International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-7 Issue-4s, November 2018

Automatic Ticket Validation System for Indian Railways

V.Vanitha, V.P.Sumathi, R.Kalaiselvi

Abstract: ***Railway system places a vital role in public transportation. Railways are widely used commutation by the public. There are many services provided by it like a ticket, catering, etc. Ticketing system has evolved from paper ticketing system to electronic ticketing system. In a metro train, the system provides smart card where a passenger can recharge and buy tickets using that, this may be regular or seasonal ticket smart card which will calculate the fare for travel. In order to book tickets for long distance travel, passengers can buy e-ticket via an internet or can in person at railway stations. In case of e-ticket, the tickets would be validated by ticket examiner (TTE) with a valid original identity proof. Passengers will be in trouble if they forget to take the ID card. Lack of Ticket Examiner leads minimal verification of the passenger's ticket. In the proposed system by the use of online services with the internet, passengers can add their own unique national Identity proof (Aadhaar card) while booking tickets, which helps automatic ticket validation. Biometric checks of the passenger take place at the entrance and exit of each compartment of the train. With the help of cloud storage, the details can be validated by comparing Aadhaar database. In case of mismatching tickets alarm rings and alert message will be sent to Ticket Examiner. Using GPS on a train, location can be obtained and the source and destination of the passenger can be validated. Checking at the exit path, the destination can be checked and can avoid the persons travelling long distance with short distance travelling ticket. Also, the system prevents the person travels without buying tickets. The proposed system is implemented using Raspberry Pi, fingerprint scanner and GPS Receiver.***

Keywords: ***Indian Railways, automatic ticket validation, biometric checking, Aadhaar data base.***

I.INTRODUCTION

The field of technology is becoming more in advance. Considering of Railway department, e-ticketing facility was introduced where users browse through the governmental website and book their long journey tickets which is later printed to show to the checker when needed. After that a new technique was introduced called M-ticketing where user messaged to the web portal through mobile phone after which a complete web page was downloaded to the mobile phone after that user can perform all the booking process as like in e-ticketing facility. In foreign countries the use of Oyster and Octopus card has become mandatory during travel.

Manuscript published on 30 November 2018.
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But we suffer when the card is misplaced and we stand in the Queue for the tickets in this situation e-ticketing, m-ticketing cannot be used. With our system ticket can be booked with just a phone application and ticket information is stored, the passengers need not take the original proof along with them. We will be using time based technique for automatically deleting of the ticket after a specific interval of time once the user reaches the destination. The information of every user is stored in a CLOUD database for security Purpose which is available in the current Railway system database for checking purpose. Also ticket checking system scans the fingerprint which stores in Aadhaar database against each passenger details. This application will be very helpful for passengers as well as Railway authorities. Ticket Checker (TTE) can view the passengers who are all travelling on the specific train and once they reached the destination that will be deleted. Also, if any, of the passenger crossed the destination notification will be sent. Location of the train can get by GPS Receiver. In this way the ticket will be checked by the checker. IoT labels a system where items in the physical world both living and non living things connected, and sensors within or attached to these items for data collection, are connected via wired or wi-fi connection. Sensors can be used for connections are fingerprint scanner and RFID. Fingerprint processing involves two methods: enrollment and matching. Fingerprint enrollment is that adding fingerprint in the database, which can need to scan a finger twice. This image will be pre-processed and store it as a template. This stored in finger library. Fingerprint matching needs to be done with 1:1 matching or 1: N matching. 1:1 matching the finger that can compare with specific templates. If 1: N matching, the finger compares with finger library. That result in success or failure.

II.EXISTING SYSTEM

The related works done by the authors to produce a smart ticketing system in the railway system which gives a good concession on seasonal tickets that can be subscribed for 30 days and the prepaid amount will deduct as per their travel. This model diminishes who failed to buy tickets, also analysis of the crowd, which can be used for railway authorities to develop their services [1]. Using Radio Frequency Identifier (RFID) the smart card distributed and differentiates seasonal or regular ticket and process according to it. Smart services which can be smart ticketing, travel customization and passenger service improved in different ways [2,3]. Integrating RFID tag in Railway ticket which is paid like a credit card which is the maximum reading distance of 10 cm, and power is 18 dBm [4].

