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Identical Twins Facial Recognition System Using Cloud

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Abstract:
Facial recognition algorithm should be able to work even when the similar looking people are found i.e. also in the extreme case of identical looking twins. An experimental data set which contains 40 images of 20 pairs of twins collected randomly from the internet. The training is done with the selected images of the twins using different training algorithms and inbuilt functions available. The extracted features are stored over the Amazon public cloud. As a part of testing phase random images from the dataset trained are selected and upon running it over the system we get the features of those images which then will be compared by extracting the features already stored in Amazon cloud. The stored values and the current image features are compared and result will be displayed on the GUI. Identical twin's facial recognition system uses the machine learning, image processing algorithms and deep learning algorithms. Regardless of the conditions of the images acquired, distinguishing identical twins is significantly harder than distinguishing faces that are not identical twins for all the algorithms.

Keywords: Identical Twins, Cloud, Facial Recognition, Image Processing.

1. Introduction

In computer technology classifying the images based on identical twin's facial recognition is a difficult task. Old facial recognition system shows very poor performance in finding difference in identical twins. Traditionally the experiments were performed to find out the difference between identical twins and also to recognize their features with difference and system like finger print, voice and iris recognition show the difference between the identical twins. In the existing methods many technologies are used for twin's identification like the finger print, the voice and the iris for the recognition. The finger print identification was used to identify the unique person. The method also proposed a scan image taken from the person and that image being compared to that in the database for identification. The iris recognition also has a similar method to that of the finger print identification system. This proposed system in this system will differentiate the identical looking twins using face recognition system.

2. Existing Systems

The existing systems are as follows:

1. Facial Recognition System
2. Eyes or Iris Recognition System
3. Fingerprint Recognition System
4. Voice Recognition System

2.1 Facial Recognition System

Facial Recognition system and biometric identification is done by scanning the human face and there by matching the with the stored images in the database. Face recognition system can be used as a platform to identify and verify a person.

2.2 Eyes or Iris Recognition System

Eyes are the important feature that is available on the face of a person. The structure of the eye may vary for everyone. Iris biometrics system will exploit the textural information from the iris that have been shown to be independent even between the irises of genetically identical faces of the

person. Automated iris biometric systems can differentiate between the two identical looking twins.

2.3 Fingerprint Recognition System

The fingerprint recognition system is done by scanning the human finger and matching with that of stored image or fingerprint in the database. This system can be used for identification and verification of individual persons.

2.4 Voice Recognition System

Voice recognition system uses both the physical and behavior based characteristics to identify the individuals. The physical characteristics of speech are found out by the shape of the mouth and length of the vocal chords and most importantly the quality of it. While the behavioral characteristics of speech involve the pitch, volume and also the conversational mannerism.

There a quite a few drawbacks of the above existing systems. The process of voice recognition system is based of unique person voice matching and this will identify the correct person. Fingerprint has more drawbacks as it has slow processing speed and which is vulnerable of getting hacked. Iris recognition system also has drawbacks i.e. there may be a mismatch of iris identification, the identification may take more time to process and if the person has some faults in the eyes then the iris recognition system is not the reliable system for identification purpose. In voice recognition system the drawback is that the individual may record and play the voice as to get into the system.

3. Literature Survey

Facial Recognition Technology is a challenging area in the pattern recognition and computer vision. Lot of research is completed in face recognition system. But still authors need to enhance the facial recognition system due the poor performance and under practical conditions [1]. Face Recognition (FR) across pose is a problem of fundamental importance in computer vision. Authors propose to address this problem using three novel techniques, viz., Spatial Differentiation (SD), Wavelet Transform based Feature Extraction (WTFE), and Twin Pose Testing Scheme (TPTS), to improve the performance of a FR system [2]. The paper measures the ability of face recognition algorithms to distinguish between identical twin siblings. The experimental dataset consists of images taken of 126 pairs of identical twins (252 people) collected on the same day and 24 pairs of identical twins (48 people) with images collected one year apart. Recognition experiments are conducted using three of the top submissions to the Multiple Biometric Evaluation (MBE) 2010 Still Face Track [3]. 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 [4]. There are several reasons for recent increased interest in face recognition, including rising public concern for security, the need for identity verification in the digital world, face analysis and modelling techniques in multimedia data management and computer entertainment [5].

4. Proposed System

The proposed system of Identical twin's facial recognition system uses few top frameworks and algorithms. Namely the frameworks and the algorithms used are OpenCv, Keras, TensorFlow, Computational Neural Network (CNN). This system includes image processing algorithm i.e. OpenCV, this will solve the computer vison problems. Keras which is a neural network library that is written in python. Tensorflow is binding of machine learning and deep learning that is basically

a multidimensional array which allows to present data in higher dimensions. Convolutional Neural Networks (CNN) is a deep learning algorithm which is made up of neuros with weights, which receives several inputs and takes a weighted sum over them and passes them through an activation function and responds with a proper output. Flask is a third party web application frame work is used to build a front end application for python code.

This paper proposes two modules i.e. Training Module and testing module. There are four main phases in the system namely:

1. Image Collection

The sample images of identical twins are collected from the internet and used in training the system.

2. Image Preprocessing

In this system, the image will have to be resized to 60*60 and the standard format used is JPEG images.

3. Feature Extraction

Features are extracted using the frameworks like OpenCv, Keras, TensorFlow, Flask and CNN algorithm. The features extracted from these are stored in AWS Public Cloud.

4. Comparison Phase

In this phase the images are selected locally and the features of the images extracted locally and those stored over AWS cloud are compared and appropriate results are displayed on GUI of the system.

