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REVIEW ARTICLE

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A Review: use of Facial Marks For Twins Face Identification and Image Retrieval

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Abstract: In recent years, with the development of digital image techniques, the use of digital image retrieval process has increased dramatically. This paper provides the review to the detection and identification of twin faces by first recognizing the face of individual twins by matching some of the basic features of identical twins like nose, lips, eyes, ears, forehead, and face features. After that, the system will retrieves all those images relevant to the given query image from the image database. But, there is a problem, by retrieving such images because it results in large amount of images of identical twins when require only the images of one out of the identical twins, as there is high degree of similarity in facial appearance in identical twins. It also requires large amount of space and processing. So, this paper presents the new approach called the retrieval of twin's images using their facial marks.

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Keywords: Facial Marks; Facial Recognition; Identical Twins; Image Retrieval

I. INTRODUCTION

Face recognition is an integral part of biometrics. In biometrics basic traits of human is matched to the existing data and depending on result of matching identification of a human being is traced. Facial features are extracted and implemented through algorithms which are efficient and some modifications are done to improve the existing algorithm models[4].

Image retrieval is the process of searching and retrieving images from a large dataset of different images.

Identical twin face recognition is a challenging task due to the existence of a high degree of similarity in overall facial appearance of the identical twins, and they cannot be distinguished based on DNA. The increase in twin births has also increased the requirement for biometric systems to accurately determine the identity of an identical twin [7]. As monozygotic twins have the same deoxyribonucleic acid (DNA) and, therefore, they cannot be discriminated using DNA. Thus, it is necessary to use other forms of identification for monozygotic twins. The study is about the usability of facial marks as biometric signatures to distinguish between Monozygotic or identical twins.

These facial marks are used to identify the individual twin to retrieve the images of a particular twin. In the next portion there is the description of types of facial marks.

II. CLASSIFICATION OF FACIAL MARKS

A facial mark is defined as a region of skin or superficial growth that does not resemble the skin in the surrounding area. Facial marks represent finer details on the face. They contain information useful to discriminate between identical twins [3].

1) **Mole**: A small flat spot less than 1 cm in diameter. The color of a mole is not the same as the nearby skin. It appears in a variety of shapes and is normally black in color.(shown in Fig. 1)

Figure 1. Showing a mole.

Figure 2. Showing a freckle

2) **Freckle**: A small flat spot less than 1 cm in diameter and appears in a variety of shapes. It is usually brown in color. (shown in Fig. 2)

3) **Freckle group**: A cluster of different freckles.

4) **Lightened patch**: A flat spot that is more than 1 cm in diameter and appears in different shapes. It is lighter in color than its surrounding area. (shown in Fig. 3)

Figure 3. Showing lightened patch

Figure 4. Showing a darkened patch

5) **Darkened patch**: A flat spot that is more than 1 cm in diameter and appears in different shapes. These spots are darker in color than their surrounding part. (shown in Fig. 4)

6) **Birthmark**: A persistent visible mark on the skin that is evident at birth or shortly thereafter. Birthmarks are generally pink, red, or brown in color. (shown in Fig. 5)

Figure 5. Showing a birthmark.

Figure 6. Showing a splotchiness.

7) **Splotchiness**: An irregularly shaped spot, stain, or colored or discolored area. (shown in Fig. 6)

8) **Raised skin**: A solid, raised mark less than 1 cm across. It has a rough texture and appears red, pink, or brown in color. (shown in Fig. 7)

Figure 7. Showing raised skin.

Figure 8. Showing a pimple.

9) **Pimple**: A raised lesion that is temporary in nature. (shown in Fig. 8)

10) **Pockmark**: A hollow area or small indentation.

III. REVIEW OF THE EXISTING APPROACHES

Pierrard *et al.* [1] presented a framework to localize prominent facial skin irregularities, like moles and birthmarks. They use a multiscale template matching algorithm for face recognition. A discriminative factor is computed for each point by using skin segmentation and local saliency measure and is used to filter points.

Phillips *et al.* [2] provided the detailed study on discrimination of identical twins by using different face recognition algorithms. They compared three different commercial face recognition algorithms on the identical twins dataset acquired at Twins Day festival in Twinsburg, Ohio. The dataset consists of images acquired under varying conditions such as facial pose, illumination, facial expression, etc. They observed that it is easier to distinguish between identical twins under controlled studio-like settings than under uncontrolled settings.

Srinivas *et al.* [3] provides differentiation between identical twins using facial marks as biometric signatures . They defined a set of facial marks (*e.g.* mole, pimple, freckle, birthmark, scar, raised skin etc.) alone. As Facial marks are considered to be unique characteristics of an individual. Facial marks are defined as visible changes in the skin and they differ in texture, shape and color from the surrounding skin. Facial marks appear at random positions of the face. So, different facial mark features are extracted to differentiate between identical twins. They have defined eleven types of facial marks including moles, freckles, freckle groups, darkened skin patch, lightened skin patch, etc., for the analysis.

