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Identification Of Criminals Using Face Recognition System

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ABSTRACT

The "Identification of criminals using face recognition system" is a cutting-edge8facial recognition system created specifically to8improve law enforcement operations by8using facial recognition technology with the Indian government's Aadhar database. By automatically comparing the photos of those caught committing crimes with their Aadhar information, the project seeks to transform the identification and tracking of criminals.

By instantly comparing Aadhar8records with surveillance photos, the method8seeks to expedite criminal detection. It improves the accuracy of suspect identification8by analysing and comparing facial traits8with the vast Aadhar database8using sophisticated algorithms. By providing law enforcement agencies with a dependable tool for quick responses to criminal situations while upholding privacy and ethical norms, this proactive strategy improves public safety.

Keywords: *Aadhar, Crime Buster, Facial Recognition, Law Enforcement, Criminal Identification, Biometric Data, Surveillance, Public Safety, Real-Time Matching, Privacy and Ethics.*

1. INTRODUCTION

For law enforcement authorities worldwide, identifying and tracking criminals is a difficulty. Although they are helpful in many situations, traditional identification techniques like DNA analysis and fingerprinting are not always enough to resolve difficult cases.

Facial recognition technology has emerged as a potent tool for person identification in a variety of domains, including criminal justice, in recent years [1].

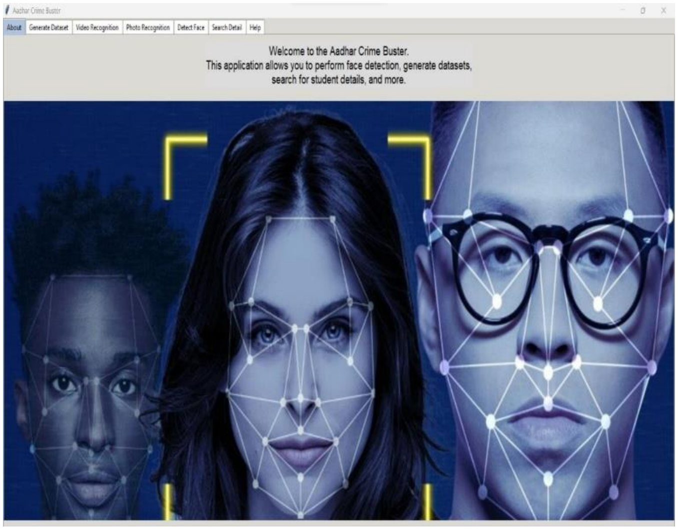
Detect criminals instantaneously or identify possible

offenders from a database of known offenders. When the live camera finds a match, alert the authorities. The system will recognize faces and compare them to a database of known criminals using sophisticated computer vision and machine learning algorithms.

In online mode, the system will analyze live cameras to find possible matches and promptly alert the authorities, while in offline mode, it will analyze photographs of known criminals and produce facial recognition information.

The system will be a crucial tool for law enforcement since it can process vast volumes of data fast and precisely.

Creating a powerful face recognition algorithm that can reliably identify faces in photos taken in a range of environmental settings and connecting it to the Aadhar database to allow for the real-time [4].



Welcome to the Aadhar Crime Buster.
This application allows you to perform face detection, generate datasets,
search for student details, and more.

Fig 1: - Proposed Model

The implementation of the facial recognition system in operational settings and the provision of training to assist staff in using it while addressing ethical issues pertaining to data security, privacy, and matching of suspected faces with their UIDAI records.

Create and design an intuitive user interface so that law enforcement officers can access and use the face recognition system effectively. Thorough testing and validation should be done to guarantee the system's correctness, dependability, and performance in a variety of situations and potential biases in the technology will guarantee that the system is used responsibly and ethically.

2. PROPOSED SYSTEM

The Local Binary8Pattern and Histogram algorithm (LBPH) for face8identification and Haar cascade for face8detection form the foundation of the8suggested facial recognition system [2].

The quickest and most straightforward method for creating a GUI application [1] is to use the Python module Tkinter to generate the Graphical User Interface (GUI) for this system. traits like collecting pictures8of people and entering their information8into a database, like the Aadhar database, training the photos in the database and8on the camera, and tracking suspects based8on their facial traits are all functions that8this system will offer.

2.1 Components

Dataset: Since it contains8all of the biometric data required to8identify an individual, the database8is a crucial component of the facial recognition system. Our system's database8is made to effectively and safely8handle a lot of [3] photos and their8associated metadata, which includes8the timestamp, location, and other technical details of8the photos.

To make it8easier and faster to get and view a large number of suspiciously taken photographs, this8dataset will include the images in a structured style.

