Railway Ticket Verification using Face Recognition

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Abstract - *Modernization of railways has forever been an issue focused on the development of the fundamental infrastructure of a nation. Since the railways represent one of the most effective modes of transport offered to the people, it would not be possible to merely keep increasing the fares to satisfy costs incurred due to maintenance and therefore the expansion activities. The railways ought to take into account upgrading itself to modern technologies for higher potency and price reduction. One such upgradation is that the role of knowledge technology and e-ticketing that is achieved with the assistance of face recognition technology. This technology has been extensively employed as a biometric method. The thought has evolved from a scientific study of the mechanization of railways and therefore the loopholes within the everyday system. A straightforward theoretical model is projected that once enforced might lead to a better management of the tedious ticketing mechanism.*

Key Words: **face recognition, ticket verification, k-nearest neighbours, OpenCV, haar cascade classifier**

1. INTRODUCTION

Ticketing system for railways was introduced to manifest and authorize valid commuters to suit one's comfort, purpose or wants while travelling. The people who started commuting through trains increased vastly, resulting in numerous problems like never-ending queues, wastage of paper, voluminous resources and staff utilization. Progressive rail passengers have high expectations of simple and economical purchases, before and during their journey. Customers wish to have a "frictionless travel", and a "frictionless experience", whereas the recent ticketing systems can discourage people from utilizing public transport. In spite of getting a colossal quantity of knowledge generated of the commuters, no analysis was taken place to enhance the railway service, and thereby the commuter's experience. To overcome the above issues, this paper proposes a ticket verification system using facial recognition that completely eliminates the idea of using paper tickets, and totally harnesses the amount of money commuters have invested for their travelling. This paper explores the idea of implementing a web app ticketing solution, which focuses on the ticket validation process using facial recognition as the key element.

1.1 Literature Survey

Various technologies have already been introduced in the past, some of them have been described in [7]. According to [7] some of the feasible technologies which can be used for railway ticketing are QR codes, NFC and BLE, each of them having their own pros and cons.

Quick Response (QR) Codes allow the storage of information in a 2D barcode format, storing information both horizontally and vertically, thus carrying several hundred times more information than regular barcodes. These codes can be read by dedicated readers, or using smart phones as long as they have a camera and autofocus feature. Also, QR Codes have the advantage of being easily created and can be printed using a regular printer, thus making the process of physical distribution not expensive[7].Near Field Communication (NFC) is a short distance wireless technology, which comes embedded in some smart phones, that allows users to exchange information with a smart card or other NFC devices. A smart card consists of a passive NFC chip which can be read by a device called a reader which is an active NFC device. An NFC tag is, for instance, a small sticker containing an NFC chip, having stored data in it, that can be read or written by an active device. Bluetooth is a wireless technology, that exchanges data over short distances using radio transmissions. The most recent Bluetooth standard is called Bluetooth Smart, or Bluetooth Low Energy (BLE); it has several advantages over the traditional standard, such as lower power consumption and enhanced range, and it is being adopted by the recently released smart phones. These technologies have their own flaws, some of them being usage of paper, high cost, high user interaction, less secure etc. Another technology which was proposed in [6] was the usage of RFID, this technology uses radio signals to exchange data between a mobile device equipped with memory and a host computer. RFID system consists of two essential components: a tag and a reader. The tag is analogous to the barcode label and it comes in different shapes and sizes. It contains an antenna connected to a small microchip. The reader functions similar to a barcode scanner. However, barcode scanner uses laser beams whereas the RFID reader uses electromagnetic waves [6]. The drawback of this technology is that it is not cost effective as a huge initial investment is required to install RFID readers in the Railway Stations. Therefore, in this paper facial recognition

technology is introduced to eliminate all the issues faced due to the previously implemented technologies.

1.2 The Proposed System

The proposed method in this paper is to use facial recognition. According to [4] facial recognition system is a type of biometric identification which is used to identify a person from the digital image of his/her face. The face is the most crucial entity which best distinguishes a person. This system can be used in many areas such as identification of law enforcement, authentication for banking and security system access. A complete process is divided into three steps where the first step is to find or create a database of faces with multiple images for each individual. The next step is to detect the faces in the database and utilize them to train the face recognizer and the final step is to test the face recognizer which was trained to recognize the images.

