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# Face Sketch Recognition System Based on Holistic Algorithm

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**ABSTRACT**: Face sketch recognition systems are widely used by the enforcement agencies . In most of the crimes none of the information is available and in some cases only the eye witness are available. In such cases forensic artist draw the sketch on the basis of information given by the witness. And these composites are posted in public places and media with the hope that some viewers will give information about the identity of the suspect. This method of identifying suspect is slow , tedious process and fails to leverage resources available to law enforcement agencies. So there is a need for a method that can automatically match facial composites to large police mugshot databases. This paper focuses on holistic based algorithm to match facial composites to mugshot automatically.

**KEYWORDS:** Facial composite recognition, Mugshot, holistic face recognition, hand-drawn composites ,software-generated composites, surveillance composites.

## I.INTRODUCTION

Biometrics are a method of uniquely identifying a person based on physical or behavioral traits. One type of biometric that are used by law enforcement agencies are face sketch recognition system. Facial composites are used to find the suspect involved in the crime when no facial images are available in crime scene. These composites are valuable when eyewitness' are only form of evidence. These facial composites are generated by the witness description and are posted in public and media with the hope that some views will provide information about the suspect. But these process of finding the suspect is slow ,tedious and may not lead to timely apprehension of suspect. So there is a need for a method that can automatically match the facial composites to large police mugshot. Mughot means photographs of a person who where arrested. In these paper we focuses on holistic based algorithm to match facial composites to mugshot.

Facial composites can be classified in to three categories:

a). *Hand-Drawn Composites*: Drawn from forensic artist based on description provided by one or more witness.Artist need proper training. Fig 1.a) shows hand-drawn composite.

b). *Software-Generated Composites*: Drawn by operator using software. Most used software's are identikit and FACES. Operator need training. Fig 1.b) shows software –generated composite.

c). *Surveillance composites* : Drawn by forensic artist.Based on poor quality surveillance images. Fig 1.c) shows surveillance composites.

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Fig 1.a) Hand-Drawn Composite b).Software-Generated Composites c).Survelliance Composites

## II.FACIAL COMPOSITE TO MUGSHOT MATCHING

There are so many algorithm that can match facial composite to mugshot. Here in these paper we focuses on holistic algorithm for matching facial composites to mugshot.

**Holistic Algorithm**

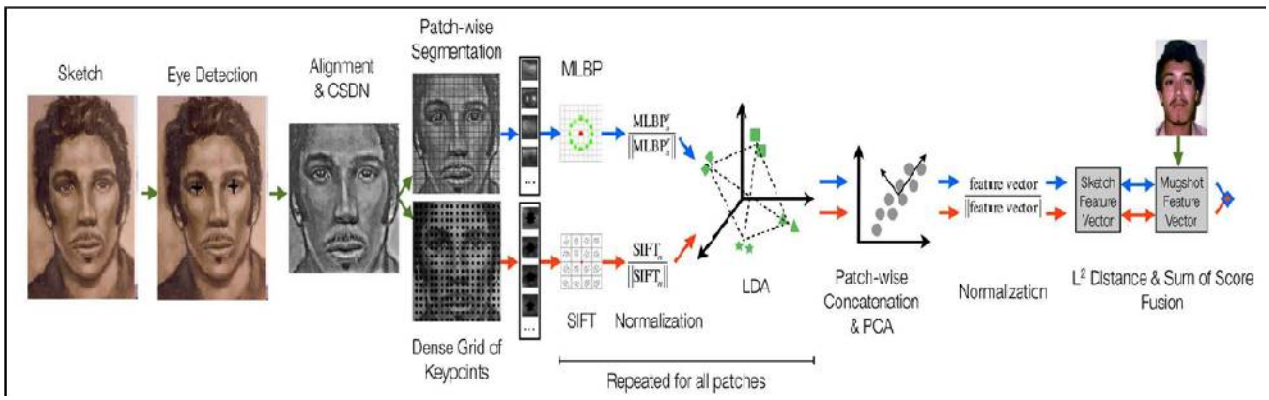


**Fig 2.HOLISTIC ALGORITHM**

The holistic method has been shown to be an effective technique for matching a facial sketch probe against a gallery of mugshots .The holistic algorithm starts with the detection of the eyes of the sketch that we are giving as input. Then the composites are normalized to a fixed height and width and transformed such that the left and right eyes are in same positon for every composites. Then CSDN that is center surround division multiplication is applied for the differences in the change of modularity. CSDN results in best matching performance for composites and reduces the complexity, this technique boost the algorithm speed. Then we apply to algorithms for feature extracion i.e, MLBP, SHIFT .These MLBP and SHIFT features are extracted in parallel from dense grid and uniform patches .For both MLBP and SHIFT features their subspace are learned using the LDA that is linear discriminant analysis. Later the projected fetures are concatenated to form a single feature vector. PCA(Principle Component Analysis) is used to decrease the template size and the resulting feature vector is normalized using the norm. Scores from the SIFT and MLBP representations are fused via a sum-of-score fusion rule after the z normalization.Normalisation using CSDN and feature extraction are described in detail ,shown below.