Hardware components:

- Camera Video Input i.e. 8CCTV device or recorded videos for testing.
- Processing unit i.e. Server8system or Laptop for testing.
- Storage device i.e. Cloud8systems or local storages like Hard Drives.

Software components:

- Haar cascade, Machine8Learning Model for image recognition.
- Local Binary Pattern8and Histogram algorithm for Image8Processing and extracting facial features.

3. METHODOLGY

a) Image Collection or Capture procedure:

Twenty pictures of8each individual will be shot with high-speed cameras for testing purposes during the Aadhar generation or upgrading procedure. To8offer thorough information8for precise identification, photos will be taken under various8lighting conditions and from8various perspectives.

b) Normalization or preprocessing of images:

To guarantee8consistency, images are pre-processed before being stored. This8could entail brightness and contrast8equalization, grayscale conversion, and scaling.

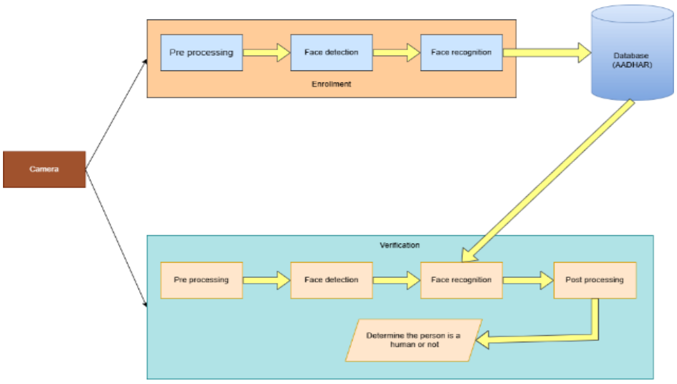
Algorithm: In the form of Pseudo Code.

Input: Live or recorded video feed of the persons.

Output: In Suspect file in excel sheet format.

Steps or Procedure

1. Transform each frame8from Red Green Blue (RGB) to grayscale format.
2. Apply the Haar Cascade8classifier for face detection and get the Region of Interest (ROI) which identifies8the areas in the image containing facial features.
3. Now apply the LBPH8algorithm on the ROI to get extract8the facial features information.
4. Post Processing: if – feature matches with the criminal profiles from8Adhar record then information goes to8suspect excel file and authorities get8alert, else process continues for next8ROI (picture) and so on.



(Data Flow Diagram)

a)Face detection and pre-processing:

The frame is first8converted from RGB colour to grayscale. 8We employed a Haar cascade classifier, which is suggested in, to identify the faces. This classifier trains a cascade function8to identify input features [9]. Haar characteristics8including edge, line, and four-rectangle8are used for this. Many calculations and characteristics are required for huge or variable-sized images, and the majority of8them are pointless [10]. Following that, the8Region of Interest (ROI), or the area8with faces, is extracted and moved on to8the following phase.

d) Recognition of Faces:

Because the LBPH method is robust, can identify both front and side faces, and outperforms other tools like Eigenfaces and Fisher faces, we choose to utilize it for8face recognition [4].

It makes use of the sliding window8concept with the neighbours, radius, and settings. It is showed8in Fig. 3.

The LBPH algorithm is used to identify the features that8best represent a face/object in an image [7]. It is a simpler method in that it efficiently classifies the image and performs better in various lighting and environmental circumstances [11].

Local Binary Pattern8 (LBP) operation creates an image8which highlights the characteristics of8ROI

(Region Of Interest) in a better way. It uses the concept8of the sliding window with the8parameters, radius and neighbours [8].

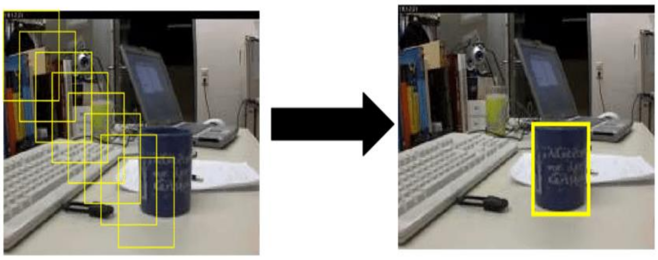


Fig 3: - (Sliding window for object detection)

First, we convert the frame into matrices of 3X3 pixels. If a8neighbour pixel in a matrix is greater8than the median pixel of that matrix8then set value 1 else 0 in that pixel position. now note8down the values of neighbour pixels8in a line we get a binary number convert that binary number to decimal number and replace it with the median pixel value8of the matrix. An image that better illustrate the features of ROI is produced by the local binary pattern (LBP) [11].

