Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 12, Issue 3, July 2021: 1512-1519

Research Article

Intelligent Face Recognition System For Criminal Identification In Railway Station

[1]C.Ranjeeth Kumar, [2]N.Janani , [3]P.L.Abinaya, [4]K.Archana

ABSTRACT

Face recognition technology is a biometric technology that uses a person's face traits to identify them. People take pictures of their faces, which are then processed automatically by facial recognition software. Face recognition is emerged as a promising future development direction with numerous possible applications. Face Recognition starts by extracting the coordinates of features such the length of the mouth, the breadth of the eyes, and the pupil, comparing the result to the measurements contained in the database, and returning the closest match. There are five stages in the suggested system. Pictures in the database are being trained. Caffe model for the face detection Techniques for feature extraction, resizing, and normalisation, and results based on comparison When you hear a voice, it's a sign of a problem. With the purpose of recognising people on a target list, automated surveillance is an important application of interest. This project uses an automated security camera to do real-time facial recognition. This project's purpose is to compare one image to multiple others that have already been trained. In this project, We offer a methodology robust face identification in a real-time setting in this research. On the Open CV platform, we apply the Caffe model to monitor faces. The accuracy of face recognition is really high. Because the computation time is so short, the suggested system can correctly distinguish multiple faces, which is important for quickly searching for suspects.

INTRODUCTION

A person's identity is inextricably linked to their face. It is the characteristic that most clearly distinguishes an individual.

[1]Assistant Professor, (Sr.Gr), Department of Information Technology, Sri Ramakrishna Engineering College, Coimbatore, India Email: ranjithkumar.c@gmail.com
[2]Assistant Professor, (OG), Department of Information Technology, Sri Ramakrishna Engineering College, Coimbatore, India Email: janani.nagaraj@srec.ac.in
[3]Assistant Professor, (OG), Department of Information Technology, Sri Ramakrishna Engineering College, Coimbatore, India Email: abinaya.loganathan@srec.ac.in
[4]Assistant Professor, (OG), Department of Information Technology, Sri Ramakrishna Engineering College, Coimbatore, India Email: archana.kumaravel@srec.ac.in

Face recognition is a fascinating and difficult issue that has implications in a variety of fields, including law enforcement identification, banking and security system access authentication, and personal identification, among others. Humans find face recognition to be an easy process, but for a machine, it is a completely different task. To date, very little is known about human recognition, such as how we analyse images and how the brain encodes them, and whether inner features are significant (eyes, nose, mouth). Specialized nerve cells in our brain respond to

particular local features of a scene, such as lines, edges, angles, and movement. Automatic face recognition entails extracting the relevant features from an image, transforming them into a useful representation, and classifying them. The most natural method of human identification is facial recognition based on geometric features of a face. The entire process can be divided into three main stages, the first being to find a good database of faces that includes multiple images for each individual. The next move is to look for images in the database photos and train the face recognizer with them. Finally, the face recognizer is tested to see if it can recognise the faces it was taught to recognise. Face recognition are being used in many areas, especially on image-hosting websites such as Picassa, Photobucket, and Facebook. These tasks can be completed using Deep Learning techniques. They can also be used to deal with a wide range of problems.

LITERATURE SURVEY

Face identification based on Local Binary Pattern(LBP) characteristics was proposed by Timo Ahonen et al [1] . They researched and compared four different textural aspects when employing the looks of local regions in their research. The findings of the experiment demonstrated and supported the validity of employing LBP for face description.

Amir Faizi [3] demonstrated how to accomplish high accuracy face detection in frontal faces by combining multiple techniques such as skin colour detection, template matching, and gradient face detection. The goal of this research was to find the best rotation angle for optimal detection. For feature detection, eye and mouse template matching has also been tested.

Face Recognition based on Local Binary Pattern(LBP) characteristics was proposed by A. Hadid et al [5]. To evaluate the research the persons are authorised to enter the room, the retrieved faces are matched to those in a predetermined database. The use of Local Binary Pattern (LBP) texture features for face recognition and background reduction is one of our approach's peculiarities.

