Smart Ticket System for Metro Train

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***Abstract*: Metro trains have gradually risen as the primary public transport. A growing number of people prefer to travel by subway over bus and other modes of travel. This in turn led to lengthy queues when tickets were collected. The main problems in the metro services with the current ticket system is that it is not flexible and efficient. The main objective is to use image recognition and artificial intelligence models to provide a ticket system so that no material-based ticket has to be used. The concept behind the proposed system is to promote everyday travel in an environmentally friendly mode of travel and to reduce traffic congestion. The proposed model would be portable because one can move from any part to another, as a pair of cameras are needed to finalize the bill at the entrance and exit. Customers will sign up to pay on their own time and this helps the new scheme to work.**

***Keywords*: Face recognition, Machine Learning, Metro Trains.**

1. Introduction

In today's world, everything is smart and digital. Transportation has been made in many ways. Public transportation of in India has been one area where new developments like this one shine. Train service is one of the newest forms of public transport, with improving mobility in the country. In many cities, the railway has become an important means of public transport because the travel time is shorter and people can avoid traffic and urban pollution. Metro train service has seen an increase in passenger numbers. 4.444 billion people take the train in the city, which is a low-cost, safe and comfortable mode of transportation. Investment in metro projects exceeded Rs 14,444 trillion in 2018-19 and the figure is expected to rise from Rs 1.8 trillion in 2021, according to a report by the infrastructure research institute of India. Everyone who takes the public transport in the bustling city hopes that the tickets will sell quickly because people want to reach their destination quickly. It is true that in some popular cities, public transport is very crowded and the number of trips per seat is very high. Over the years, different ticket types have been used around the world. Passengers are tired of queuing to buy tickets or have their smart cards swiped. In addition, travelers can use more than public transport routes to reach their destination. Therefore, it is important to automate instant ticketing and payment systems. Face ticket Recognition is an instant and widely used technology in many modes of transportation. Face recognition is a biometric application that can identify people in images by analyzing and comparing patterns. Facial biometrics, can identify a person without human assistance and does not require an expert to interpret the results of, which identifies the organization.

2. Related Work

Manoj Panwar et al. [1] explain the gradual increase in air pollution in India, which indicates that vehicle use is and pollution is increasing. proved that with the increase in the number of motor vehicles, pollutants of type such as CO, NOs and other small particles also increased. Demonstrate that the use of public transport, such as the subway, helps to provide a non-polluting mode of transport. Chapter Get. [2] Analysis of Biometric Authentication. Existing biometric authentication methods are reviewed with a focus on security and privacy solutions. Further, it identifies the differences of each biometric system and concludes on its advantages and disadvantages. In particular, we discussed life and the pursuit of self-defense. Varun Kaushik et al. [3] focused on the Fool Evidence ticket system type for public transport systems and here describes people's counting methods for common proof. RFID and Face ID are two authentication systems. If the two numbers match, it means there is an error or there is no error. The limitation of is that using two different methods solidifies the model defined by. Natalia Boyko et al. [4] compares two computer visualization objects, Open and dlib, explores features, identifies strengths and weaknesses, and finds ways to best understand. articles summarizing facial recognition. The basic research of face recognition and the implementation of full recognition are explained. Compare the product analysis of the two libraries with the number of iterations using the algorithm for - execution time. Neel Ramakant Borkar et al, [5] describes real-time face recognition application using 2 different algorithms, Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA). And the author used Gaussian Filing to make front-face images in the AT&T face dataset. The advantage of the in this paper is that the combination of PCA and LDA improves accuracy by up to 97% compared to LDA and PCA, which have 94% and 91% accuracy, respectively. Yan Kween and others., [6] mainly focused on face recognition performance in ConvolutionalNeuralNetworks.

