

Sketch Analyzer: Human Face Sketch Analysis Technique

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Abstract— Suspect's sketches drawn on the basis of description given by victim or eyewitness plays very important role in cracking crime cases but still they are not effectively used due to some deficiencies in current system. In this paper we have proposed technique which can analyze the face sketches of suspects and find the match from the police mug-shot database to help Police narrow down potential suspects quickly. Face recognition technique is one of the most common biometric recognition techniques because people identify each other by their face. Currently if any sketch of suspect is drawn based on recollection of eyewitness, its copy is first sent to all police stations and then it is matched with every present record manually. This technique is time consuming and inconvenient hence we require a system which can analyze sketch of suspect and find the most likely data from database. The technique explained in this paper effectively reduces the time required to locate potential suspect.

Keywords— face sketch, Sketch Analyzer, facial ratios etc

I. INTRODUCTION

Face recognition techniques can be used to assist law enforcement. Police keeps records of every criminal they catch which involves criminal's personal details as well as their photographs. Whenever any crime takes place there are chances that the existing criminals are involved in a crime. In such cases if the photo image of suspect is available police can match that photo with photos available in the record but in most cases the photo image of suspect is not available to police. In such situation sketch drawing of suspect drawn based on the recollection of victims and eyewitness can be important evidence for police. Police can match the sketch with photos available in the record but this is most tedious as well as time consuming task. Here Sketch Analyzer can play important role as it can automatically retrieve most appropriate matches with sketch from the police mug-shot database. Sketch analyzer technique stated in this paper reduces efforts as well as time period required to find most appropriate match with sketch of suspect. It gives police narrowed list of criminals from mug-shot database. Police claim that nearly 20% of the sketches drawn in 2012 year helped crack the cases concerned.[4] It states that how much suspect's sketches are helpful to crack the crime cases. But this rate of cracking cases using suspect's sketch could be increased by automatically searching through a photo database using a sketch drawing. Automatic retrieval can not only help

to locate suspect but it also help to eyewitness as well as artist to modify the sketch interactively based on the similar photos retrieved from photo database.

II. CURRENT SYSTEM

Currently in India there is no any automatic photo retrieval technique used by police to retrieve photo from available records. Police are manually matching suspect's sketch with available criminal's records one by one which become a very tedious as well as time consuming task for them. Whenever any sketch is drawn based on recollection of victim and eyewitness it's copy is sent to all police stations and then it is matched with every present record manually. As sketch is supposed to match with thousands of photo records there is great possibility that some records could be missed to match as well as it can be ignored by some police station due to any reason. Hence this manual technique is not much reliable.

III. LITURATURE ANALYSIS

In psychology study, researchers have long been using various face drawings, especially line drawings of faces, to investigate face recognition by the human visual system [3]. Human beings can recognize caricatures quite well, which is a special kind of line drawings of faces, with particular details of a face accentuated, compared with the ability to recognize face photos[3]. Face recognition has attracted great attention in recent years. An important application of face recognition is to assist law enforcement. However, due to the great difference between sketches and photos, and the unknown psychological mechanism of sketch generation, face sketch recognition is much more difficult than the normal face recognition based on photo image [5]. Now a day's important of face recognition and application on face recognition goes on increasing. Literature says that market of Bio-metric application is now in huge demand. eg. Multimedia management, Security, Smart card, Banking etc. each and every sector have great importance of face recognition[5].

IV. PROPOSED SYSTEM

To overcome the problem related to current system we need technique which will automatically retrieve most appropriate photos matching suspects sketch. Sketch analysis technique proposed in this paper overcomes this problem related to

manual system. Sketch analysis technique makes use of the ratios of distance between various face components i.e. eyes, nose etc. The face is the feature which best distinguishes a person.[1] Almost every face is unique in nature. A slight difference in shape or size of components as well as distance between them makes every face look different from each other. Sketch analyzer makes use of these features of Human face to distinguish them from each other. Sketch analyzer evaluates various ratios of distance between various major face components like eyes, nose etc and makes use of this description to compare sketch with the photos from mug-shot database which will also be stored as description in database.