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For Smart transportation, the system uses XYT gait recognition model that collects automatic fare collection system and classify the luggage and children with the use of infrared sensor and camera attached in the pathway. By the way, to avoid interference transmit and receive sensors are placed in the angle of 45 degrees [5]. ASR ticketing is an android application for suburban railways and using the GPS facility can obtain train time for each passenger application. Data can be stored in a CLOUD database for validation purpose [6]. A QR code-based intelligent ticket checker system is used for booking and automatic deletion in time of interval. The big data problem is mitigated here by automatic deletion [7]. Also, Dynamic and transparent seat allocation is provided for users by TTE application using the camera in their mobile phone [8]. The platform level biometric check with other database provides security and safety for passengers [9,11]. The system connected to the server used for verifying and use of NFC short range, high communication frequency connects to user ticketing system. System Structure: The system consists of a server, mobile device, mobile POS terminals, and mobile verification terminals. There are four stages: registration, booking, purchase, verification. CS ticket: some ticket certification information that ticket providers provide [14]. The security part mainly includes some confidential information. The system connected to the server used for verifying and use of NFC short range, high communication frequency connects to the user ticketing system [15]. IoT based diagnostic system was also discussed in [18,19].

A. DRAWBACKS OF EXISTING SYSTEM

All the existing solution for validation provided for the metro train**.** RFID (Radio-frequency Identifier) based smart travelling card, which is expensive and that can be tough to understand for naïve users. One more disadvantage is the need to carry a smart card always. If without taking a smart card, cannot claim a seasonal ticket advantage. Using mobile application the TTE has to scan their ticket and this is not an automatic ticketing system and also need TTE same as now. It is manual work and need more resources(TTE). A QR code-based solution is less secured compared to fingerprint based ticket validating system.

III.PROPOSED SYSTEM

The proposed system implemented with Android Application and Raspberry Pi. Android based application is developed to book the ticket by entering the passenger's details and Aadhaar number. These details are stored in the cloud database. And at the entrance of the train compartment, a passenger has to take fingerprint scans at that time cloud aadhaar database can be compared. Figure 1 explains the architecture diagram of automatic railway ticket validation system. The architecture diagram shows the system providing secured validation system with fingerprint scan of each passenger. Figure 2 shows the work flow diagram of the automatic railway ticket validation system.

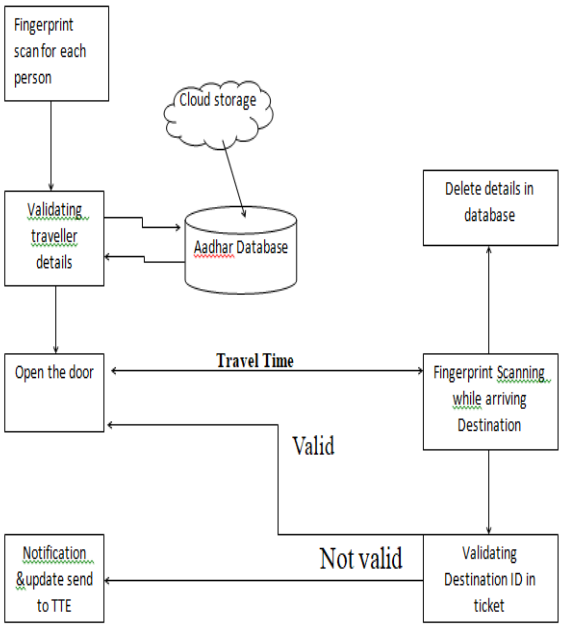

Fig 1. Automatic Train Ticket Validation system

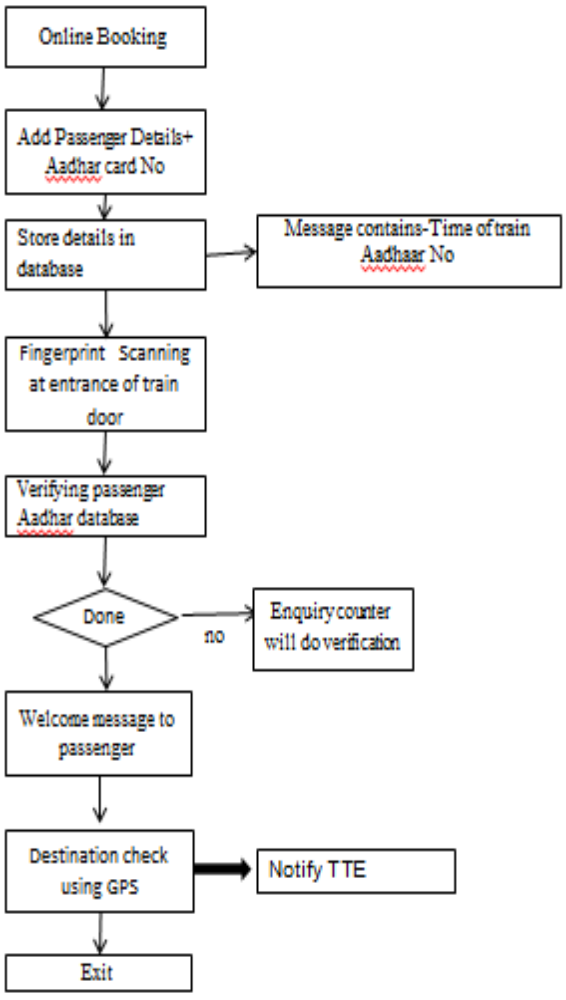

Fig 2. Work Flow Diagram for Automatic Ticket validation System

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The proposed system contains the five modules.