In Face recognition survey paper[6] approached that The first goal is to provide an up-to-date assessment of the available literature, and the second goal is to provide some insights into facial recognition research. We categorise existing recognition approaches and provide full descriptions of typical approaches within each area to give a comprehensive survey. Relevant topics such as psychophysical investigations, system evaluation, and lighting and position variation are also discussed. Trust based cross layer routing with secure analysis is studied in [9].

The Data Driven patterns are recognized by local binary patterns (LBP) and local ternary patterns (LTP) have been very successful in a number of applications including face recognition, object detection, and texture analysis this research was proposed by Xian-Hua-Han et al[7].This approach is based on based on the notion that human perception of a distinct pattern is influenced not only by the stimulus's absolute intensity but also by its relative variance We also propose a rotation invariant co-occurrence WLTP (RICWLTP) methodology to be more discriminating for picture representation by using co-occurrence context information.

PROPOSED SYSTEM

Face detection is done using a pre-trained weights caffe model produced by Berkeley AI.Research (BAIR). The data has been pre-programmed for the criminal class. The convolutional and dense layers utilised in the Neural architecture extract the features. The Face Recognition module is used to identify the user. If the criminal has been identified, it is indicated by red bounding boxes labelled with the specified class name and parameters; for unknowns, it is

indicated by blue colour. An intimation, consisting of the criminal's image along with the identified location/cctv sector, is sent to the management/police station.

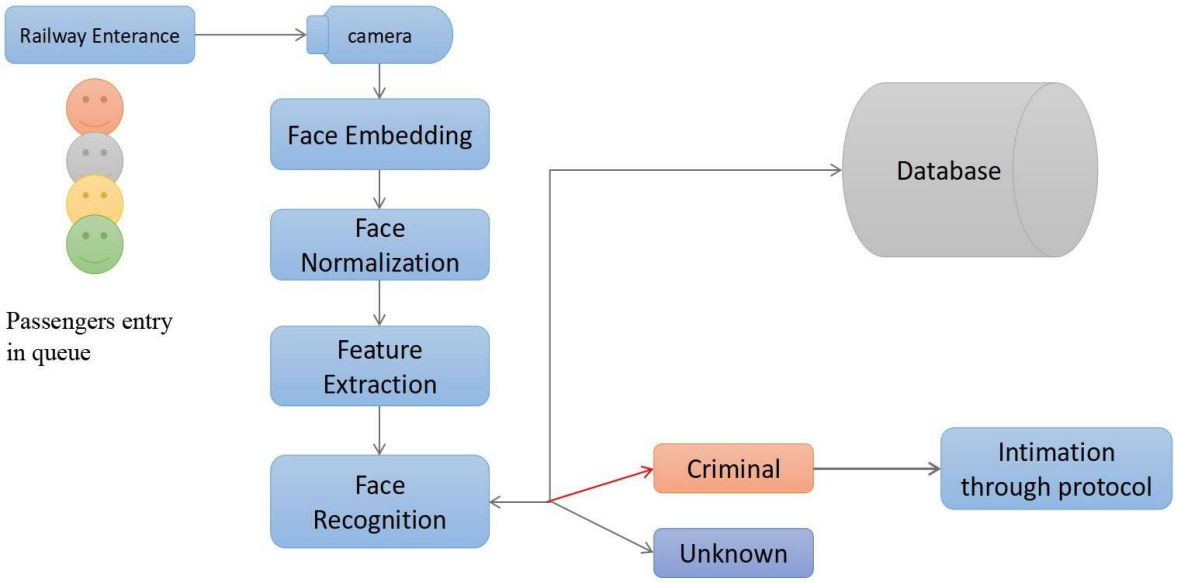


Fig : 1 Block Diagram

The camera is installed at the railway station's entry, exit, and ticket desks. Face Embedding, Normalization, Feature Extraction, and Face Recognition utilising Face Recognition Module are the four common methods that the process goes through. The Embeddings are processed and saved in a dat file (.dat). Finally, the embeddings are compared to the generated.dat file. Then, based on the outcome, a bounding box with a label of criminal or unknown is displayed. An alarm notification through voice bot is implemented and sent via protocol as a message.

