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Weapon Detection with Criminal Face identification

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Abstract

It takes a lot of effort and time to identify and recognize crooks eighty percent of criminals commit repeated offenses per the national crime records bureau report the ability of criminals to avoid leaving fingerprints or biological evidence at crime scenes is growing the unique and essential characteristic of the human face is its ability to recognize people through the use of cutting-edge facial recognition technology this initiative aims to improve public safety by identifying and apprehending those involved in criminal activity by utilizing cutting-edge technology crime scene detection can predict the likelihood of a crime occurring without the need for human intervention. An investigator can better understand the course of events during a crime by using information from weapon detection and surveillance on the individual. Technology's revolutionary impact on criminal prevention and detection is interesting. An individual's face is a distinctive and vital feature of their body that allows for identification. With cameras positioned across various locations, recognition of faces from an image might be utilized to detect offenders. That way, we may use it to find the identity of a perpetrator. For every facial expression, it creates a distinct pattern and matches it to other pictures in the collection. Details related to the associated image will be shown if a match is found for the input face.

Keywords: *Criminal Detection**,** Machine learning**,** open CV*

1. Introduction:

Security risks are a major problem in today's society, necessitating the developing cutting-edge technology to counter them is necessary. When compared to current security surveillance techniques, the suggested approach provides a significant improvement. Conventional surveillance systems may only be able to identify firearms without linking them to particular people. By creating a smooth link between weapon detection, recognition of faces, and the database, our project closes that gap and makes it possible to fully comprehend the possible threat situation. Current data about the weapon's owner is made available to security staff so they may act quickly and wisely, enhancing security and safety in public areas, vital infrastructure, and other high-risk areas. To identify weapons in real-time video feeds, the system makes use of a Convo-lutional Neural Network's capabilities. Whenever a weapon is identified, the system takes a picture of its frame and uses face recognition to determine who is in it. Additionally, improving the system's speed, accuracy, and performance is included in the project's scope. It is imperative to guarantee that the system functions well in diverse climatic conditions and illumination circumstances. Furthermore, by creating the groundwork for future developments in security technology, this initiative contributes to the development of smarter, more advanced systems that are able to efficiently mitigate security threats. The suggested system's ultimate goal is to make a major contribution to improv-

ing security protocols and preserving safety for all in the context of changing security challenges.

2 Literature Survey:

Mr.SMD.Shafiulla et al.[1]. describes that face recognition has greatly boosted the performance of semantic pattern using images. It was found that VGG CNN models are best performing models, especially in a limited data scenario producing the classification accuracy of 89.5% in identifying criminal faces. Rohit Alex Badana et al. [2]. proposed that face detection and recognition techniques and provide a complete solution for image based face detection and recognition with higher accuracy using Neural Networks, Computer Vision. Solution is proposed based on performed tests on various face rich databases in terms of subjects, pose, emotions and light. Atharv Somani et al. [3]. has addressed the increasing crime rates and limited police presence, an automatic facial recognition system utilizing cascading classifiers has been proposed as a solution. The proposed system has a matching rate of over 80%, making it a highly effective and efficient method for criminal recognition in public place. Aakriti Singhal et al. [4]. describes criminal face detection using the stored slices stored in the database. Then with the help of the Amazon Rekognition, it predicts the criminal by matching the created image with the existing database, if the result is 70-80% of then that face is declared as a criminal. Alireza Chevelwalla et al. [5]. described regarding – face recognition is among the most challenging topics in computer vision today. It has applications ranging from security and surveillance to entertainment websites. Face recognition software are useful in banks, airports, and other institutions for screening customers. Germany and Australia have deployed face recognition at borders and customs for Automatic Passport Control. Sakib-Ahmod et al. [6]. proposed a system aims to inform the authority of a property when it is under criminal activities such as robbery, snatching with guns, knives, and other weapons. The design focuses on detecting the gun through the camera setup attached to system. After capturing an image of weapons, it processes the image through the OpenCV and detects it. Dilmini S. J et al. [7]. proposed a unique method for character training, crime including weapons, crime prediction based on real-world data, and face and fingerprint identification. The suggested approach was tested, and the results of the subsystems were compared to find confirmation. The police report summary is also given a lot of weight by the system. Prof.Supriya Manwar et al. [8]. proposed ML models to detect weapons and identify criminal in real time, law enforcement officials can be alerted to potential threat quickly and effectively. This can help to prevent mass shooting and other violent crimes. Prof. Kiran Yesugade et al. [9]. describes the law enforcement with a more comprehensive tool for quickly identifying and apprehending suspects. Traditional methods are often slow and impractical in crowded places, so our system uses advanced techniques like Convolutional Neural Networks (CNN) and Haar Cascade algorithms to detect and recognize faces in real-time. Mr.S.Bharath et al. [10]. proposed a study for concealed weapon detection in real time video using Image Processing and openCV and Hear cascade and also focused on detecting the weapon in live CCTV streams and at the same time reduced the false negatives and positives