A. Aadhaar based Ticket Reservation System

Booking the train ticket with the help of Android Application entering the passenger name, train number, date of travel, source and destination also aadhaar number. Aadhaar number is a unique number which given by Indian govt., so it prevents the unknown passenger. After submitting the ticket the popup confirmation of booking will arrive.

B. Ticket Checker Application

The ticket checker module is enabled by logging with train number and password. Ticket Checker can view the passengers who are all travelling on that train with a name and aadhaar number. Also, If the passenger crossed their booked destination notification will be sent to the TTE.

C. Location Application

For validation of the source and destination of the passenger, GPS tracking is needed. To manually set the location this application will be used. This is linked to Ticket Checker application for destination verification. Once passenger crossed the destination, the notification reached to Ticket checker.

D. Biometric Validation

At the entrance of the train, the passenger can scan their fingerprint and entry after validation done. Fingerprint searching with cloud aadhaar database. If it matched it allows entering into the train. At the time of exit also this should be taken to verify the destination. Biometric check takes place for misusing tickets. Each passenger fingerprint stored in aadhaar database. Using this passenger details can be verified. Avoid the person who travels without ticket. Find fraud who travels with other's ticket. The following algorithm explains about enrolment of fingerprint and searching and matching it. Enrolment of fingerprint is passenger details storing in aadhaar database. While, searching is used to match the passenger fingerprint who needs to enter in the train. Figure 3 explains the fingerprint enrolling algorithm.

- Initialize sensor information
- Enroll new finger
- Waiting for finger to read
  - Converts read image to characteristics and stores it in charbuffer 1
  - Checks if finger is already enrolled
- Wait that finger is read again
  - Converts read image to characteristics and stores it in charbuffer 2
  - Compares the charbuffers
  - Creates a template
  - Saves template at new position number

Fig.3 Fingerprint Enrolling Algorithm

- Initialize the sensor
- Gets sensor information
- Search the fingerprint and calculate the hash
  - Wait for fingerprint to read
  - Converts read image to characteristics and stores it in charbuffer 1
  - Searches template
- Loads the found template to charbuffer 1
- Downloads the characteristics of template loaded in charbuffer 1
- Hashes characteristics of template

Fig.4 Fingerprint Searching Algorithm

Figure 4 provides algorithm for fingerprint searching and calculates the hash and searches the corresponding template.

E. Destination Check & Notify TTE

To avoid the passenger travelling long journey with the short distance ticket which is high cannot be discovered bymanual verification. If they crossed the destination specific passenger name and aadhaar number will be pop up for TTE.

IV.IMPLEMENTATION AND RESULTS

The implementation of this system contains Raspberry Pi 3 model B, Fingerprint scanner to verify the each passenger identity, Cloud database to store the data and retrieve the data for verification. LCD Display to exhibit the valid passenger name and also indications, if invalid passengers enter into the train. Once, the passenger getting into the train, automatically the status changes in the cloud.

Raspberry Pi 3 is a single board computer [17] which has wireless lan or Ethernet connection. Raspbian and debian based linux OS can be used. Figure 5 shows the internal connection between Raspberry pi and fingerprint module and LCD display provides the output for the model.

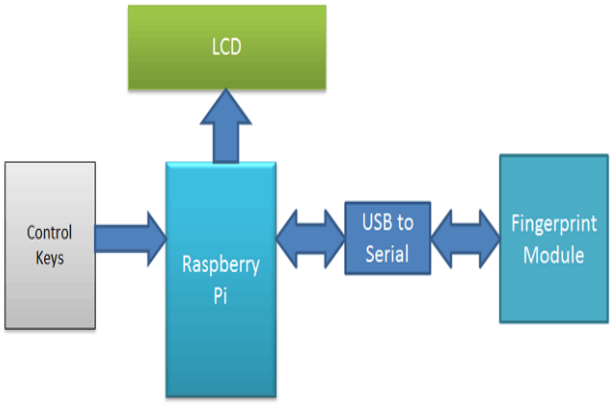

Fig.5. Fingerprint scanner connected to Raspberry Pi

The working model was tested in our college bus. The automatic ticket validation system contains fingerprint and LCD display which is 16*2 dot matrix contains 16 characters and 2 rows to display output. Stepper motor acts like automatic door and opens if the passenger is valid.

