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"FACE IDENTIFICATION SYSTEM FOR IDENTIFYING THE CRIMINALS"

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Abstract-: Abstract. We all know that our Face is a unique and crucial part of the human body structure that identifies a person. Therefore, we can use it to trace the identity of a criminal person. With the advancement in technology, we are placed CCTV at many public places to capture the criminal's crime. Using the previously captured faces and criminal's images that are available in the police station, the criminal face recognition system of can be implemented. In this paper, we propose an automatic criminal identification system for Police Department to enhance and upgrade the criminal distinguishing into a more effective and efficient approach. Using technology, this idea will add plus point in the current system while bringing criminals spotting to a whole new level by automating tasks. Technology working behind it will be face recognition, from the footage captured by the CCTV cameras; our system will detect the face and recognize the criminal who is coming to that public place. The captured images of the person coming to that public place get compared with the criminal data we have in our database. If any person's face from public place matches, the system will display their image on the system screen and will give the message with their name that the criminal is found and present in this public place. This system matching more than 80% of the captured images with database images.

keywords:
Face Detection, Face Recognition, Open-CV, Image Processing

1. Introduction

Face identification systems have emerged as a cutting-edge technology in the realm of law enforcement, offering a powerful means of identifying criminals swiftly and accurately. Leveraging sophisticated algorithms, these systems analyse facial features such as the distance between the eyes, nose shape, and jawline to create unique templates for individuals. This enables law enforcement agencies to rapidly match suspects captured in surveillance footage or photographs with known criminals in their databases, facilitating the apprehension of offenders and the prevention of further criminal activity. While the integration of face identification systems into criminal identification practices holds significant promise for enhancing public safety, it also presents ethical and privacy challenges. Concerns regarding data security, potential biases in algorithmic decision-making, and the risk of false positives underscore the importance of implementing robust safeguards and regulations. Balancing the benefits of this technology with the need to protect individual rights and privacy remains a critical consideration as face identification systems continue to evolve and

proliferate in law enforcement and security contexts.

2. Literature Survey

2.1 Face detection-: We have used OpenCV which presents a Haar cascade classifier, which is used for face detection. The Haar cascade classifier uses the AdaBoost algorithm to detect multiple facial features. First, it reads the image to be detected and converts it into the grey image, then loads Haar cascade classifier to decide whether it contains a human face. If so, it proceeds to examine the face features and draw a rectangular frame on the detected face. Otherwise, it continues to test the next picture [3].

2.1.1 Haar features-: A simple rectangular Haar-like feature can be defined as the difference of the sum of pixels of areas inside the rectangle, which can be at any position and scale within the original image. This modified feature set is called 2rectangle feature. Faces are scanned and searched for Haar features of the current stage. The weight and size of each feature and the features themselves are generated using a machine learning algorithm from AdaBoost.

2.2 Face extraction-: The LBP operator is applied to describe the contrast information of a pixel to its neighbourhood pixels. The original LBP operator is defined in the window of 3*3. Using the median pixel value as the threshold of the window, it compares with the gray value of the adjacent 8 pixels. If the neighbourhood pixel value is larger or equal compare to the median pixel value, the value of pixel position is marked as 1, otherwise marked as 0. The function is defined as shown in equation 1. It can be illustrated in Figure 2.2. $N(x) = \{1, x \geq 0\ 0, x < 0\}$ eq. (1)

2.3 SQLite-: SQLite is a very popular database which has been successfully used with on disk file format for desktop applications like version control systems, financial analysis tools, media cataloguing and editing suites, CAD packages, record keeping programs etc. There are a lot of advantages to use SQLite for this application: 1) Lightweight: SQLite is a very light weighted database so, it is easy to use it as an embedded software with devices like televisions, Mobile phones, cameras, home electronic devices, etc. 2) Better Performance: Reading and writing operations are very fast for SQLite database. It is almost 35% faster than File system. It only loads the data which is needed, rather than reading the entire file and hold it in memory. If you edit small parts, it only overwrites the parts of the file which was changed. 3) No Installation Needed: SQLite is very easy to learn. You do not need to install and configure it. Just download SQLite libraries in your computer and it is ready for creating the database. 4) Reliable: It updates your content continuously so, little or no work is lost in a case of power failure or crash. 5) Portable: SQLite is portable across all 32-bit and 64-bit operating systems and big- and little-endian architectures. 7) Reduce Cost and Complexity: It reduces application cost because content can be accessed and updated using concise SQL queries instead of lengthy and error-prone procedural queries.