3 Proposed Methodology

The proposed methodology contains the following section. Preprocessing, segmentation, Feature Extraction, face detection, acquisition of camera, weapon detection, Feature Extraction, Template matching, weapon detected

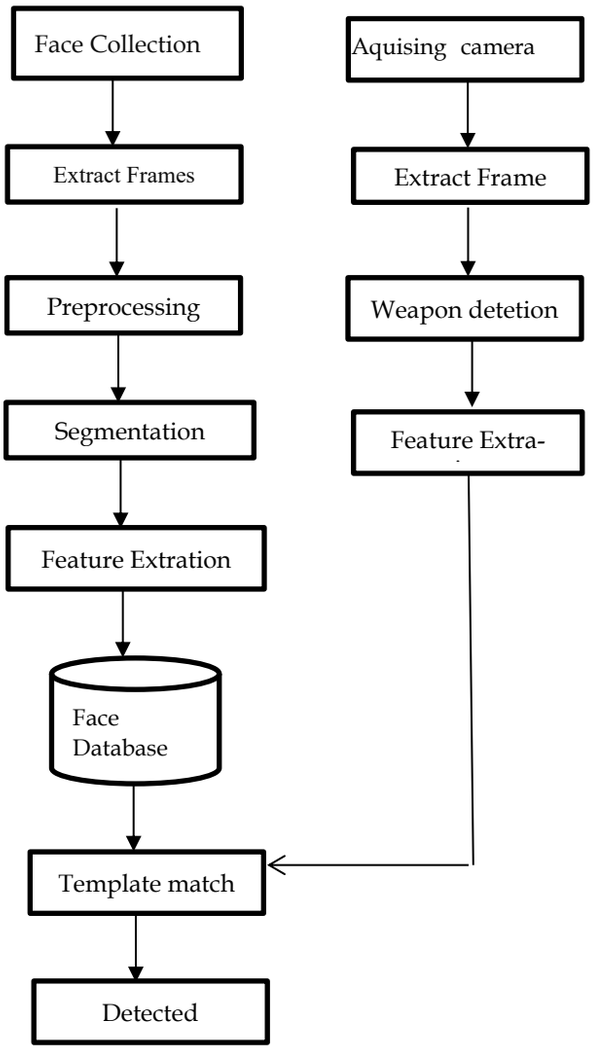

Figure 1: Flowchart of proposed methodology

3.1 Collection of faces:

The progress of a sophisticated weapon detection system for criminal face identifying hinges on the comprehensive collection and analysis expressions to optimize the systems accuracy of facial images this collection involves compiling a diverse database of faces representand robustness. which is mentained in fig2.

Figure 2: Collection of faces

3.2 Extract Frames

Individual frames are taken out from footage at predetermined intervals or in response to particular events, such motion detection, in order to build a system for face identification and criminal weapon detection. A weapon analytical model that has been trained to recognize and pinpoint weapons in a scene is then applied to each frame.

3.3 Preprocessing:

Before pictures of faces are input into identification methods, preprocessing in recognition of faces refers to a set of methodical procedures used to improve the consistency and quality of the images. Typically, identifying faces is the first stage in the process, when methods like the Haar cascade are applied.