A. Abstract View of proposed system

Suspect's sketch will be given as input to sketch analyzer which will evaluate some mathematical ratios and will give description as output. Before doing this it is necessary that all criminal's photo images should be stored with description in the database using Sketch Analyzer. Description of suspect's sketch will be then provided to the efficient search algorithm to find most appropriate matches from database. Search algorithm will retrieve several matched description in maximum matched description to minimum matched description order. From the several matched results top N results can be considered and these results can be shown to victim or eyewitness to identify exact criminal. Sketch Analyzer assumes that the sketch or photo image of suspect is with neutral expression on face as well as in good clarity.

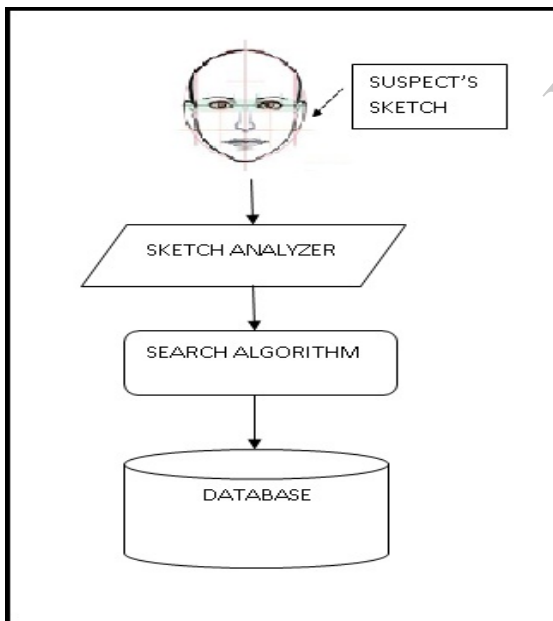


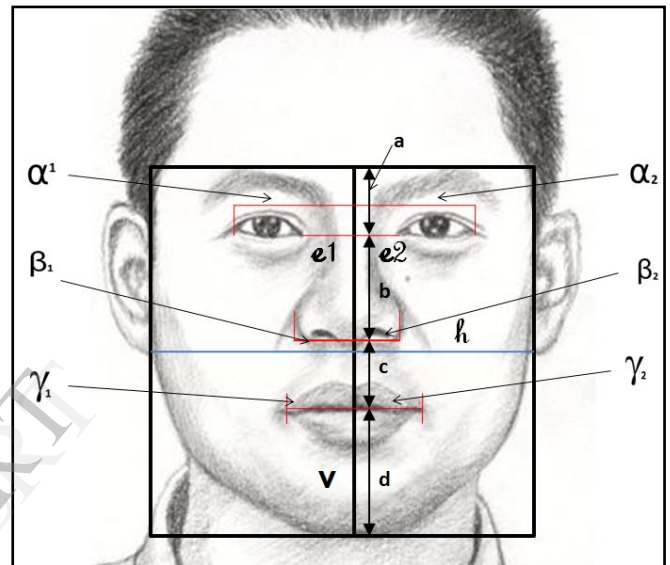
Fig.1 Abstract View of proposed system

B. Sketch Analyzer mechanism

Sketch analyzer consists of resizable Frame having vertical length denoted by 'v' and horizontal length denoted by 'h'. Vertical line divides sketch or photo image vertically and it is used as staring point to measure width of left and right side of nose, eyes etc. Sketch should be mapped with frame in such way that upper boundary of frame will touch an eyebrows,

lower boundary will touch to the chin and two side boundaries will touch to the left and right edge of face as shown in Fig. 2. Once the sketch is mapped to the frame all the inner measure lines are adjusted to the width of respective face component. These measure lines are used to evaluate or calculate facial ratios which will be used as description of sketch or photo image. This description is used to compare with the description of criminal's photo image records already stored in database.