3. Project Concept:

The project concept of implementing a Face Identification System for Identifying Criminals revolves around the development and deployment of cutting-edge technology to enhance law enforcement capabilities. This initiative aims to create a robust system capable of accurately identifying suspects and known criminals through advanced facial recognition algorithms. Key components of the project include the development of sophisticated facial recognition algorithms, the compilation of a comprehensive criminal database, integration with existing surveillance infrastructure, and careful consideration of ethical and legal implications. By leveraging artificial intelligence and deep learning techniques, the system will analyse facial features to create unique biometric templates, enabling rapid and accurate identification of individuals involved in criminal

activities. Through rigorous testing, evaluation, and collaboration with law enforcement agencies, the project seeks to improve the efficiency and effectiveness of criminal identification processes, ultimately contributing to enhanced public safety and security. Additionally, the project will prioritize ethical and responsible use of technology, addressing concerns related to privacy, data security, and potential biases to ensure the system's integrity and fairness in law enforcement operations.

4. Proposed Working:

The proposed working of the Face Identification System for Identifying Criminals begins with the acquisition and preprocessing of facial data collected from various sources such as surveillance footage, photographs, and official records. Advanced computer vision algorithms are then employed to extract key facial features, including the distance between eyes, nose shape, and jawline contour. Utilizing these extracted features, unique biometric templates are generated for individuals and securely stored in a database. When presented with a new facial image or video frame, the system compares its biometric features against those in the database using sophisticated matching algorithms. Potential matches are ranked based on similarity scores and presented to authorized personnel for verification. Human judgment is crucial in assessing the accuracy of matches and making informed decisions based on additional context and evidence. The system continuously learns from feedback provided by users and updates its algorithms to improve accuracy and performance over time. Seamless integration with existing law enforcement operations ensures effective collaboration between the technology and human personnel, while adherence to ethical and legal standards ensures privacy protection, data security, and fairness throughout the process. Through this proposed working framework, the Face Identification System aims to provide law enforcement agencies with a reliable and efficient tool for identifying suspects and enhancing public safety.

5.Design Concept and Block Diagram:

1. Block Diagram:

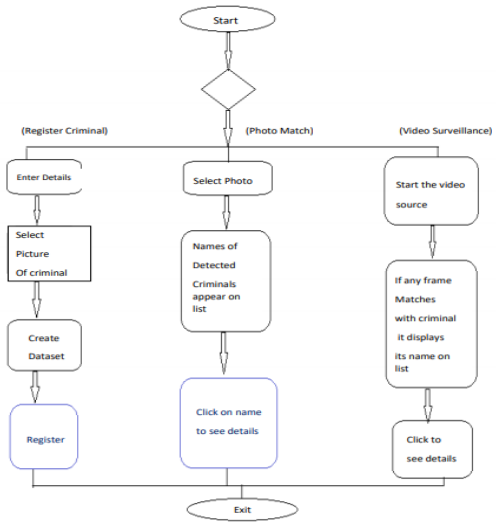

Fig: -1. Block Diagram

2. System Architecture:

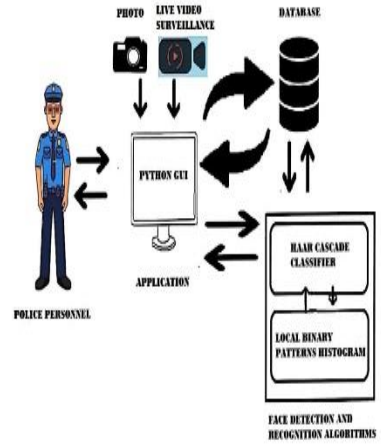

FIGURE 2 - ARCHITECTURE OF REAL-TIME CRIMINAL IDENTIFICATION USING FACE RECOGNITION

Fig: -2. System Architecture

6.Conclusion

In this project, we can detect and recognize faces of the criminals in an image and in a video, stream obtained from a camera in real time. We have used Haar feature-based cascade classifiers in OpenCV approach for face detection. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. Also, we have used Local Binary Patterns Histograms (LBPH) for face recognition. The project will be a

milestone for video-based face identification and for surveillance systems. Several advantages of this algorithm are: Efficient feature selection, Scale, and location invariant detector, instead of scaling the image itself, we scale the features such a generic detection scheme can be trained for detection of other types of objects (e.g., cars, sign boards, number plates, etc.). LBPH recognizer can recognize faces in different lighting conditions with high accuracy. Also, LBPH can recognize efficiently even if single training image is used for each person. Our application has some disadvantages like: Detector is most effective only on frontal images of faces it can hardly cope with 45° face rotation both around the vertical and horizontal axis.

7.References

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