Preprocessing is done by resizing, mirroring and normalizing of the image. The data used is from AT&T and correct. 99.82% was obtained by the author. The limitation of the Paper is that it requires high processing power and memory to recognize the faster and improve accuracy. Radhika C. Damali et al. [7] introduced SVM, MLP and CNN face recognition methods. DNN for face detection. For the method based on SVM and MLP, features are extracted using PCA and LDA feature extraction algorithms. In the CNN-based approach, images are fed directly into the CNN module as feature vector. The proposed plan confirms the accuracy of, according to CNN. Keerthi GS et al, [8] describes a video-based facial recognition (VFR) technology, in which a system is capable of identifying a specific person in a face-based video. The authors developed a model that uses CNN to improve performance and system performance while running efficiently. The architecture created by the author was the inspiration to create the model. Savitha G et al. [9] describes the processes involved in video-based face recognition, namely image acquisition, image segmentation, feature extraction, classification, and face detection. The extracted features are used to train operators for the rendering images. Florian Schroff et al., [10] describe face recognition using a machine called Face net that maps face images to a compact Euclidean space. Author used face recognition as vector, authentication and integration, and Face Net embeds. Author used a deep convolutional network. Among them, the author has used Labeled Faces in the Wild (LFW) datasets, resulting in with 99% accuracy.63% Each person's face is recorded in 128 bytes, so 128-d is called face embedding.

3. Proposed System

The online portal will be provided to Metro passengers, employees and managers. Users can create their smart Ticketing System accounts via the portal or with the help of the staff at the station by providing their personal information and face photo. Portal provides passengers, employees and managers with tools to create/withdraw money, parking points and charge, add money to purse money in the car. The face recognition pattern is updated iteratively as each user edits or deletes the data. Here, faces are detected and images are preprocessed before training the model. When the driver walks to the entrance with a smart recording next to the automatic ticket vending machine (AFC), the camera captures the frame using the training method introduced in the face detector Face to perform face detection, preview image and human identification. recognition captures the pattern of the user ID. If a user has a balance in their online wallet, login details of the user are stored, trip details appear on the screen and Gate AFC opens. The user can go anywhere they want, exit the system again after reaching the address, use the learning model to get the user ID, capture frame, find face, front view and face recognition. The system will automatically calculate the price from station to station, authenticate the user and deduct the price from the online wallet. When the payment is completed, the trip details will be displayed and the AFC gate will be opened for the user to end the trip. Users will be informed with ride details, fares and hours when each ride is completed. The user can also view the details of his previous ride on the portal.

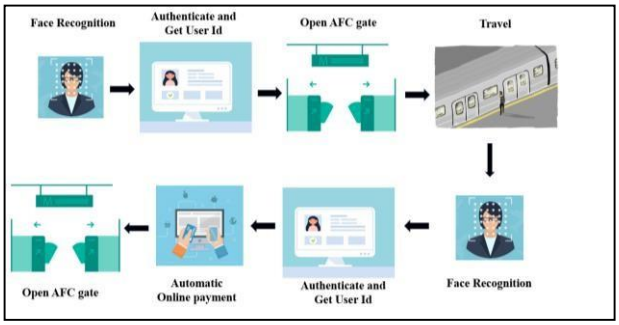

Fig. 1. Proposed systems

4. Algorithms

The whole idea is that we run the facial recognition for 4-5 seconds, repeats the facial recognition and adds the names one after the other. After running the circuit for 4-5 seconds. We use names list and to find the maximum number of occurrences of a name (the number of times a name is repeated) when recognized as an ID. We use the maximum frequency method to prevent the system from being identified as a fake customer.

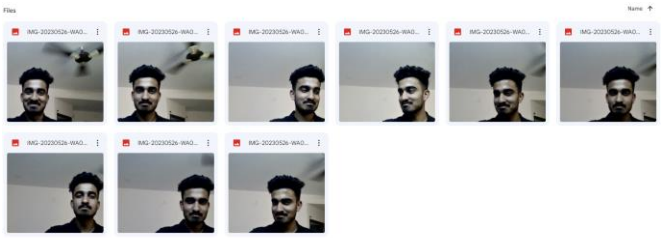

Fig. 2. CSE-B9 face dataset images

Figure 2. The special image collection created for the smart metro ticketing system has been introduced. It has ten photos per user.

Step 1: The Haar Cascade classifier is based on the Haar Wavelet technology, which decomposes the pixels in the image into squares with the function. This uses the "whole image" concept to calculate detected "features". Haar Cascades uses an Ada-boost learning algorithm that selects a small set of important features () from a large set to provide useful results for classes, and then uses digits to identify faces in images. The Haar The Cascading Classifier is based on the Viola-Jones Detection algorithm, which is trained to provide some faces and non-faces and train the operator to recognize faces.