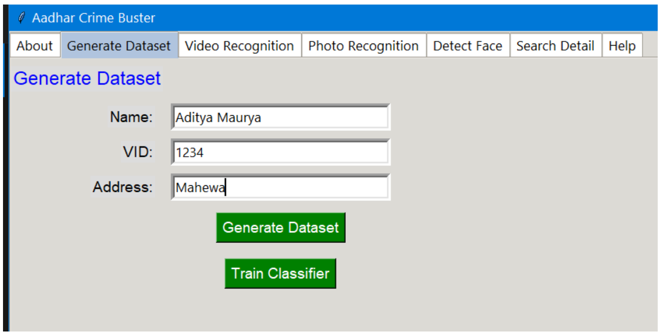
We take the histograms from each8grid and concatenate them to create a new, larger histogram since the image has now been converted to LBP form. The original image's properties are8shown by the concatenated histogram. The facial image from the database is8represented by each histogram. The aforementioned procedures are followed for the8new image, and a new histogram is obtained [13].

e) Post-processing

In order to identify the person8in the picture, it now compares the new histogram with the histograms from8the training dataset (using Euclidean distance). It selects the histogram with the least distance, because they are8preferable [12]. It also extracts the ID associated with that histogram.

- **If-** confidence is more than 74%8then details belong to the extracted ID8is shown on the frame as in the8suspected names are updated into a8Suspect excel sheet only if such name is not already8in the excel sheet to avoid duplication8of names.
- **Else-** word “Unknown” is8shown on the frame and if confidence is greater than the threshold which is given value874%, then the person’s image is saved in a separate folder. This helps in identifying any intruders in the class and reduce8the8wrong classification of8students to an unknown person.

4. TESTING AND RESULTS



Name: Aditya Maurya

VID: 1234

Address: Mahewa

Fig 4.1: - Generate Dataset

The dataset generation feature replicates the process of creating8Aadhaar cards. It demonstrates that during the Aadhaar enrolment process, 200 photos of the applicant are captured8from various angles within a span of just820 seconds.

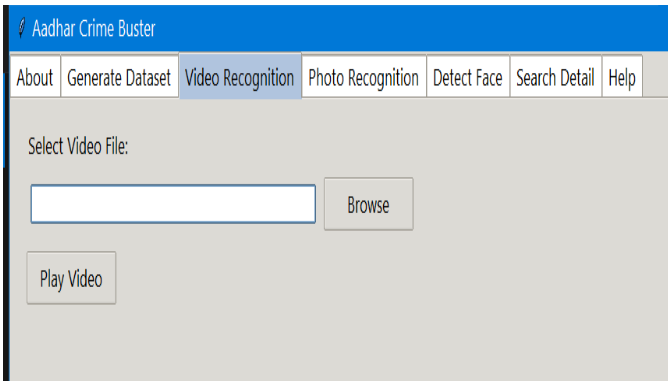


Fig 4.2: - Video Recognition

This feature enables8law enforcement agencies to upload videos capturing crimes in progress and match8them against the existing Aadhaar database.

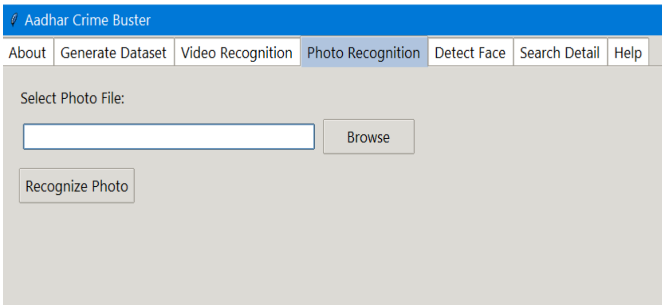
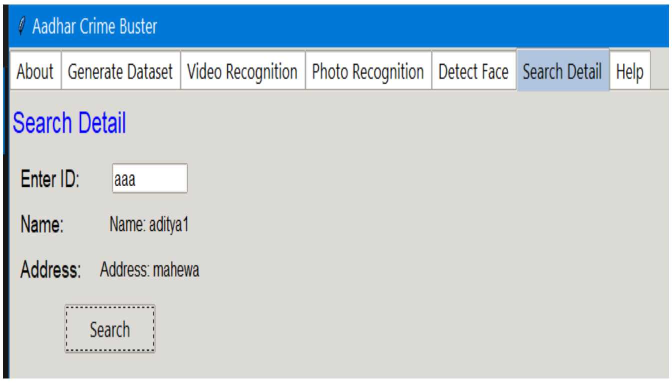


Fig 4.3: - Photo Recognition

This feature allows law8enforcement agencies to upload a photo of a suspect or criminal and retrieve8their details, such as name, Aadhaar ID, address, and more, from the existing Aadhaar database [6].



