right hand). The maximum activation time of the scanner is limited for 5 sec. If the rider is unable to touch the scanner again it will ask the rider to insert coin.

Step 3: Taking of finger print image and keeping in Centralized Database: Let the rider has touched the scanner and the scanner successfully scans the image of 5 finger prints of the rider. Now the image of 5 fingers of the passenger will be send to a central database which keeps the image of all the passengers. The database is connected with all the metro stations.

Step 4: Detection of finger print image from the previous Database: After travelling on the Metro Train from the starting station, that passenger has to exit from its destination station premises. When at the exit gate the passenger has to touch the finger print recognizer, then the scanner scans the finger print image again and verifies the image with the previous stored images.

Step 5: Exact fare calculation and opening of Exit gate: This step is involved in fare calculation of a passenger; If the any images between the five fingers of that particular passenger match with the previous images from the central database, then the gate will open and will let the passenger to go out. Simultaneously this exit gate will calculate the exact fare charges of that passenger from the starting station and end station. If the fare does not match with the exact fare of the Passenger from the starting station to destination station, then the gate will identity

B. *Multi Rider*

This biometric system for ticketing is also helpful and convenient for the multi rider. They do not have to buy the smart card, do not have to keep it with them, do not have to keep it carefully because in practical it is very problematic to keep the card properly in pocket and purse.

So, for the smart card user or for the multiple rider passengers, the ticketing process will follow some steps.

Step 1: For the multi rider passenger, they have to recharge their account against their unique finger prints. For this purpose the passenger have to pay the amount as multiple of Rupees 100 at the particular counter.

Step 2: After recharge the passenger have to enter the ticket zone area through the entrance gate. At entrance gate the passenger have to touch the finger print scanner machine. The scanner will read the finger prints and identify the print of that passenger from the centralized database which is keep at the time of recharge, if the finger print matches then the scanner sends the information about the starting station of the passenger to the centralized database.

Step 3: Suppose the passenger have travelled five stations from the starting station to the end station and the fare is rupees. 20. That passenger now wants to exit from the ticket zone area at the end station. The passenger has to touch the finger print scanner at the exit gate. The scanner will take the image and compare with the stored images from the previous centralized database.

Step 4: If the finger print matches from the stored previous database then the automated system automatically deduct the used fare charge from the account of the passenger and will let the passenger to exit or the finger print does not match with the stored database, it will generate an alarm message.

C. System Architecture

The proposed system will be used a highly specialized system that let the passengers to travel the distance from starting station to end station by comparing the image of finger with the stored image in the database. At the time of storing finger print as a template in the database, it will automatically categories the finger print as Arch, Loop and Whorl and stores them separately.

Arch--Ridges start from both sides and rise smoothly in the center. Think of it as a Road Test. Can you ride your bicycle across the hill without getting a flat tire from a puncture?

Loop--Ridges start on one side, curve and return to the same side. Look for a river that appears to be flowing into a lake formation.

Whorl--Ridges appear to circle, spin, whorl, or spiral. Look for a target in the center of the pattern.

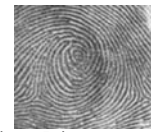
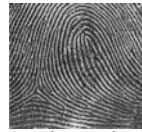


Figure 1: Image of Arch Finger Print Figure 2: Image of Loop Finger Print Figure 3: Image of Whorl Finger Print

System Design

Required Hardware

For this ticketing system, two types of gates are required.

For Entry Gate: At entry gate an indicator will be used to insert fare chare. After inserting the fare, it will ask for give the finger print. Finger Print Scanner will be used to capture the image and extracts the unique features. Lastly it will be send to the SQL Server table.

Software Design

The software of this proposed ticketing system consists of:

- a. Application Program
- b. Database.

Application Program

The Application Program can be developed with Microsoft C# programming language using Microsoft Visual Studio framework. It provides a user interface for the proposed system. Because this programming language easily runs on both Microsoft operating system and Unix operating system. It can easily communicate with database.

Database

The main component of this proposed ticketing system is it's database. For this purpose the SQLServer database can be used. Because SQL Server can store and maintain a large number of data. It is very fast and easy to operate. The database will record the Passenger Id, Finger Print, Inserted Fare Amount, Starting Station and Destination Station in a table.

Working Method & Flow Chart:

This proposed ticketing system will work on two basic steps:

1. Capture & Storing (Image and Fare charges).
2. Verification & Fare Checking.

Capture & Storing (Image and Fare charges):In this step, the finger print of the passenger will be captured and the unique features are extracted and stored template in the database along with the passenger Id and inserted fare charges.

Verification & Fare Checking: After travelling when a passenger will ready to exit from the station premises, this step will require. The objective of this step is to capture the image of the outgoing passenger and check that with the

already existing image of finger print. If it matches then check the travel fare with inserted fare and let the passenger to go out.

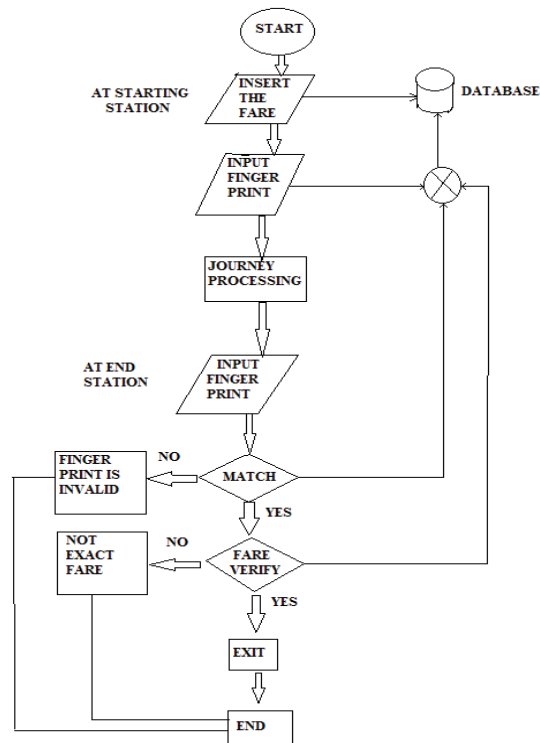


Figure 4: Flow Chart

III.CONCLUSION

This proposed system is more accurate system than old ticketing system. Yes, it has some complexity for storing finger print and comparing at the time of exit of the passenger. Because it deals with a large number of passenger and the fare charges calculation. The calculation time of fare charge will be less than 1 micro second. If, it will take more time the queue of passengers will be created. But the Advantage of this Biometric ticketing system are it is automated, it reduces the cost of Token and Smart Card, it prevent the terrorist attack and Fast working.

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