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In Scenario 1, passenger was allowed after fingerprint validation into bus. The door opens only the passenger is valid. Figure 6 depicts the process of validation in the entrance of train

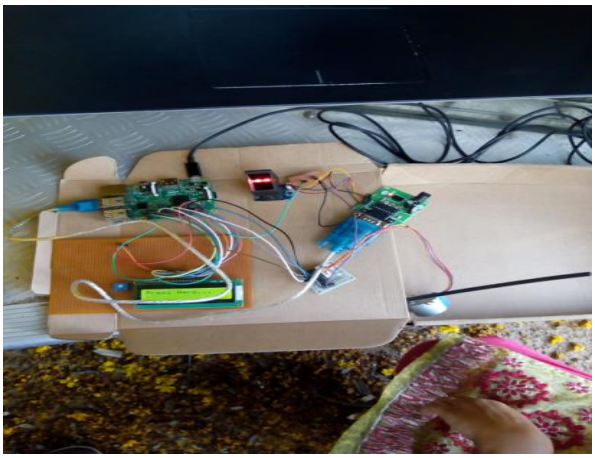

Fig.6a Before fingerprint scan

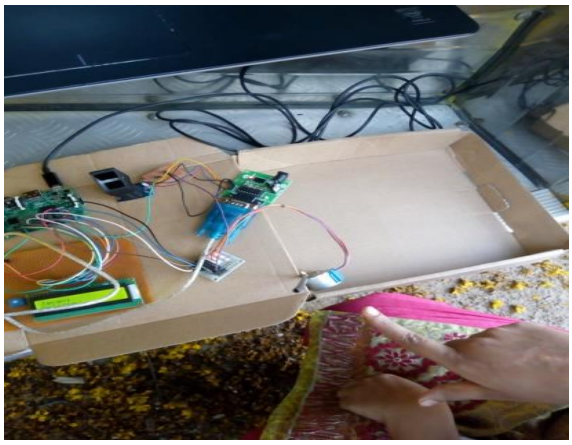

Fig.6b After fingerprint scan

Scenario 2, When passenger off the board from bus to desired valid destination, scans fingerprint & gate will be open. Meanwhile, Passenger details removed from TTE Database. Figure 7 depicts passenger needs to get down from train and after getting removed from the table.

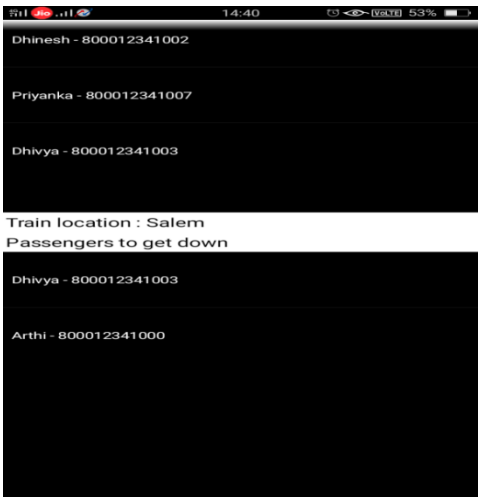

Fig.7 TTE Database

Scenario 3, If passenger crossed their destination, TTE gets notification message. Figure 8 shows the notification for TTE for passengers once crossed their valid destination

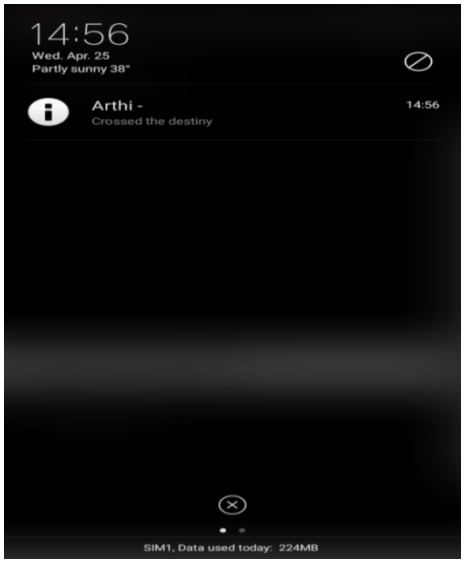

Fig.8 Destination crossing notification

V.CONCLUSION AND FUTURE WORK

Automatic validating train ticket implemented and tested successfully. Also, this system provides security and fraud detection, which is the person who is travelling without tickets and passengers travelling short distance tickets for long. This system contains fingerprint verification, which is very simple for everyone. Using location identification services the system identifies the person who crossed the destination and notifies to ticket checker. This system reduced manual work and will not allow any fraud occurs

Currently, this work is designed in such a way that the reservation can be done only for the person who is booking through the mobile app and not for other co-passengers. This design could be enhanced so that a reservation can be extended to the other co-passengers as well. This would be helpful, if a person doesn't have an app on his mobile or if a person is not aware of using the app. Also, the scope of the project doesn't cover the reservation/verification of tickets for kids, this could be enhanced to get details of kids under 5 years and provide during the reservation and can be validated with the fingerprints during the travel.

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