METHODOLOGY

Deep learning has recently become popular in the field of recognition systems. As a result, deep learning and face recognition work together to form deep metric learning systems. In a nutshell, deep learning in face detection and identification will primarily focus on two areas: accepting the input image or any other relevant image, and providing the best outputs or results of the image of the picture. We have used dlib facial recognition framework, which is a simple approach to structure face evaluations. Dlib and face recognition are the two most important libraries in the system.

a. Face detection is achieved using a pre-trained weights caffe model produced by Berkeley AI Research (BAIR).

b. The data has been trained to identify criminals.

c. The convolutional and dense layers utilised in the Neural architecture extract the features.

d. The Face Recognition module is used for identification purpose.

e. If the offender has been recognised, the bounding boxes are red and labelled with the specified class name and parameters; for unknowns, the bounding boxes are blue.

An alert is sent to the management/police station, containing the criminal's photograph as well as the determined location/cctv sector.

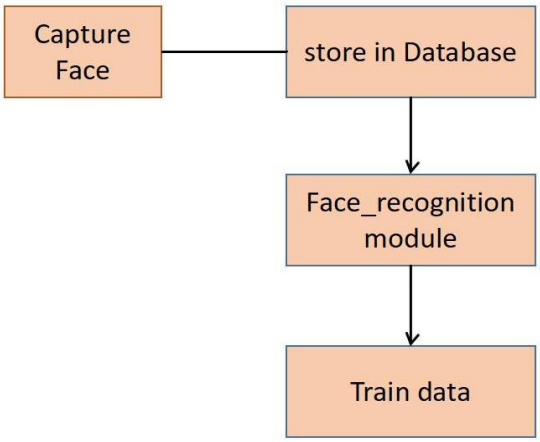


Fig.Training Phase

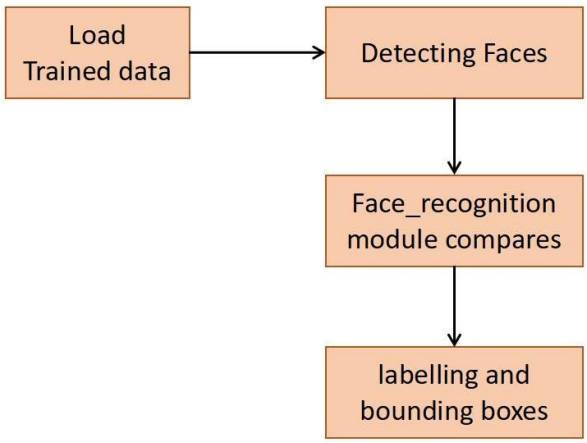


Fig.Recognition phase

ALGORITHM

Caffe Model:

Caffe is a deep learning framework that prioritises expressiveness, performance, and modularity. Berkeley AI Research (BAIR) and community collaborators are working on it.

Application and innovation are aided by **Expressive architecture**. Models and optimizations are configured rather than hard-coded. By setting a single flag, you can switch between CPU and GPU training and then deploy to commodity clusters or mobile devices.

Active development is aided by **Extensible coding**. Caffe has been forked by over 1,000 developers in its first year, and many substantial changes have been provided back. The framework keeps track of the state-of-the-art in both code and models thanks to these contributors.

Caffe's **speed** makes it ideal for research experiments. That's 1 millisecond per image for inference and 4 milliseconds per image for learning, and newer library versions and hardware are even faster. Caffe is, in our opinion, one of the fastest convnet implementations accessible.

Community in Caffe Model already drives university research, startup prototypes, and even large-scale industrial vision, voice, and multimedia applications. The Caffe model is utilised to detect faces in this case.

Face_Recognition Lib :

Face recognition and manipulation from Python or the command line Built with deep learning and dlib's state-of-the-art face recognition. To acquire all the faces that appear in a photo, get the locations and outlines of each person's eyes, nose, mouth, and chin. This aids the neural network in producing the 128 distinct facial traits.

