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Differentiating Identical Twins by Using Conditional Face Recognition Algorithms

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Abstract: ***Reliable and accurate verification of people is extremely important in a number of business transaction as well as access to privileged information. Identical twins have the closest genetics-based relationship and therefore, the maximum similarity between face is expected to be found among identical twins. This paper presents facial features, which has important for the acceptance of expert proof in legal proceedings for determining the identity of an individual from facial images. Our experiments show that modal of face recognition systems can distinguish two different person who are identical twins. We show the effect of using a variety of facial surface representation and suggest a method of identifying identical twins. Performance results are broken out by lighting, expression, gender and age***.

Keywords*:* Facial landmarks, Face and gesture recognition, Identical twins.

1. Introduction

Authentic and precise verification of people is exceedingly important in a number of business transaction as well as access to favor information. Biometrics, which refers to automatic identification of people based on their physical or behavioral characteristics, is constitutionally more reliable than traditional knowledge-based (password) or token-based (access card) methods of identification. Identical twins can have biometric signatures that are very similar, especially when the signature is derived from a face image. While face recognition software system exhibited inadequate performance, there is other biometric modalities that can offer a performance increase at the cost of increased invasiveness. In this paper the focus is to review the performance of current face recognition algorithm on a dataset containing face image of identical twins. As the performance of face recognition system in constrained environment continues to improve focus is shifting from methods that improve face recognition performance in general, to methods that handle specific cases of failure. Until recently, a scenario that has been known to confound even human face recognition had not been studied for automated face recognition systems. This setup is the ability to distinguish between identical twins. Because identical twins are genetically equivalent, their facial appearance is also quite similar. Generally, differences in their appearance can only be attributed to exposure to different environmental factors and rare cases of genetic mutations.

The work flow of the system is shown below. The proposed system is based on four primary stages. The different phases are Preprocessing, Feature Extraction, Classification, and Verification.

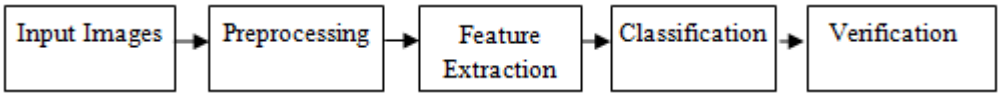

Figure 1: Basic Block Diagram for face recognition

The primary focus of this paper is to use different unspecified face recognition algorithms are experienced in various parameters. Performance is deliberate with respect to four covariates: (i) illumination, (ii) expression, (iii) gender, and (iv) age. There were two sessions; the first is set of experiments looks to differentiate between identical twins when images of subjects are taken on the same day. The next sets of experiments aim to distinguish between identical twins from images taken one year apart. The effect of the four covariates can then be applied to images taken on the same day and one year apart to assess the effect of elapsed time on the recognition of twins.

The use of face recognition in forensic applications is becoming more and more common, especially because when other biometric modalities may not be available. The main focus is to assess the performance of current face recognition algorithms on a dataset containing face images of identical twins.

2. Literature Review

J. R. Paone, J. M. Grant [1] presented the performance is reported for variations in illumination, expression, gender, and age for both the same day and cross-year image sets. Algorithms are designed to differentiate an image of one person from an image of another person or to confirm if the two images are of the same person.

A. Ariyaeeiniaa, C. Morrison, A. Malegaonkara [2] described a, speaker verification capability for discriminating between identical twins has been investigated. The additional challenge introduced by

monozygotic twins the process is due to their identical physiological developments.

M. Bronstein, M. M. Bronstein, and R. Kimmel [3] explored the use of facial surface data, derived from 3D face models (generated using a stereo vision 3D camera), as a substitute for the more familiar two-dimensional images. A number of investigation shave shown that three-dimensional structure can be used to aid recognition.

A. Jain, S. Prabhakar, and S. Pankanti, [7] proposed the most widely used measure of fingerprint similarity is based on minute details of the ridges if the relative configuration (e.g., placement and orientation) of ridge anomalies (endings and bifurcations) of two fingers is similar, then their minutiae-based similarity is high. The primary focus of the work is the fingerprint similarity based on the fingerprint minutiae information.

A. Wai-Kin Kong, D. Zhang [8] Examining an automatic palm print system on identical twins and Identifying their genetically related features. Identical twins having the closest genetics-based relationship are expected to have maximum similarity in their biometrics.

P. Jonathon Phillips, Patrick J. Flynn [11] proposed a, ability of face recognition algorithms to distinguish between identical twin siblings. Performance results are reported for both same day and cross year matching. Confidence intervals were generated by a bootstrap method. Recognition performance is reported for three of the top submissions to the Multiple Biometric Evaluation (MBE) 2010 Still Face Track. For the Cognitec FaceVACS system, there is greater overlap between the match distribution and the non-match distribution consisting of identical twin sibling face images than a general impostor distribution.

