

Face Sketch Creation and Identification

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Abstract – Forensic face sketching is a technique used by Investigatory organizations to help identify suspects in criminal investigations. This paper will discuss the process of forensic sketch construction and identification. The paper will begin by providing an over view of the history of forensic sketching and its role in criminal investigations. It will then describe the process of creation of a face sketch, including the initial interview, sketching techniques, and finalizing the sketch. The paper will also discuss the challenges and limitations of forensic sketching and identify potential solutions to these challenges. The paper will conclude by giving a summary of the present status of the research in this field and proposing possible are as for further study.

Keywords- Face Sketch and Construction, Face Recognition, Criminal Identification, Deep Learning, Cloud Computing, AWS.

I. INTRODUCTION

Forensic sketching has been used by Investigatory organizations for decades to help identify suspects in criminal investigations. A forensic sketch is a visual representation of a suspect's facial features and other physical characteristics that can be used to help witnesses or victims identify the perpetrator. The accuracy of a

forensic sketch can be crucial in solving a case, and the process of creating a sketch requires skill and expertise.

History of Forensic Face Sketching:-Forensic sketching has its roots in the late 19th century, when law enforcement agencies began using photographs to help identify suspects. However, photographs were often of poor quality, and witnesses or victims may not have been present at the time of the crime. In the 20th century, forensic sketching became more common as artists began using their skills to create sketches of suspects based on witness descriptions.

Process of Creating a Forensic Face Sketch:-The process of creating a face sketch begins with an initial interview of the witness or victim. The artist will ask a series of questions about the suspect's physical appearance, such as the shape of their face, the color of their eyes, and any distinguishing features such as scars or tattoos. The artist may also ask the witness to describe the suspect's clothing or other details that could help in the identification process.

After the interview, the artist will begin sketching the suspect's facial features using a variety of techniques, including shading and cross-hatching. The artist may also use computer software to create a digital sketch. The artist will work with the witness to refine the sketch until it accurately represents the suspect's appearance.

Challenges and Limitations:-Forensic sketching can be challenging for several reasons. First, witnesses may have difficulty recalling the suspect's appearance, particularly if the crime occurred under stressful or traumatic circumstances. Second, the artist's interpretation of the witness's description may be subjective and influenced by personal biases. Finally, the accuracy of the sketch can be affected by factors such as lighting and the witness perspective.

To address these challenges, law enforcement agencies may use multiple witnesses to create a composite sketch or may use technology such as 3D facial reconstruction to create a more accurate representation of the suspect's appearance.

Current State of Research:-The field of forensic sketching is constantly evolving, and researchers are exploring new techniques and technologies to improve the accuracy of forensic sketches. Recent research has focused on using facial recognition software to match sketches to photographs or video footage, as well as developing new techniques for creating more realistic and accurate digital sketches.

II- LITERATUREREVIEW

Numerous research studies have looked at different methods for creating and identifying face sketches. According to a study by Kemp and others (2016), the accuracy of forensic sketches depends on the quality and detail of the witness's description. The study found that witnesses who provided more detailed descriptions produced more accurate sketches. The study also suggested that the use of an interactive sketch system that allows witnesses to make changes and adjustments to the sketch can improve the accuracy of the result.

In a study by Kovera and others. (2019), the researchers found that forensic sketches were more accurate than composite sketches, which are created using a computer software program. The study also found that the use of a sequential lineup, where witnesses view each suspect one at a time rather than in a group, improved identification accuracy.

Another study by Bruce and others. (2019) examined the impact of race on the accuracy of forensic sketches. The study found that witnesses were more accurate at identifying suspects of their own race, but that this effect was reduced when the sketch artist was of a different race. The study suggests that matching the race of the

sketch artist to the race of the witness may improve identification accuracy.

Zhang and others. In 2019, presented an automatic and effective photo to sketch synthesizing method based on Dual transfer, which includes both inter domain and intra domain transfer. This method is extremely difficult to implement and has a high computational cost.

Overall, these studies suggest that forensic sketch construction and identification is an important tool for law enforcement, but that its accuracy depends on a variety of factors including the quality of the witness description, the use of interactive sketch systems, the type of lineup used for identification, and the race of the sketch artist.

Therefore, all above the earlier methods were either inefficient or difficult to implement. This application as mentioned above not only overcomes the limitations of the specified proposed technique, but also own users to upload hand-drawn face sketches, thus linking traditional hand-drawn face sketch techniques with new modernized composite faces.