TECHNIQUES

1.Face Normalization

Face normalization results under the same identity in unconstrained environment. Face images are under different views across pose, lighting, expression and background. FNM can keep a high-level consistency in preserving identity. Directly warping the input face to a normalised view is tricky. This must be done to remove perspective distortions, relight to an evenly lit environment, and predict a frontal and neutral face.

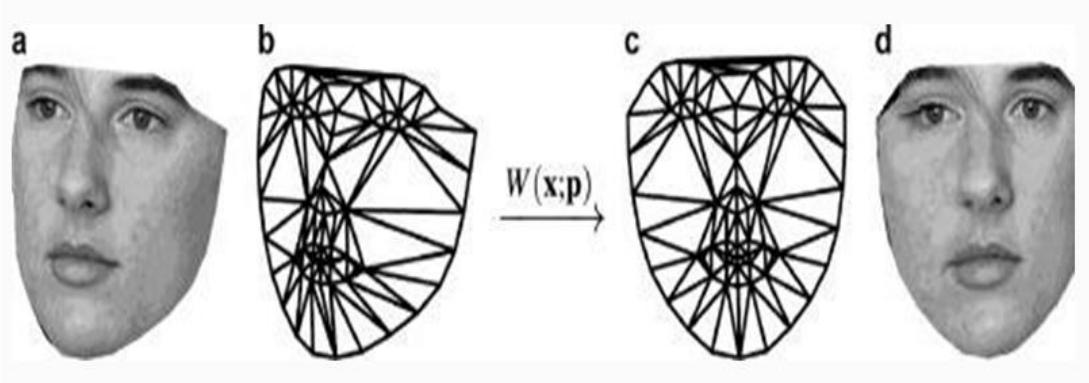


Fig :Face Normalization Diagram

2.Feature Extraction

The process of extracting face component parts such as eyes, nose, and mouth from a human face image is known as facial feature extraction. The extraction of facial features is critical for the start of processing techniques such as face tracking, facial expression recognition, and face recognition. Later, this extracted feature helps in classification of classes and in identifying similarities in images.128 characteristics generated by the neural network(n*faces) =>The configuration of the neural network so that the characteristics of images face1 face2 were as close as possible and the characteristics of images face2 and face 3 will differ.

3.Face Embedding

The algorithm takes note of some critical dimensions on the face, such as the colour, size, and slant of the eyes, the distance between the brows, and so on, for face recognition. i.e. a transformation of facial photographs into a compact Euclidean space vector. All these put together define the face embedding — the information obtained out of the image — that is used to identify the particular face.

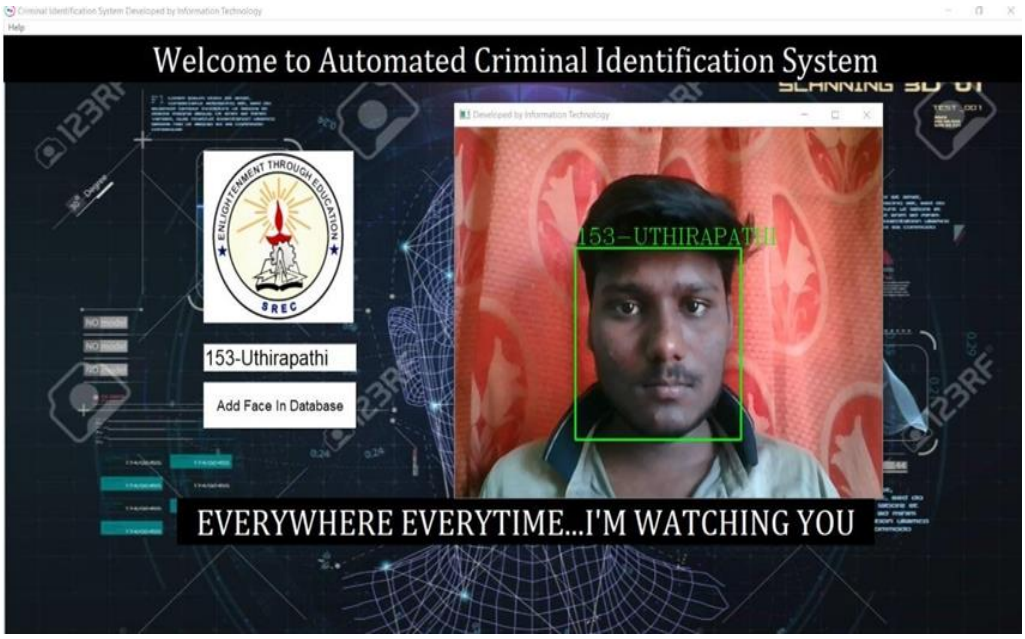
4.MODEL ARCHITECTURE : Layers used 2D convolutional layers and Max pooling layers and Dense layer with Activation function as SOFTMAX.

