A Literature Survey of Facial Recognition of Identical Twins

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Abstract: Biometric identification system must be able to distinguish between individuals even in situation where the biometric signature may be similar, such as in the identical twins. Main focus is on twin based image retrieval which retrieves all image from database by matching some of the basic features of identical twins like nose, lips, eyes, forehead and face features. With the advancement of computer technology Image Retrieval based on Identical twin face recognition is a challenging task because of the high degree of similarity in their overall facial appearance. Commercial face recognition systems exhibit poor performance in differentiating between identical twins under practical conditions as they cannot be discriminated based on DNA**.**

Keywords: Face recognition, Facial marks, Identical twins, Image retrieval

I. INTRODUCTION

With the advancement of computer technology image retrieval based on identical twin face recognition is a challenging task because of the high degree of similarity in their overall facial appearance. Commercial face recognition system exhibit poor performance in differentiating between identical twins under practical conditions as they cannot be discriminated based on DNA Therefore; other biometric traits are needed to distinguish between identical twins. The ability to distinguish between twins base done different biometric such as face, iris, finger print, voice etc, is a challenging and an interesting problem in biometric.

Biometric: Biometric comes from the Greek language and is derived from words bio (life) and metric (measure). A biometric system is basically a pattern recognition system automated methods of recognizing a person based on physiological or behavioral characteristics of a person.

• Physiological information: Information related to human shape of body like face, iris, retina, finger prints, hand geometry and palm point.

• Behavioral Information**:** Information related to behavioral of the person like voice, signature and keystroke dynamics. Some more promising biometric strategies are hand veins, facial thermo gram, DNA, odor and scent. Biometric technologies are a secure means of authentication because biometric data of every person is unique and cannot be shared cannot be copied and can't be lost.

A. Face Recognition:
Face Recognition is biometric identification by scanning a person's face and matching it against a stored template. Face Recognition can be used for both identification and verification of a person.

B. Iris Recognition:
Iris is small circle surrounding the pupil of the human eye. The structure of human eye is unique for every individual even this pattern is different for both the iris. Iris texture has a complex pattern that remains stable over time. Distance between public and the boundary of iris is unique for every individual and hence can be used for recognition purpose.

C. Retina Recognition:
Retina recognition biometric model is used to identify the individual's. There is no way to replicate a retina and the pattern of the blood vessels at the back of the eye is totally unique and never changes.

D. Fingerprint Recognition:
Fingerprint form during the gestational process. The ever changing fetal environment guarantees that each finger will have a different print and different formation.

E. Speaker or Voice Recognition:
Automatic speaker recognition (ASR) system use both physical and behavior based biometric traits to identify individuals. The physical properties of speech are determined by the shape of the mouth and the length and quality of the vocal chords, while the behavioral aspects of speech include pitch, volume as well as conversational mannerism.

Mimicry constitutes a primary challenge for ASR systems. A professional can imitate another person's voice or speaking style, but an identical twin can sound like a sibling simple because their voices have the same acoustic properties.

II. IMAGE RETRIEVAL

In recent years, with the development of digital image techniques and digital albums in the internet, the use of digital image retrieval process has increased dramatically. Image retrieval systems categorized as image retrieval research and development and it has two approaches text-based information retrieval (TBIR) and content-based image retrieval (CBIR).

A. Content-based image retrieval:
CBIR plays a significant role in the image processing field. Based on image content, CBIR extracts images that are relevant to the given query image from archives.

B. Application of CBIR:
• The CBIR systems have a big significance in the criminal investigation.
• The identification of unsubstantial images, tattoos and graffiti's can be supported by these system.
• Medical image storage and retrieval is one such application which requires huge storage space and not easily solved by computer.

C. CBIR Techniques:

Query Techniques: Query by example is a query technique that involves providing the CBIR system with an example image that it will then base its search upon.

Semantic Retrieval: The ideal CBIR system from a user perspective would involve what is referred to as semantic retrieval, where the user makes a request like "find pictures of Abraham Lincoln". This type of open-ended task is very difficult for computers to perform-pictures of Great Danes look very different and Lincoln may not always be facing the camera or in the same pose.

Content Comparison using distance measure:
The most common method for comparing two images in content based image retrieval is using an image distance measure. An image distance measure compares the similarity of two images in various dimensions such as colors, texture, shape and others.

III. LITERATURE SURVEY

Jain Anil et al. this paper give an introduction to biometric system which is basically a pattern recognition system. Biometric based user authentication system serve as a reliable means for meeting the challenges in today's world of information and network security. In this introduction to multi-biometric systems, their classification and various integration strategies and presented. Multi-biometric system employ more than one biometric trait and hence provide greater level of security as compared to unimodal biometric system. Its patterns are complex and have degree of randomness in them [1].

Lin et al. represented the face at multiple layers in term of global appearance, facial features, skin texture and irregularities that contribute towards identification. Global appearance and facial features are modeled using a multilevel PCA (principal component analysis) followed by regularized LDA (Linear discriminate analysis) [2]

Pierrard et states a framework to localize prominent facial skin irregularities, like moles and birthmarks. They use a multi scale template matching algorithm for face recognition. A discrimination factor is computed for each point by using skin segmentation and local saliency measure and is used to filter point. [3]

Sun et this paper presented a study of distinctiveness of biometric characteristics in identical twins using fingerprint, face and iris biometrics. They observed that though iris and fingerprints show little to no degradation in performance when dealing with identical twins, face matches experienced problems is distinguishing between identical twins. All of these studies were either conduct on very small twin biometric database or evaluated using existing in house or commercial matchers. [4]

Phillips et presented the first detailed study on discrimination of identical twins using different face recognition algorithms. They compared three different commercial face recognition algorithms on the identical twins dataset acquired at twin's burg, Ohio. The dataset consists of images acquired under varying condition such as facial pose, illumination, facial expression etc. [5]

Jain Arun et states various issues related to multimodal biometric system have been presented. By combining multiple biometric traits, the performance of biometric system can be improved various applications of multimodal biometric system and different levels of fusion are discussed. The multimodal biometric is very popular in these days due to its performance and advance level of security though some complexity also exists in multimodal system which reduces its acceptability in many areas. [6]

Srinivas Nisha et this paper provides differentiation between twins using facial marks alone. Facial marks are considered to be unique and inherent 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 random position of the face. By extracting different facial mark features they aim to differentiate between identical twins. There are eleven types of facial marks including moles, freckles, freckle groups, darkened skin, lightend skin, etc [7]

Shinde Anagha A.et in this paper approach to the detection and identification of human faces is presented and then recognizes the person by comparing characteristics of the face to those of known individuals is described. A face recognition system using the principal component analysis (PCA) algorithm was implemented. The algorithm is based on Eigen faces approach which represents a PCA method in which a small set of significant features are used to describe the variation between face images. Experimental results for different number of Eigen faces are shown to verify the viability of the proposed method. [8]

IV. CONCLUSION

It is observed that there is a high degree of overall facial similarity between the identical twins. The ability to distinguish between identical twins based on different biometric modalities such as face, iris, fingerprint etc, is challenging and interesting problem in the biometric area. They cannot be discriminated based on DNA. Therefore other biometric traits are needed to distinguish between identical twins, using face recognition to differentiate between of the high degree of similarity in their overall facial appearance. There have been several criminal cases in which either both or neither of the identical twins was convicted due to the difficulty in deterring the correct identity of the perpetrator.

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