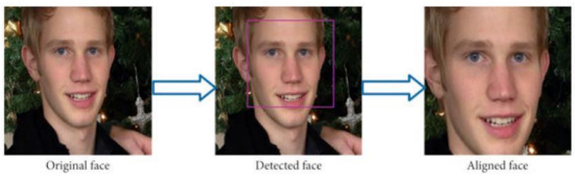

Figure 3: Preprocessing of face

3.4 Segmentation:

Segmentation plays a crucial part in recognizing faces by precisely extracting and analyzing features by isolating the face region from the rest of the image. Typically, face identification is the initial stage of the process, whereby potential face regions are recognized via the use of algorithms like Haar cascades or deep learning approaches that rely on pixel intensity patterns or learned attributes. After a face has been located, techniques for segmentation enhance it by precisely determining its boundaries inside the image, as fig. 4 shows.

Figure 4: Segmentation of face

3.5 Feature Extraction

In the feature Extraction .it uses harr feature to detect the edge, line and centre of the image which was mentioned as shown in fig3.

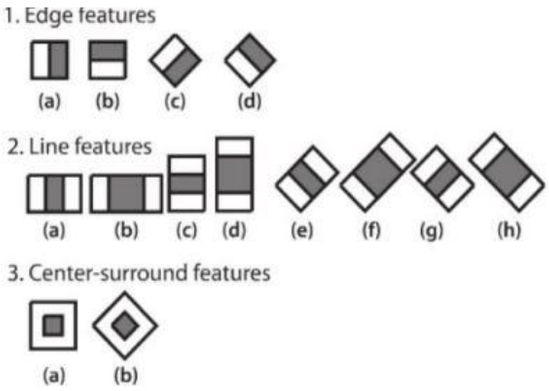

Figure 5: Common harr feature

3.6 Weapon Detection

The weapon detection process typically starts with detecting and localizing the weapon of individuals within an image by using CNN algorithm which is shown in the fig 6.

Fig 6: Weapon detected

3.7 Template matching:

The images in the database and the person with weapon present in front of camera contains similar features will get detected. And the details of the criminal will be displayed.

4 Experimental Result:

The project contains home page ,Criminal Registration page, and Result page.

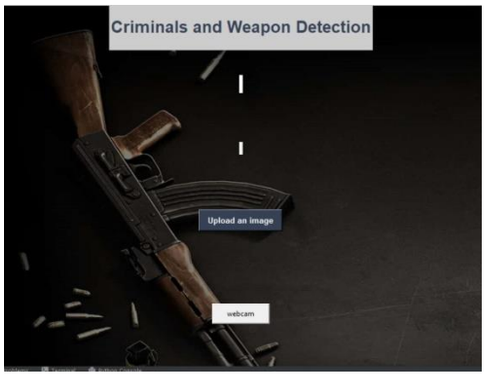

Figure 7: Home page

The values entered in a Home page as shown in the fig 7.

Figure 8: Detected Criminal

The resultant and detected weapon is as shown in the fig 8.

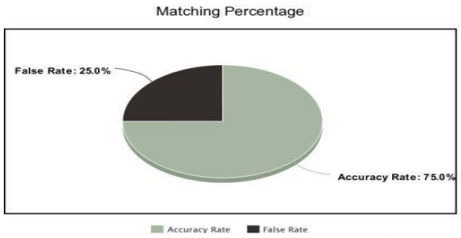

Figure 9: matching percentage of faces

The above graph gives the Accuracy and failed rate of Criminal

5. Comparative Analysis

Our proposed methodology contains more accuracy than other proposed system.

Author Name	Technology used	Accuracy
[1] Alireza Chevelwalla	Neural network is used to detect the criminal face with weapon	84%
[2] Atharv Somani	Cnn is used to detect criminal face with weapon	870%
Our method	Cnn and yolo provide clear detection with no blur	89%

Table 1: Comparative analysis

Face detection	Detected criminal	Result	Accuracy
		Matched	(8/14) *100= 57.14
		Matched	(6/9) *100 = 6 6.66
		Matched	(1/27) *100=3.7

Table2: Number of matched and unmatched Criminal

No of images	Detected images	Accuracy
300	290	96

Table3: Accuracy of detected and undetected images

6. Conclusion

Real-time processing is crucial for the effectiveness of the system, as it needs to analyze and detect potential threats in real-time. However, achieving real-time processing can be computationally demanding, requiring efficient algorithms and hardware infrastructure to handle the high volume of data in a timely manner. This would involve integrating multiple surveillance cameras and employing algorithms to track individuals and objects across camera feeds. The ability to track suspicious individuals or weapons across different locations can provide valuable insights and aid in crime prevention and investigation

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