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Sketch-Based Image Retrieval System for Criminal Records

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Abstract - An Overview of the facial recognition system using computer vision algorithms. The algorithm mainly uses the dlib library for finding the faces, estimating face landmarks, and Deep convolutional networks for pattern matching. Sketch-based image retrieval (SBIR) is a system where the user provides a sketch as input to the system to retrieve images relevant to the given sketch. Content-based image retrieval (CBIR) is widely used for retrieving images from substantial image databases. However, users are not satisfied with traditional information retrieval techniques. Therefore, the paper presents a simple and effective deep learning framework based on convolutional neural networks (CNN) for fast image retrieval, consisting of feature extraction and classification. From multiple studies on various CBIR tasks using image databases, we have yielded promising results that reveal important insights for improving the performance of CBIR.

***Key Words*:** Deep Learning, Face recognition, DCNN, Feature extraction, Image retrieval

1.INTRODUCTION

More and more criminal acts are taking place on a regular basis. Authorities attempt to identify the perpetrator based on clues such as Eyewitnesses, Closed-Circuit Television (CCTV) recordings, and Deoxyribonucleic acid (DNA) samples, etc at the crime scene. The eyewitnesses play an essential role. The eyewitness gives the drafter details of the suspect's or victim's facial features. The downside is that this process is time-consuming. To circumvent this problem, we devised a sketch-based image retrieval system.

The main purpose of this system is to obtain the most accurate images of criminals. The system is developed using his DCNN algorithm, a machine learning algorithm. The DCNN algorithm is a deep convolutional neural network that helps identify patterns in images or videos.

This article mainly deals with libraries such as face_recognition and dlib to solve presence system issues. The advantages and limitations of the library will be discussed in the next post. It also discusses the rationale and feasibility of the required optimal solution. Before discussing the above points, let's first discuss the basics of facial recognition, then discuss the hurdles we face in solving problems using these technologies, and the solutions to those challenges. The system is designed so that the algorithm saves time when the face is first displayed in CSV format in the video. To arrive at such a result, we first need to handle the following tasks:

• Explore methods and basic principles of face recognition
• Analyze the methods the library uses to solve the problem

These points should be considered when building an algorithm. This is done with the help of libraries.

2. LITERATURE SURVEY

A crime scene artist creates a sketch based on the memories of witnesses [1]. To ensure law enforcement moves forward, we want a particularly efficient and powerful system for capturing evidence images. Forensic evidence sketches are usually made due to the difficulty or incomplete liability of witnesses, leading to inaccuracies and shortcomings. To date, the largest study [2] most effectively considers important aspects of a suspect's appearance and consists of a face and part of a forensic cartoon. Additional semantic information was overlooked, in addition to things like pores, skin tone, and eye color.

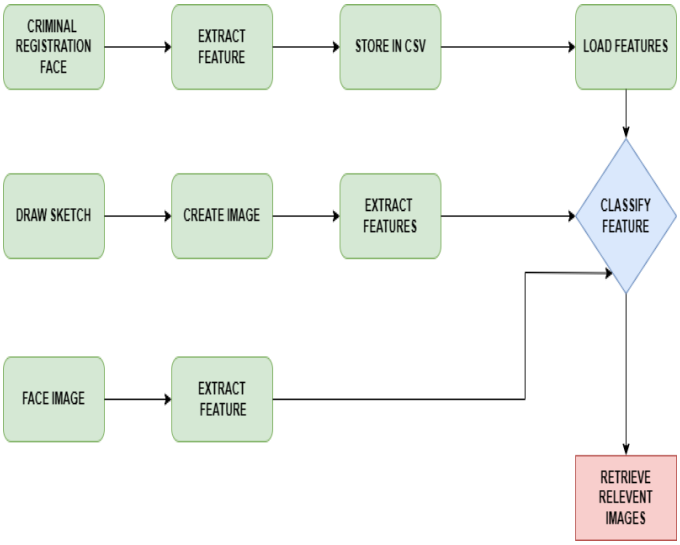
Khan et al. [3] provided a way for retrieving mugshot photos from cartoon pics. to research the local part of mug-shots and sketches, they provided a Bayesian classification-primarily based technique. Khan et al. [4] proposed an approach for retrieving suspects' images primarily based on linguistic

descriptions furnished by way of an onlooker. They proposed to convert the enter linguistic description given through an onlooker into facial attributes and their descriptions. A facial characteristic vector has then generated the use of the facial attributes. Face attributes vectors are derived from database photographs all through the education technique. A cluster-based totally ensemble category technique is used to get the face photographs that correlate to the entered language description.

