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A REAL TIME CRIMINAL FACE RECOGNITION USING AN AUTOMATED SURVEILLANCE CAMERA

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Abstract: Face recognition is among the most reliable biometric identification methods, along with fingerprints, DNA, palm prints, hand geometry, iris recognition, and retina. Face recognition uses the distinctiveness of faces to enable biometric identification for security purposes. The limitations of facial recognition utilising biometric identification are the drawn-out process and erroneous findings. This essay makes suggestions for ways to speed up facial recognition while maintaining accuracy. Machine learning was used to complete the proposed facial recognition procedure. Multiple faces might be accurately identified using our improved face recognition technique.
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IndexTerms **- Criminal Identification, Facial recognition, Real-time, Open Cv**

I. INTRODUCTION

Facial acknowledgement innovation is a biometric strategy for distinguishing or confirming an individual's character utilizing their face. It has much utilization, including security, reconnaissance, and showcasing. With the progression of profound learning methods, like Cascade classifiers, the exactness and speed of facial acknowledgement frameworks have worked increasingly lately. In any case, despite its expected advantages, the utilization of facial acknowledgement innovation likewise raises worries about security, exactness, and predisposition. State-run administrations and associations really should cautiously consider these issues while executing facial acknowledgement frameworks and lay out clear guidelines and rules to guarantee that they are utilized morally and capably. Fundamental to human character is the face. It is the area that understands people the most. Face affirmation is a fascinating and difficult topic with many applications across many fields. For instance, explicit confirmation is required for access to security systems, banking, and ID verification, among other things. A face acknowledgement framework utilizes an information base of pictures and looks at one more picture against those to track down a match, on the off chance that one exists. For every facial picture, distinguishing proof should be possible by involving the RGB values for the eye tone, the width and level of the face, and utilizing different proportions [2].

II. RELATED WORK

Hubel and Wiesel's research on the visual cortex of a cat served as the initial source of inspiration for convolutional neural networks [3]. Small cell districts in the visual area are sensitive to particular areas of the visual field. To put it another way, if certain regions of the visual field are stimulated, those cells in the visual area are also active. The shape and orientation of the items in the field of attention are also important to the functioning of the energised cells.

The oldest brain model was the neocognitron[3], which was based on these organic drives. The absence of the concept of weight sharing was the most obvious of these disparities. The most obvious of these disparities was that no attempt was made to share the weight. LeNet-5, one of the most used fully convolutional architectures, was created. Banks utilised this organisation to identify handwritten numbers on checks. The convolutional brain network hasn't changed much since then; the main difference is that it now employs additional layers and has reliable initiation that closely resembles the ReLU. In addition, there are a variety of hardware alternatives and training strategies that may be used to improve training results when using deep networks and large data sets. Face recognition, object detection, semantic segmentation, and image captioning have all been successfully accomplished using CNN. Complex and sophisticated models like R-CNN, Fast RCNN, and Faster R-CNN [5] have been developed for many object detection models used in autonomous vehicles, facial detection, and more [4].

III. LITERATURE SURVEY

Title	Author	Journal Name	Journal Year	Conclusion
Web frontend Realtime Face Recognition Based on TFJS	Chenyang Li, Chunfang Li	12th International Congress on Image and Signal Processing, BioMedical Engineering and Informatics (CISPBMEI)	2019	In this research, we suggested a real-time facial recognition system with a web front-end. We developed a design by examining various strategies, common APIs, and frameworks. After that, we put it into practise and ran several scenarios through it. The outcome demonstrates that user acceptance of front-end real-time facial recognition is high. In order to implement face searching or face swapping, the system will eventually be coupled with a video/live streaming website.
Criminal Face Recognition System	Alireza Chevelwalla et al.,	International Journal of Engineering Research & Technology (IJERT) ISSN: 2278-0181	2015	This system makes use of our face recognition system, which makes use of the colors, features, and distances of a face. Our system allows two modes of operation, one with very few false positives and one with very few false negatives, thanks to its two degrees of freedom. We have demonstrated a number of issues with the face recognition process, including the lighting and background conditions of the facial images.
				The creation of a face detection algorithm that is less prone to error and failure and works well regardless of skin color could lead to future enhancements to our system. Additionally, it would be impossible to fool the system by altering facial features with a more extensive feature set.
Face Detection and Recognition System using Digital Image Processing	Gurlove Singh, Amit Kumar Goel	Proceedings of the Second International Conference on Innovative Mechanisms for Industry Applications (ICIMIA 2020) ISBN: 978-1-72814167-1	2020	Since the time when the The system's accuracy for both manual and automatic face recognition was less than 90% because the number of Eigen faces that may be employed is constrained by the PCA transformation. It takes more effort to fully automate the frontal view face detection system, which, when virtually demonstrated, exhibits flawless accuracy. The performance of this system in the real world will be far more accurate. The system that was created and constructed lacked enough strength to attain a high accuracy rate. One of the key reasons for this problem is that the face segmentation system's subsystem does not show minute variations in the degree of stability to scale or rotation of the segmented face image. The created system's performance can only be compared to manual face detection if the eye detection method is included.