The algorithm has four stages:

1. Haar feature selection.
2. Create a complete image.
3.Adaboost training.
4. Tier classifiers.

Step 2: The general approach is to directly compare the unknown face we found in step 1 with all the pictures we have of people tagged. like our unknown face, must be the same person.

Due to the large amount of data generated by Public Transport from users, it is not possible to repeat all the previous faces to compare with all the new images. This will take a long time.

They need to be able to recognize faces in milliseconds, not hours. We need a way for to extract a measure from each face. We can then rank three identical unknown faces and find known faces with the closest rank. Deep learning may be better than human where the face needs to be measured. The solution is to train a deep convolutional neural network, but instead of training for the network to recognize objects in images as we did before, we will tell it to generate 128 parameters () for each face. These 128 parameters are called face embedding. Concept of reducing raw data such as images to a document Computer-generated number After repeating this step a million times a million times, thousands of different people learn to build reliability on neural networks Create 128 metrics per person. All ten different pictures of the same person should give approximately the same measure. The good folks at Open Face have done just that and have posted lots of tutorials that we can use right out of the box. Thanks Brandon Amos and team! So, all we have to do is run our face image over their pre-trained mesh to get 128 measurements for each face.

Step 3: Find the person's name from the right. All we have to do is find the person with the closest match to our test image in our database of acquaintances. You can do this with any machine learning classification algorithm. We will use a simple linear SVM classifier, but many classification algorithms will work. All we have to do is train a classifier that can take measurements from the new test images and tell which of the known ones is the closest match. This distribution takes milliseconds to run. As a result of the distribution, a list of people appeared!

Face recognition:

All the above algorithms use image objects to process face recognition. A better way to do this is to create a list of points. One such method uses 128 different points to identify each face. Using deep learning, it can bring to encoding which makes 128 different ways of interpreting the image. The Triple loss function using three images. Big picture, sub pictures and negative. Deep learning methods will generate 128 values so that is as close as possible to human images and to other people's images. The weight of the CNN network was set to to generate the possible number. As shown in the picture above, during training everyone knows the value of 128 as. These 128d values are very specific to the face of different people.

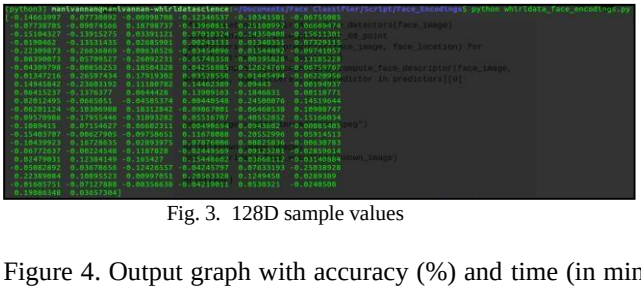

Fig. 3. 128D sample values

Figure 4. Output graph with accuracy (%) and time (in minutes) on the y-axis and the dataset on the x-axis. Of these, the face recognition algorithm uses the Advanced Face Recognition model, which has been tested on the above three databases such as AT&T, GT_DB and CSEA11 databases. The AT&T gives an accuracy of 97% because GT_DB has an accuracy of 81%, which is lower compared to 100% for the CSEA11 dataset.