As shown in Fig. 2 measure lines are mapped to the width of an eyes, a nose and mouth. Same procedure is followed whenever criminal's photo image record is stored as



description using Sketch analyzer.

Fig.2 Sketch Analyzer frame mapped with sketch

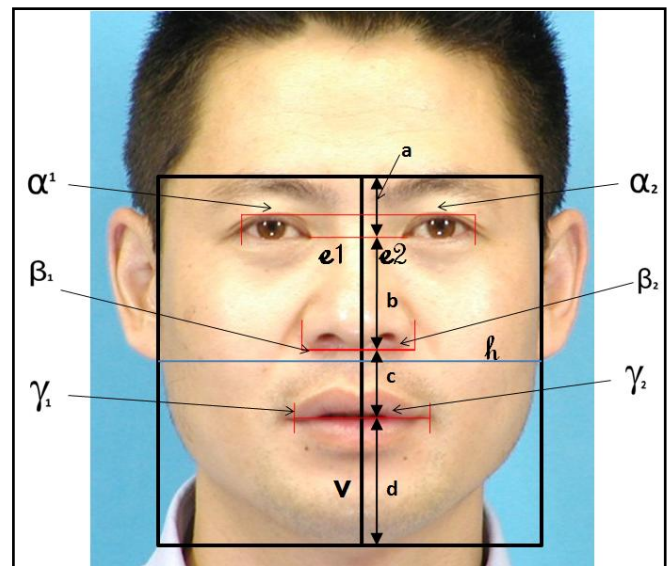


Fig 3. Sketch Analyzer frame mapped with photo image
Denotations used:

v = vertical measure of face.

h = horizontal measure of face.

α^1 = distance of lateral canthus(left eye) from vertical line.

α_2 = distance of lateral canthus (right eye) from vertical line.

β_1 =width of left nostril from vertical line v .

β_2 = width of right nostril from vertical line v .

γ_1 = width of left portion of mouth from vertical line v .

γ_2 = width of right portion of mouth from vertical line v

$e1$ = distance of medial canthus (left eye) from vertical line.

$e2$ = distance of medial canthus (right eye) from vertical line.

a = distance between upper boundary and lower eye level.

b = distance between lower eye level and lower level of nose.

c = distance between lower level of nose and mouth level.

d = distance between mouth level and lower boundary.

Φ = horizontal distance to vertical distance ratio.

Following Fig. shows various Facial Ratios.

$$\alpha = \frac{\alpha^1 + \alpha_2}{h} \quad \beta = \frac{\beta_1 + \beta_2}{h}$$

$$\gamma = \frac{\gamma_1 + \gamma_2}{h} \quad e = \frac{e1 + e2}{h}$$

$$A = \frac{a}{v} \quad B = \frac{b}{v}$$

$$C = \frac{c}{v} \quad D = \frac{d}{v}$$

$$\Phi = \frac{h}{v}$$

$$\text{Description} = \{ \Phi, \alpha, \beta, \gamma, e, A, B, C, D \}$$

Set of all these ratios is used as description of sketch as following:

Using search algorithm this description is compared with the description of photo image of criminal's stored in similar format in the database. Additional information can be added in description like identification marks on face which will additionally help to search record.

CONCLUSIONS

Sketch Analyzer will help to increase rate of criminal's identification using their sketch drawn based on recollection of victim or eyewitness.

Sketch Analyzer will decrease the burden or workload of manually matching suspect's sketch with every criminal's record.

Sketch analyzer will provide new way to crack the crime cases within minimum time.

Sketch Analysis Technique is more reliable than the traditional way of matching suspect's sketch with photo image of criminals as Sketch Analyzer will compare sketch description with every present record in database which may not be always possible in case of traditional way.

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