III -METHODOLOGY

This application allows you to create an accurate synthetic facial sketch using a predefined set of facial features provided as a tool that can be resized and repositioned as per eyewitness requirements/description. Here, the human face is categorized into different facial features such as head, eyes, eyebrows, lips, nose, ears, etc., and also, we can implement some important wearable components such as hats, eyeglasses in the application.

Security and privacy are the primary concerns of Investigatory organizations before customizing the system. Keeping this in mind, the application is designed to protect their privacy and perform security measures in the following ways:

a) Machine Locking: The Machine locking technique would ensure that the application once installed on a system could not be tampered and could not be operated on any other system, for which the application uses two locking parameters i.e., one software and one hardware locking parameter. HD ID – Volume serial of

hard-drive with OS. NET ID – Hardware ID – MAC Address.

b) Two Step Verification: Every law enforcement authorized user would be given an official E-Mail ID which would use to login on to the application, thus using this step would require the user to enter random code been shared with them on their mobile/desktop to complete the logging process.

c) Centralized Usage: The system which has the application been installed would be connected to a centralized server of the law enforcement department campus containing the database and the other important feature set of the application, thus the application could not be operated once disconnected from the server.

IV- DESIGN

System Flow

The images below show how the system generally works. It starts with a login screen and with a two-step verification confirmation. The program can also be used with hand-drawn sketches or customized face sketches created with the drag-and-drop feature. Each image then undergoes for a feature extraction process that helps the program apply image processing and computer vision algorithms before matching the sketch against a database and displaying the degree of similarity between the sketch and the photo in the database.

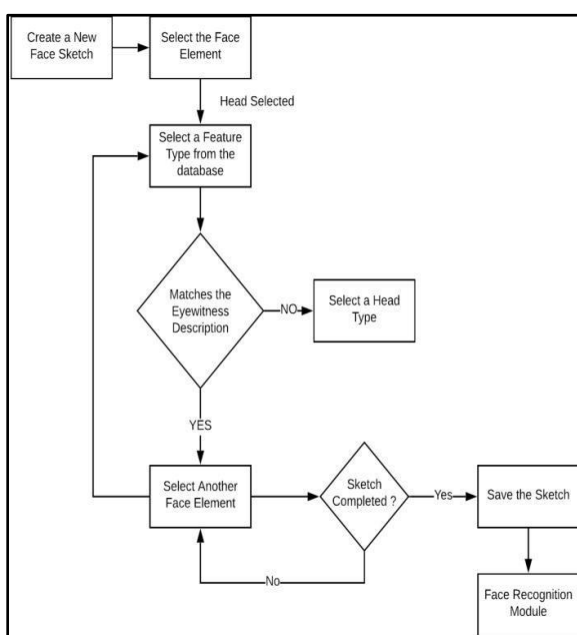


Fig. 1 Flow Chart for Creating Sketch in

Face Sketch Construction: This flowchart shows the user flow the platform followed to create an accurate face sketch based on witnessed description. The dashboard is designed to encourage people not to undergo professional training before using this platform, already saving the timeframe which would have been taken a lot of time and resources of the Department.