Shinde Anagha *et al.* [4] described an approach to the detection and identification of human faces and then recognizes the person by comparing characteristics of the face to those of known individuals. The Principal Component Analysis (PCA) algorithm was implemented for face recognition system. The algorithm is based on an eigen faces approach. By using principal component analysis it becomes possible to get reduced set which is much easier to analyze and interpret.

The major advantage of PCA is using it in eigen face approach which helps in reducing the size of the database for recognition of a test images. Experimental results for different numbers of eigen faces are shown to verify the viability of the proposed method.

Patvardhan *et al*. [5] proposed an effective image retrieval scheme based on multi resolution wavelet transform. The proposed scheme is used to extracts both color as well as texture features of the query image for relevant image retrieval. The color feature extraction algorithm is wavelet based and inspired by standard Mpeg-7 Scalable Color Descriptor (SCD). It uses HSV color space and Haar wavelet transform for size reduction.

Syam B. *et al.* [6] presents an efficient approach to retrieve the medical images by using the aid of genetic algorithm and Squared Euclidean Distance (SED) with feature extraction process. In feature extraction first, the low-level features such as color, texture, shape, are extracted from the database medical images and from the query medical images. After that, the medical images which are relevant to the given query medical image are retrieved from the feature medical image database. This could be visualized from the precision recall determined from the retrieval results. The proposed CBIR based on GA have the benefit of the shape feature in addition to other features. The extracted medical images are most similar to the given query medical image.

Ricanek *et al.* [7] states that one of the most formidable Challenges facing biometric systems is discriminating between monozygotic or identical twins. They describe that the number of multiple births (from twins through octuplets) has been increasing over the past two decades due to advances in fertility treatments and when there is a higher probability of multiple births. Research indicates that identical twins' lifestyle choices and distinct experiences increase facial differentiation as they age. This paper mainly concerns with the aging factor of identical twins as identical twins are not so identical especially by the time they become adults.

Gonzalez-Diaz *et al.* [8] proposes a generative model that concurrently tackles the problem of large-scale query-by example image retrieval and region-of-interest (ROI) segmentation. The proposed method provides three main benefits with respect to traditional retrieval approaches: first, the segmentation of the ROI may be useful in many applications (e.g. video editing); second, it improves the retrieval process by enforcing the matches to fulfill a set of geometric constraints; and, third, using a mixture model to represent the matching process allows us to consider more than one image region being matched in a reference image.
So, their method improves the reliability on the matching process between a query image and a set of reference images. Furthermore, by taking advantage of the links to the ROI provided by the true matches and the proposed method is able to perform a suitable ROI segmentation.

Dass *et al.* [9] represents a new approach called image retrieval system based on Interactive genetic algorithm (IGA). In this work, representing and retrieving the image properties of color, texture and edge are used using interactive genetic algorithm (IGA). CBIR is still a developing science. As image compression, image feature extraction, and digital image processing techniques become more developed. So, in the research field CBIR maintains a steady pace of development.

IV. RELATED WORK

In the previous work there is the identification of identical twins based on facial marks. But, sometimes only the facial marks are not sufficient for the identification of identical twins. So, there is a need for using also the shape of the faces of identical twins along with facial marks. So, in the next portion there is the description of the proposed work.

V. PROPOSED WORK

First of all, the images of twins are collected and stored in the image database for the purpose of implementation of the proposed work. There is the need to collect the images of face only as per the requirement of proposed work. After that, following steps are performed one by one.

Step1: The first phase is used to find the skin area of face. The system will first read an RGB color image and then by using skin-tone analysis highlight the skin color.
Step2: In 2nd phase, by using principle component analysis the principle components such as nose, lips, eyes, forehead, and mouth etc. are extracted for matching.
Step3: In the next phase facial marks such as mole, scar, freckle and pimple etc. are detected. Then, by matching the corresponding mark locations between the two images characterizes each face image.
Step4: In the 4th module detects the shape of each face image by using locations from the center to the right, center to left, center to upward and center to downward.
Step5: After performing all the above steps the next phase is used for the retrieval of the required images.

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VI. CONCULSION

There are different methods of image retrieval such as content based image retrieval system (CBIR) and text-based image retrieval (TBIR). Different methods can be used for retrieving images of different kinds by recognizes the images in image database with the given query image. As the principle components (such as nose, lips, eyes, forehead and face) can be used to identify the identical twins but, in some conditions the resulting images may not be so accurate because of the high degree of similarity in the identical twin faces. So, In that case the facial marks along with the shape of face of identical twins can be used to differentiate among them. And then the system will retrieve only the required images.

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