Facial emotion recognition using deep learning: review and insights	Wafa Mellouka, Wahida Handouzi	The second International Workshop on the Future of Internet of Everything (FIoE) will take place in Leuven, Belgium, from August 9 to 12, 2020.	2020	This paper discussed the most recent research on FER and provided us with information regarding the most recent developments in this field. We have discussed several CNN and CNN-LSTM designs that have recently been developed by various researchers in order to have and attain an accurate detection of human emotions. A number of databases have also been given by us, some of which comprise naturally occurring photos from the outside world, while others were developed in labs (See Table.1). We also discuss the high rate that researchers have obtained, which demonstrates that machines of today will be better able to interpret emotions and that human-machine interaction will become increasingly natural.

IV. PROPOSED METHODS

The suggested system is composed of four steps: real-time picture training, multiple face detection, real-time image training and comparison with security camera images, and comparison-based outcome. Frames will be created from the camera's video using the method we propose. A face in a frame is pre-processed to reduce noise and redundant data when it is detected. In comparison to conventional methods of identification, the proposed system would be more reliable, less prone to human error, and would contribute to faster case resolution. By utilizing the power of machine learning algorithms and computer vision techniques, this would enhance the speed, accuracy, and efficiency of criminal identification.

V. METHODOLOGY

When it comes to object detection, which is the process of locating instances of objects in an image or video, cascade classifiers are a popular algorithmic approach. The objective of a real-time criminal face identification system that makes use of automated surveillance cameras would be to identify human faces that correspond to those in a database that contains known criminals.

Here's a step-by-step overview of how such a system could be built using Cascade classifiers:

1. Data collection: Make a substantial collection of negative examples as well as images of known criminals. To ensure that the system can recognize faces under a variety of lighting conditions, angles, and occlusions, it is essential to have a diverse and representative dataset.
2. Data preparation: By cropping and resizing the images to a standard size, like 128x128 pixels, you can prepare the dataset for training. To make training easier, each image must also be label a criminal or not.
3. Extracting attributes: Utilizing a technique like Local Binary Patterns (LBP) or Haar-like features, extract features from the prepared images. The image's shape, texture, and contrast are all captured by these features. An open-source tool like OpenCV can be used to extract features.
4. Training the classifier: Utilize the extracted features and labelled data to train a Cascade classifier. The algorithm is trained to distinguish between criminal and non-criminal faces using a supervised learning method for the classifier. As the cascade progresses, a cascading structure of decision trees that is capable of face detection with increasing accuracy is created as part of the training process.
5. Evaluation: Make sure the trained classifier can accurately and reliably identify faces by evaluating them with against a separate test dataset.
6. Integration with the camera used for surveillance: Process the live feed in real-time to identify faces and integrate the trained classifier with the surveillance camera system.
7. Face recognition: Using the trained classifier, identify human faces in the camera feed by moving a window over the image at various scales and positions and applying the classifier to each window.
8. Recognition of faces: Match the recognized face to the information base of realized lawbreakers utilizing a matching calculation like Euclidean distance or cosine comparability. An alert is triggered to notify law enforcement if a match is discovered.
9. Continuous learning: Retrain the Cascade classifier and continuously add new images to the dataset to enhance the system over time.