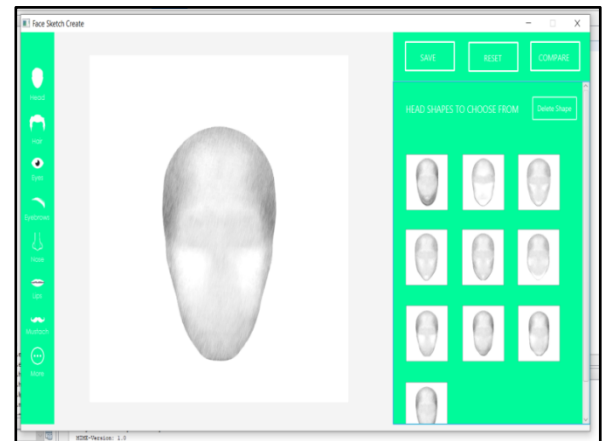


Fig. 2- User Interface of Sketch Creation

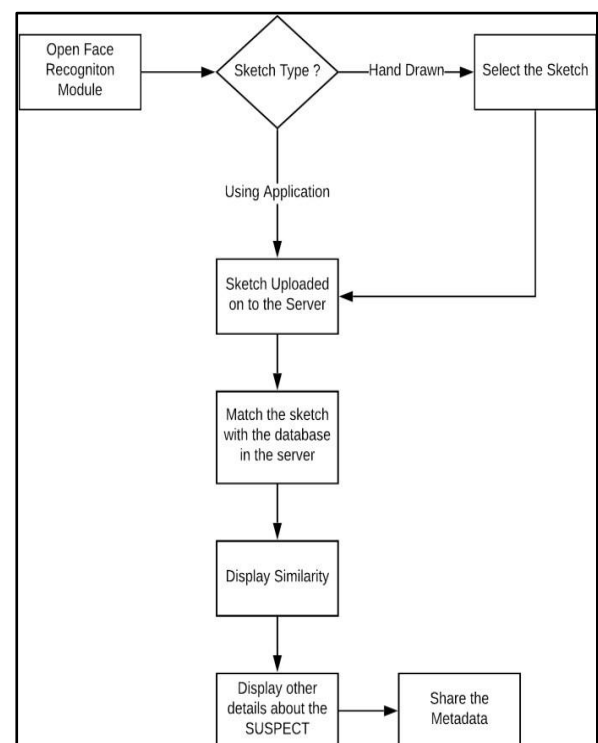


Fig.3 FlowChart for Recognizing a Sketch in the application

Face Sketch Recognition: This flowchart shows the user flow the platform goes through to recognize an accurate face

sketch based on eye witnessed description. The dashboard is simply designed to encourage people not to undergo professional training before already using this platform, saving many departments time and resource-consuming using timeframes.

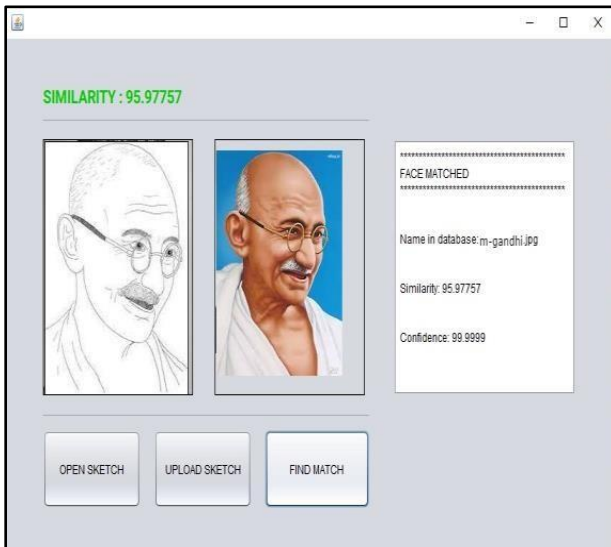


Fig.4- Face Sketch mapped to data base record

V – RESULT & DISCUSSION

The Project “Face Sketch Creation and Identification” has been designed, developed, and finally tested with real-world scenarios maintained from the first splash screen to the last screen, capturing data from records with security, privacy, and accuracy as key elements of each scenario. The platform exhibits excellent accuracy and speed, and the face sketch creation and recognition process achieve an average accuracy of over 90% with a 100% confidence level when tested with different test cases, test scenarios, and data sets. This is a very good tool according to relevant studies in this field. This platform has unique features that make it different compared to related studies in this area, making it stand out from all related studies and proposed systems in this area, thus improving overall safety and accuracy.

Table 1: Comparison of accuracy with other methods

Method	Accuracy(%)
ProposedMethod	94.6
HOG+GLCM Descriptor[2]	94.4
PCA/LDA+Geometric Information[6]	94
Generation using CNN[7]	93.8

When tested with various test cases, test scenarios, and datasets, the platform exhibits excellent accuracy and speed during the face sketch creation and recognition process, achieving average similarity of over 90%. The system achieved 94.6% accuracy and 100% reliability this is a very good rate according to relevant research in this area.

CONCLUSION

In conclusion, forensic sketching is an important tool in criminal investigations that can help identify suspects based on eyewitness accounts. The process of creating a forensic sketch involves an initial interview with the witness or victim, followed by using various techniques to create a sketch that accurately represents the suspect's appearance. However, forensic sketching can also pose challenges, such as difficulties in recalling details of the suspect's appearance and subjective interpretation of the sketch by the artist.

Despite these challenges, advancements in technology and research have shown promising improving the accuracy and reliability of forensic sketches. The application displayed aspice result from a security perspective by blocking the use of the platform if the MAC and IP address credentials did not match the user's assigned credentials in the data base. You can even generate a new OTP each time the OTP page is reloaded, or the user tries to log in to the platform gain. The platform exhibits excellent accuracy and speed, and the face sketch creation and recognition process achieve an average accuracy of over 90% with a 100% confidence level when tested with different test cases, test scenarios, and datasets.

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