In the proposed system the new users have to register themselves to the site. While doing the registration images of the person will be captured and trained. Once the registration is complete, the user can login anytime and book a ticket. While booking a ticket the user has to fill the basic details such as source, destination, and date and so on.

When the user goes to the railway station and walks through the gateway, the camera will detect the face of the user and check if the user has booked a ticket. If the user has booked a ticket, then the gateway opens and the user can pass through it and if the user hasn't bought a ticket then the gateway will remain closed. In this way this system prevents people without a ticket from travelling and it also eliminates the usage of a physical ticket.
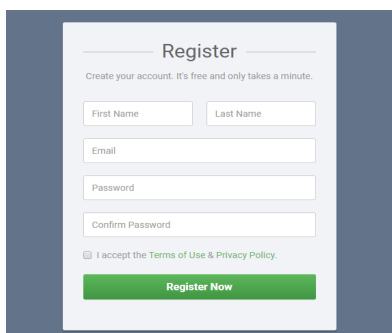
Step 1: Registration

Fig -1: Registration Form

A new user has to register by entering the required details and the camera captures the image of the user which will be used for the verification.

Step 2: Login

The registered users can login to the portal to book the tickets by entering the username and password, if either of the fields are incorrect then an error is thrown.
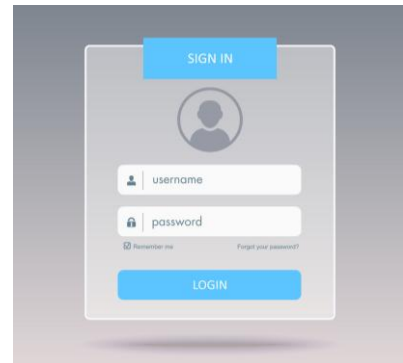

Fig -2: User Login to book tickets

Step 3: Database Generation

A database is created and all the details of the users including their images are stored in it. The images of the users will be trained using a specific algorithm.
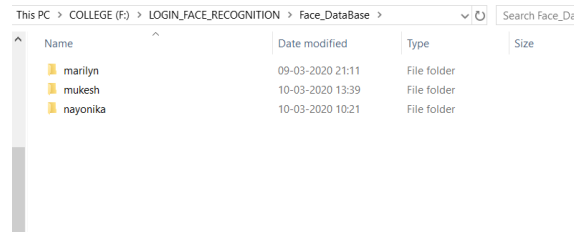

Fig -3: Database to store images

Step 4: Ticket Verification

Fig -4: Verification at the gateway

This phase takes place when the user walks into the gateway in the railway station. The camera installed above the gateway detects the user's face and it checks with the database to verify if the user has booked a ticket. If the verification is true, then the user is permitted to enter the gateway otherwise the gateway will remain closed thus preventing the users without a ticket from proceeding with their journey.

2. TECHNOLOGY STACK

OpenCV

It is a library of python bindings which is used to solve computer vision problems. The cv2 module of OpenCV is used for reading and writing images from the video stream.

K Nearest Neighbors (KNN)

It is an algorithm used for classifying objects based on the closest training examples in a feature space. An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common amongst its k nearest neighbors.

Haar Cascade Classifier

It is used for object detection; it detects the face in an image based on various features. It has a cascade function which is trained from a lot of positive and negative images, based on the training objects can be detected from other images.

3. CONCLUSION

The system is expected to be fully automated, reliable, transparent and convenient. The whole system can be practically implemented for luxury trains and buses, airport-bounded buses, metro stations, airports especially at cities in India. This helps to reduce chaos and ensures a smoother travel for passengers onboard. For commuters, traveling is unified, simplified, cost-effective and comfortable. Railway authorities only have to authorize commuters' travel, no wastage of paper, security of commuters is ensured, no cash money transaction needs to be done and less staff and resources are required. A practical and necessary up-gradation to the Indian Railways has been proposed which solves a number of problems in the current system. Such advancements are necessary considering the ever-increasing number of passengers in order to make travelling a more enjoyable experience.

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