M. T. Pruitt, J. M. Grant [12] described a, three covariates are examined, namely expression, lighting, and glasses. For the baseline experiments, the expression is neutral, the lighting is controlled, and the subject is not wearing any kind of glasses
.
Zhenan Sun*a*, Alessandra A. Paulino*b*, Jianjiang Feng [13] presented the discriminability of some of the identical twin biometric traits. Multimodal biometric systems that combine different units of the same biometric modality show the best performance among all the unimodal and multimodal biometric systems, achieving an almost perfect separation between genuine and impostor distributions.

Brendan Klare, Alessandra A. Paulino [14] evaluated the accuracy of distinguishing between identical twin using the entire face, as well as each facial component (eyes, eyebrows, nose, and Mouth). The impact of discriminate learning methods on twin face recognition is investigated, while previous studies have provided a better understanding of the vulnerabilities of face recognition systems when presented with a twin imposter, in this offers some initial guidance for how face recognition systems can be designed to improve twin identification.

3. Problems of Confusion of Twins' Identities

In spite of the fact that the biometrics of identical twins is affected by many factors, some of them such as facial features are still very similar. Some identical twins share not only similar facial features but also the same signatures. Confusion over their identities has made it difficult for others to know who owns what and who does what. As a result, some identical twins partake in commercial scams such as fraudulent insurance compensation. Most importantly, if one of the identical twins commits a serious crime, their unclear identities cause confusion and uncertainty in court trials.

For the lighting covariate analysis, subjects had images taken both indoors under studio lighting and outdoors with uncontrolled lighting. In this instance, uncontrolled lighting Can range anywhere from direct sunlight to the amount of light visible through the clouds on a rainy day. Work on distinguishing identical twins based on other biometrics including palm print, fingerprint, iris, and speech recognition.

In introducing the Twins Days dataset, Phillips et al. examined a set of covariates and studied the effects of illumination and expression on differentiating identical twins. The identical twin impostor distribution to the general impostor distribution. Pruitt et al. later applied a set of algorithms to the dataset and studied the performance of each algorithm.

4. Proposed Work

The Fig 2 describes the Process flow of Detection of Identical twins. The proposed system is based on four primary stages. The different phases are Preprocessing, Feature Extraction, Classification, and Verification.

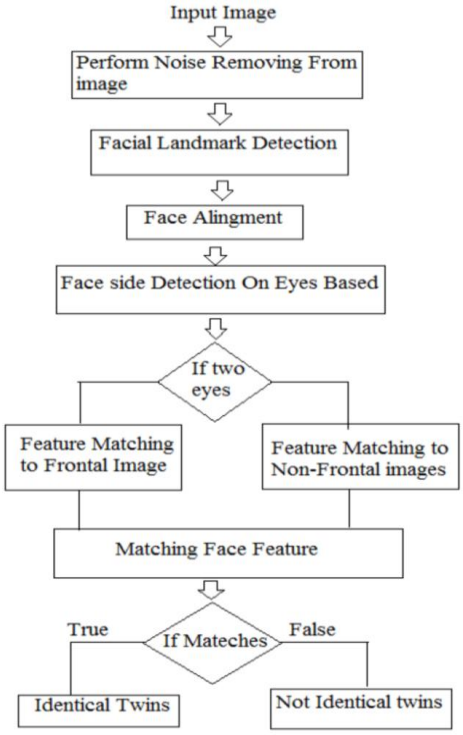

Figure 2: Process flow of Detection of Identical twins

A. **Preprocessing**
The aim of preprocessing is improvement of the image data that suppresses unwanted distortions or enhances some images features important for further processing.

B. **Feature Extraction**
Feature extraction is a special form of dimensional reduction. Transforming the input data into the set of features is nothing but the feature extraction. Two kinds of features are used in pattern recognition problems. One is face alignment and second one is face landmark. The similar facial components are placed into one groups while the others in different group. To encode this similarity, there is descriptor, which is useful for classification of similar facial feature.

C. **Classification**
After extracting the facial features their length, width and area are computed by some classifier. Classification is based on different conditions. This classifier helps to construct discriminating groups to recognize probe face sketch through face photos database.

D. **Verification**
The features of face are grouped in one category and are compared with already extracted feature of face and if matching is found indicates twins otherwise not. Basically dataset is collection of images having images of twins was used images of subjects were acquired at the Twins Day festival.

5. Conclusion

We conclude that using the Twins Days Dataset it is possible to distinguish identical twins under ideal and also give more accuracy in less ideal condition also using subject which is side view.

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