It's essential to take note that the exactness of a facial acknowledgement framework can be influenced by variables, for example, the nature of the pictures or recordings, the size and variety of the preparation dataset, and the decision of element

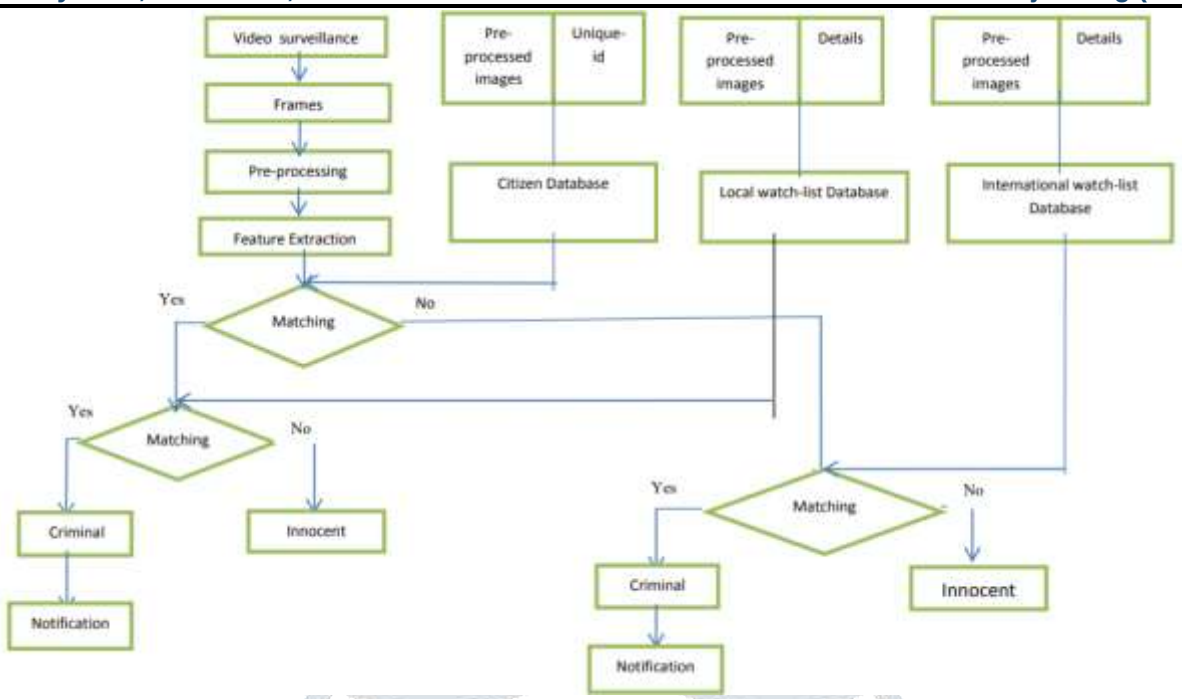

Fig: Flowchart of proposed methodology

The security camera captures a video or picture that is converted into frames. A face is pre-processed at the time it is identified in a frame. The process then moves on to feature extraction, where algorithms are employed. The aspects of handled photographs that are saved in the data collection are compared to the characteristics of the handled ongoing picture. If a match is discovered, it is further compared with the characteristics of images kept in a local data set to determine whether the person is a criminal or not. If he is a criminal, a warning is sent to the police academy via FireBase with his information and the best time to catch him under the camera's surveillance. In the unlikely event that a match is not discovered in the list, he is not guilty.

Fig. Face detector, Nose detector, Eye detector output

VI. CONCLUSION

In this challenge, we can instantly identify and recognise the faces of criminals in a photo taken by a camera. Cascade Classifiers have been incorporated into our OpenCV face detection method. It uses machine learning to prepare a fountain capability from a large number of both positive and negative photos. Then, various images are detected using it. Applications for crowd surveillance would benefit greatly from the face identification and recognition technology.

VII. REFERENCES

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