SeekSuspect is an interactive suspect retrieval device advanced by using Jain et al. [5] that can find suspects most effectively based totally on the informant's visible memory. Sagayam et al. [6] provide a semantic photo retrieval-primarily based content material-primarily based picture retrieval method. They verified the usage of present algorithms by including three-D characteristics to boost the machine's performance degree. Suwannakhun et al. [7] proposed a geometrical face version joint with an identity gadget to reduce errors in retrieval. In this technique, the identity of the character with the id card is checked and compared with the present face photo database. Chuo et al. [8] proposed a suspicious face detection model. They music

suspicious interest inside the camera and compare the suspect's Face images from multiple surveillance cameras. Shrivastava et al. [9] proposed a face retrieval system. The input in their approach consists of visual input from the user trying to get the desired image of the target face. The results of the experiment were based on a small data set, which is one of the drawbacks of their approach. Ounachad et al. [10] proposed a sketch-to-face retrieval approach. Based on the sketch, get the suspect's face image from the database. Face images were acquired using Euclidean distance, Murkowski distance, Manhattan distance, and Chebyshev distance. However, sketch-based facial recognition can be hampered by eyewitness noise. Avoid this noisy information from witnesses and get the facial images of the most relevant suspects. The proposed work accepts verbal descriptions as input and finds the best images from a repository of faces.

3.SYSTEM ARCHITECTURE AND METHODOLOGY



Before devising an algorithm for criminal records, the following issues should be addressed-

• Find Faces – the faces should be recognized from the image.

• Position of faces –In real-world test cases, we mostly see faces that are rotated or not in the correct position, i.e. not facing

the camera. The primary purpose of this point is to turn the image so that it is taken directly in front of the camera

• Identifying unique facial features – This is the main step of the facial recognition system. In this step, the unique facial features of the face are captured and stored in digitally valued forms.

• Identifying the person – the received data from the input image is later compared to the data available to us, if both of the data are similar, then the system should retrieve related images.

We proposed the sketch-based image retrieval system in which the system extracts the most prominent features from the image. Dlib library and DCNN algorithms that are targeted and optimized to recognize these specific features are then used for detection and recognition. We are using deep learning techniques to train the criminal dataset.

Step 1: In this article, we will consider in detail all the steps to build a face recognition system and implement it using the above libraries. The first and main step in developing such a system is to identify faces from a given image.

Step 2: After finding the faces in the image, the next problem we face is the position of the face. In most images, the face is not centered as required by the algorithm. Otherwise, it will affect the algorithm's performance and accuracy. To solve this problem, we use Face Landmark Estimation. The basic idea is to find 68 specific points (called landmarks) that exist on each face- the top of the chin, the outer edge of each eye, the inner edge of each eyebrow, and so on. Then train the machine learning algorithm to find those 68 specific dots on each side.

Step 3: We use a DCNN which will be trained to identify 128 unique numeric facial features. The next step is to train a deep convolutional neural network to generate unique numeric values for 128 features out of a huge number of criminal images in the database. Once the neural network is trained, it can take input from never-before-seen faces and instantly generate unique features.

Step 4: The final step of the algorithm will be comparing the faces to available faces i.e., the available 128 features which were obtained in the previous step are compared to the data we have, if the data is matched then the system will retrieve related images of the criminal from the dataset

4. CONCLUSION

We went through several algorithms and approached models for different types of image retrieval from input data. We found a deep learning approach model/ algorithm provides more accuracy and precision for detecting the face of a person even if it continues to be in motion. It proves to be more efficient and faster to process the criminal face in real-time, as time plays an important role in immediate action in the crime branch Further implementation of this project will have a good effect on those where level 1 techniques can be directly applied. Trademark image searching is an obvious example – while the technology of image retrieval may not be perfect, it is already good enough to be useful in a commercial environment. Other areas where retrieval by primitive image feature is likely to be beneficial are crime prevention (including identification of shoe prints and tire tracks as well as faces and fingerprints), architectural design (retrieval of similar previous designs and standard components), and medical diagnosis (retrieval of cases with similar features). Video asset management is an area that is already benefiting from SBIR technology, in the form of shot boundary detection and keyframe extraction.

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