NEED OF AN AUTOMATED SYSTEM

Because of the growing demand for systems that can assist in areas such as surveillance and security, this type of individual authentication can no longer be done using simple hand-crafted methods, necessitating the development of automated systems that can quickly correct errors and process human face recognition. When work is done by machines, it can complete jobs efficiently in a short amount of time and eliminates the significant errors that humans make. Face detection can be made easier with a real-time GUI-based face recognition system, which can be done in a variety of ways.

RESULT

The model has an accuracy of 99.38% on the Labled Faces in the wild benchmark. And Capable of detecting nearly 450 faces.



Positive Values:

1. Illumination doesn't affect the model.
2. Having or taking of hair & beard , the model still works fine.

Failure Cases:

1) Face could not be recognized in presence of mask or scarf.
2) Some time of sunglasses could be a problem in identification.

CONCLUSION

In this project, we were able to detect and recognize faces of the criminals in an image and in a video stream obtained from a camera in real time, just using a single image with accuracy of 99.3%. We have used Caffe model for face detection. It is a Deep learning based approach where it is already a pre-trained weight file. It is then used to detect objects in other images. Also, we have used Face_Recognition lib to recognize faces of the criminals.

FUTURE SCOPE:

Any industry requires a high level of security. This work is primarily focused on criminal identification in the railway industry. Open CV will be used to implement the presented system. This technique achieves a recognition rate of 97 percent to 99.3 percent. Because of the distance, camera resolution, and lightning, there will be some variation in the outcome. To speed up the processing, advanced processors can be used. By adding more recognition servers, the processing time for image collecting can be reduced.

REFERENCES

1. Ahonen T, Pietikäinen M, Hadid M and Mäenpaä T (2004), "Face Recognition Based on the Appearance of Local Regions", Machine Vision Group, InfoTech. University of Oulu, Finland, IEEE.

2. Ahonen T, Hadid A and Pietikäinen M (2006),"Face Description with Local Binary Patterns: Application to Face Recognition", Draft, June 5, 2006.

3. Faizi A (2008), "Robust Face Detection using Template Matching Algorithm," University of Toronto, Canada.

4. Feng P (2004), "Face Recognition based on Elastic Template," Beijing University of Technology, China, M H Yang, D J Kriegman, and N Ahuja. Detecting facesin images: a survey. IEEE Trans. on PAMI, 2002.

5. Hadid A, Heikkilä M, Ahonen T and Pietikäinen M (2004), "A Novel Approach to Access Control based on Face Recognition", Machine Vision Group, InfoTech Oulu and Department of Electrical and Information Engineering. University of Oulu, Finland.

6. W. Zhao, R. Chellappa, P. J. Phillips, and A. Rosenfeld, "Face recognition: A literature survey," ACM Computing Surveys, vol. 34(4), pp. 399–458, Dec. 2003.

7. Rodriguez Y (2006), Face Detection and Verication Using Local Binary Patterns, Ph.D. Thesis, ~Acole Polytechnique Federale de Lausanne.

8. Nosaka R, Ohkawa Y and Fukui K (2012), "Feature extraction based on co-occurrence of adjacent local binary patterns," in Proceedings of the 5th Pacic Rim conference on Advances in Image and Video Technology - Volume Part II, PSIVT2011, pp. 82-91.

9. Dr.S.Palaniswami and A.Rajaram "A Trust-Based Cross-Layer Security Protocol for Mobile Ad hoc Networks", 2009, International Journal of Computer Science and Information Security, Vol. 6, No. 1, pp.165-172.