**A).CSDN (Centre Surround Divisive Normalization)**: It is interactions between centres and surround regions of the receptive fields. A constant plus a measure of local stimulus contrast.

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**B). Feature Extraction using SIFT and MLBP**:

1) SIFT (Scale Invariant Feature Transform): It is an algorithm in computer vision to detect and describe local features in images. For any object in an image, interesting points on the object can be extracted to provide a"feature description" of the object.

SIFT Algorithm Step

Step 1. Constructing a scale space

To create the scale space first successively blurring is done on original image using Gaussian blur.

Gaussian Blur

$L(x,y,6)=G(x,y,6)*I(x,y)$ (1)

Where, L - blurred image

x, y - Location coordinator

6 - Scale parameter (Amount of blur)

SIFT then takes scale space to next level and resize the original image to half size.

Step2. Laplacian of Gaussian approximation (LOG)

Typical LOG operation involve taking image, blurring it a little, calculate 2nd order derivative. It is good for finding key points in image but cost of computationally intensive. So, better solution is to use DOG. It is great for finding out the interesting key points in image.

Step3. Finding a key points

In this process has iterate through each pixel and check for all its neighbors, Checking is done within the current image and above and below it.

Step4. Eliminates edges and Low Contrast regions

In previous step lots of key points are produce. Some of them lie along an edge, and on they do not have enough contrast. In both case they are not useful as features, so need to get rid of them.

Step5. Assign and Orientation to key points

To provide rotation invariance most

prominent orientation in that region are figure out

2). MLBP (Multiscale Local Binary pattern) MLBP is extension of LBP operator.LBP proved to powerful local descriptor but inefficient in case of heterogeneous faces. In MLBP size of block indicates scale, yields more robust representation. Besides multiscale representation MLBP encodes not only microstructures but also macrostructures of image pattern and hence provide more complete image representation than LBP.

## III.APPLICATION DOMAIN

There are numerous application areas in which FR can be used, a few of which are outlined below:

**Verification :** When presented with a face image of an unknown individual along with a claim of identity, ascertaining whether the individual is who he/she claims to be .

**Identification :** Given an image of an unknown individual, determining that person's identity by comparing that image with a database of images of known individuals.

**Security**-: access control to buildings, airports/seaports, ATM machines and border checkpoints; computer/ network security; email authentication on multimedia workstations.

**Criminal justice systems**-: Mug-shot/booking systems, post-event analysis, forensics.

**Video indexing** (labeling faces in video).

**Image database investigations**-: Searching image databases of licensed drivers benefit recipients, missing children, immigrants and police bookings.

**Smart Card applications**-: In lieu of maintaining a database of facial images, the face-print can be stored in a smart card, bar code or magnetic stripe, authentication of which is performed by matching the live image and the stored template .

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**Surveillance**

**Access Control**- Face verification, matching a face against a single enrolled exemplar, is well within the capabilities of current Personal Computer hardware. Since PC cameras have become widespread, their use for face-based PC logon has become feasible, though take-up seems to be very limited.

## IV. RESULT

**Figure 3 shows the performance of holistic algorithm when matching hand –drawn composites to mugshots.**

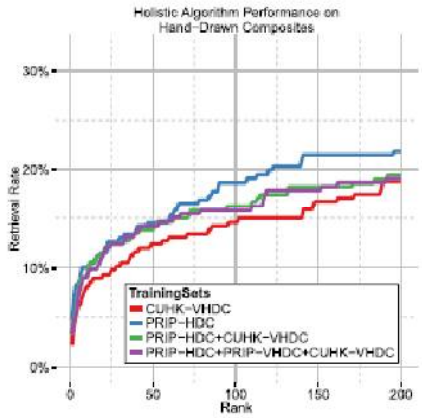


**Fig 3 Holistic algorithm performance on hand-drawn composites**

## V.CONCLUSION

In the proposed method, Test and Training images are initially filtered with CSDN to compensate for the differences related to the change in modality, and two different local feature descriptors are then extracted. A training set of prototypes is selected, in which each prototype subject has an image in both the gallery and probe modalities. Current face recognition systems have reached a certain degree of maturity when operating under constrained conditions however they are far from achieving the ideal of being able to perform adequately in all the various situations that are commonly encountered by applications utilizing these techniques in practical life. The ultimate goal of researchers in this area is to enable computers to emulate human vision system. The proposed system is working well for images of face with expression, size variation and illumination. Results achieved were accurate for recognizing faces.

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