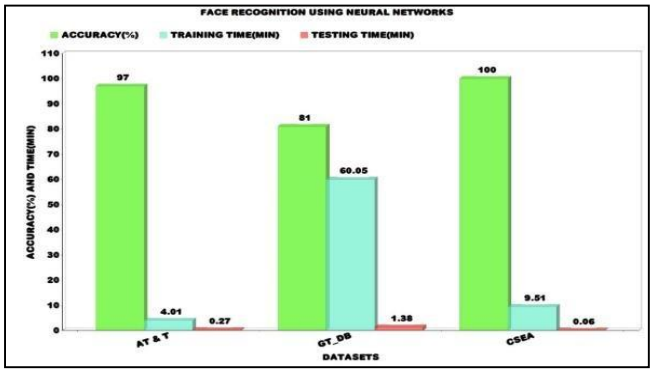

Fig. 4. Advanced face-recognition on different datasets

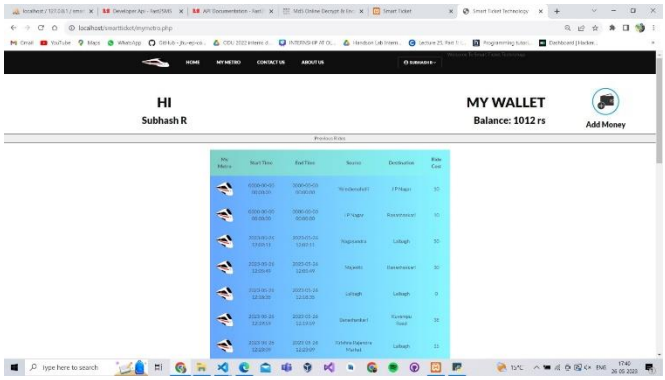

Fig. 5. User Ride Information

Figure 5. User history page showing user entries. This page shows the session name and wallet, as well as base stations and stations visited by the customer. It also mentions fees and dates and times.

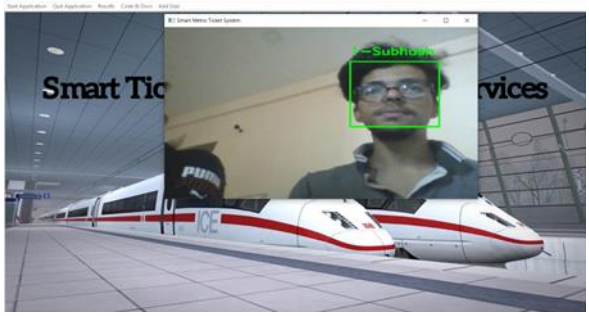

Fig. 6. Metro ride facial recognition

Figure 6. Show pages during user authentication. Page shows the name of the prediction, then if the input field is blank or the output field is open, the input page opens.

Fig. 7. Metro Exit display

Figure 7. After the user is authenticated, the logout page will appear. Page shows the name and wallet of the customers visited and the starting point of the station, this page also shows the exit and fare of station. Balance is set and presented.

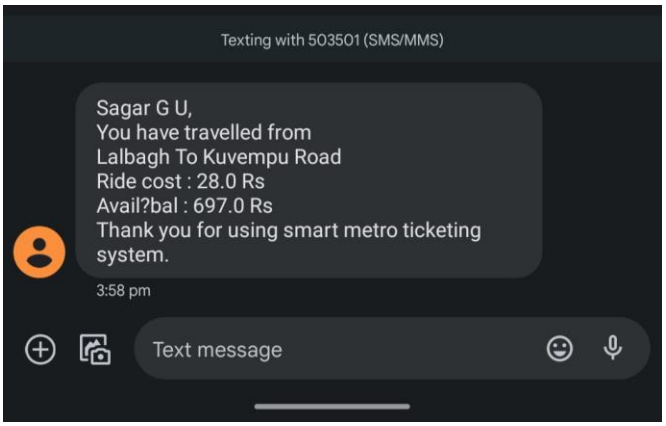

Fig. 8. SMS Notification

Figure 8. Shows the SMS notification sent to metro passengers after exit, with information such as fare, remaining balance and route. An experiment showing the speed of face recognition. The test requires an image.

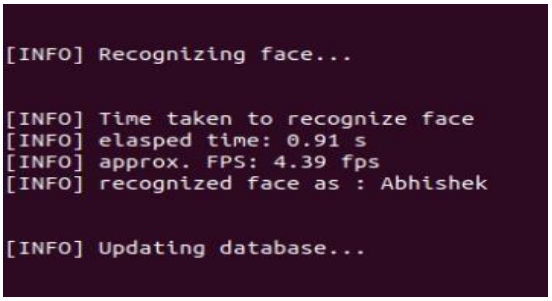

Fig. 9. Test case of recognition speed

Figure 9. Images should be recognized quickly. As expected, the system recognized faces in 1 second.

5.Conclusion

The Metro Smart Ticketing System provides solutions for many important aspects of public transport such as user friendliness, proof of fraud, security authentication, analysis of business information and public transport quality. The current job of can be further enhanced by creating a better user interface GUI because the application changes depending on the application's runtime. The model can be trained with images that have in certain areas where it is used to improve the accuracy of the prediction.

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