Search Detail

Enter ID: aaa

Name: Name: aditya1

Address: Address: mahewa

Fig 4.4: - Search Detail

The face recognition system identifies a face as either unknown or as a match from the database, along with the corresponding Aadhaar ID. The search detail8feature then allows you to use the Aadhaar8ID to retrieve additional information, such as the individual's name, address, phone number, and more.

The Face recognition rate8of suspects is 77% and its false-positive rate is 28%. This system is recognizing persons8even when they8wearing glasses or cap or grown a beard.

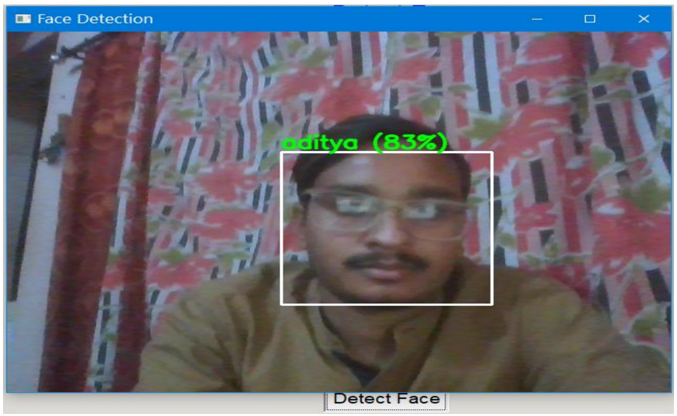


Fig 4.5: - (Testing with spectacles)

Face Recognition of unknown persons for both existing and proposed8models is 60%. This happened mostly8due to detecting random objects in the8background (like cars, curtains, etc.)

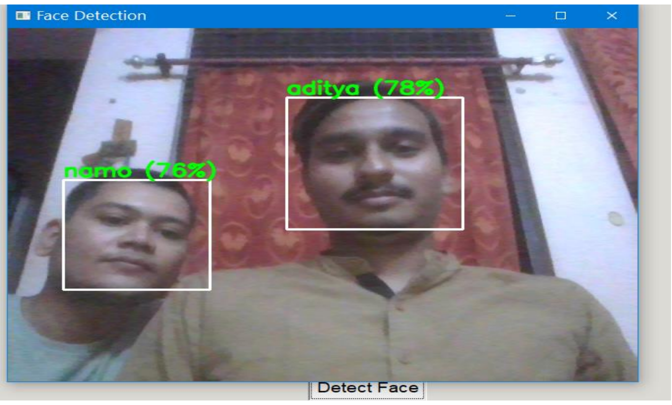


Fig 4.6: - (Testing with two people in a frame)

Its false-positive rate is 14% and 30% for the proposed and8existing model respectively.

In the existing system, it is8observed that when a person in the video turned his head sideways more or move8away from the frame then the confidence value may decreased than threshold8value (74%) then the person in the frame8is marked as an unknown [12].

Performance Evaluation	**Accuracy %**
Person recognition rate (Live Video)	77
False-Positive rate (Person)	28
Unknown person recognition rate (Existing model)	60
Unknown-person false positive rate (Existing model)	30

Unknow person recognition rate (Proposed model)	60
Unknown false positive rate (Proposed model)	14

(Performance analysis table)

5. FUTURE SCOPE

Depending on several factors, port scanning initiatives may have varying8scopes in the future.

Real-time surveillance:

Create technologies that enable8tracking and surveillance of individuals in public areas in real-time, 8enabling law enforcement to promptly8keep an eye out for and react to crimes or8threats.

Integration with IoT Devices:

Facial recognition technology is8integrated with Internet of Things8 (IoT) devices, including sensors and smart8cameras, to build a network of8interconnected devices that enhance security8enforcement and surveillance testing.

Cooperation with Governmental Organizations:

Enhance public safety by collaborating with law8enforcement8and8government organizations to implement facial recognition technology for border control, internal8security8and8violence prevention.

Multi-modal biometrics:

combining different biometrics, 8including voice or iris recognition, to8provide a range of biometric applications8that improve identification security8and precision.

Enhanced Accuracy:

The facial recognition system's8accuracy is continuously increased to8identify and lower false alarms through8integration with deep learning and algorithms.

6. CONCLUSION

One of the well-known8methods for facial recognition is LBPH. Our technology is able to identify a student8who has made inadvertent modifications, such as growing a beard or donning8spectacles.

The dataset is small, which is the issue here. A better dataset could be created in the future, which could theoretically produce a more accurate result. By synthesizing fresh and comprehensive training examples, we can enhance these haar cascade classifiers and raise their recognition rate of unknown individuals. If an intruder is identified in the frame, a visual and audio system alarm can be added.

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