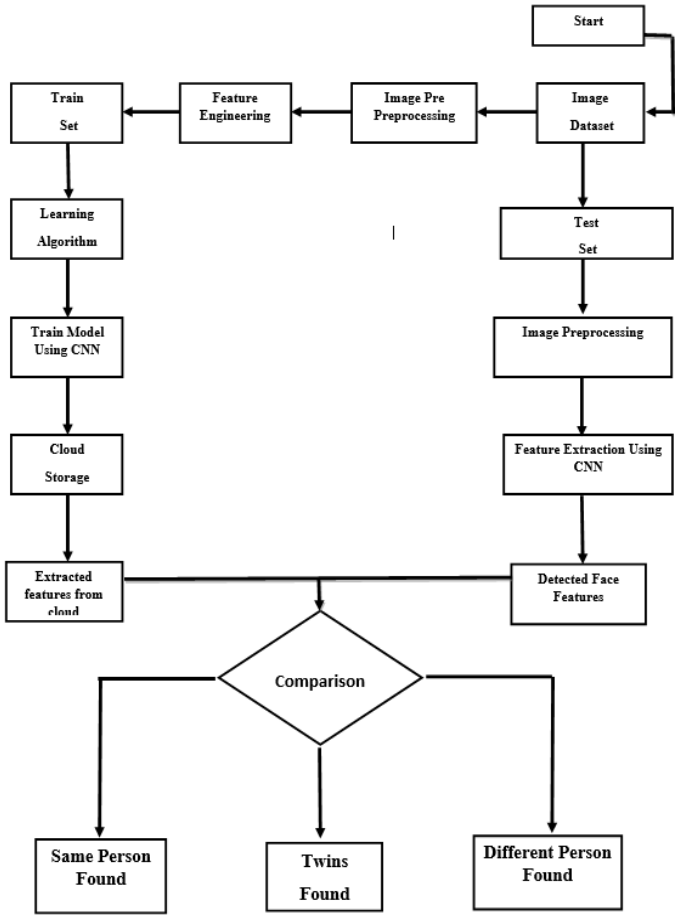

Figure 1: Overview of the System Architecture

The identical twin's facial recognition system has two main module designs:

1. Training Module Design
2. Testing Module Design

Firstly, the training module uses a local dataset as an input to the system for training the model. Upon selecting the dataset, the image processing phase is entered where the images of twins in the dataset are extracted and images are resized to 60*60 to just limit our system to get more clear view of just the face. There by remove all the unnecessary noise from the images.

The next step is to convert the data to compatible format in order to allow lower layers of the algorithm to use this data as an input. Following which the normalizing of the data is done. The features are extracted using the CNN module as the model consists of multiple layers which will try to capture the important features excluding the noise and the negative values. Once the final layer gives the features the AWS Cloud is connected and the features of images and labels are stored in the database.

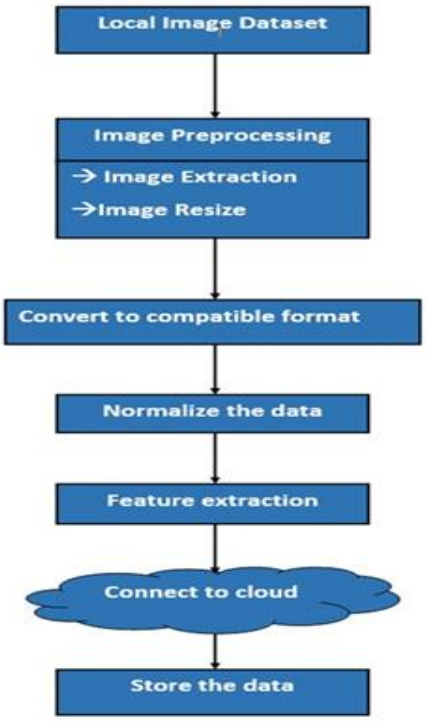

Figure 2: Training Module Design

Finally, the second module is the testing module as shown in the fig 2. In this module the user is asked to input two images from the dataset randomly. The images selected as input goes through the image preprocessing phase where in the image is resized to 60*60 and the noise is removed. Then the data received after removing noise is converted to

compatible format in order to allow the lower layers of the algorithm to use this data as an input.

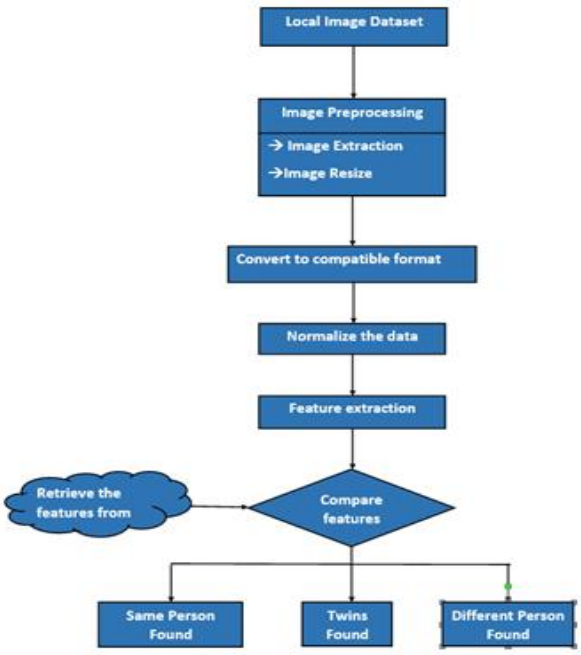

Figure 3: Testing Module Design

Following this step, the data is normalized, and finally it passes through the CNN module and extracted the features going through its multi-layer model to capture the important features excluding the noise and negative values i.e. as shown in the figure 3. Once we have the features of both locally selected images, we connected to AWS cloud and try to compare the features extracted locally and with those stored in the cloud database.

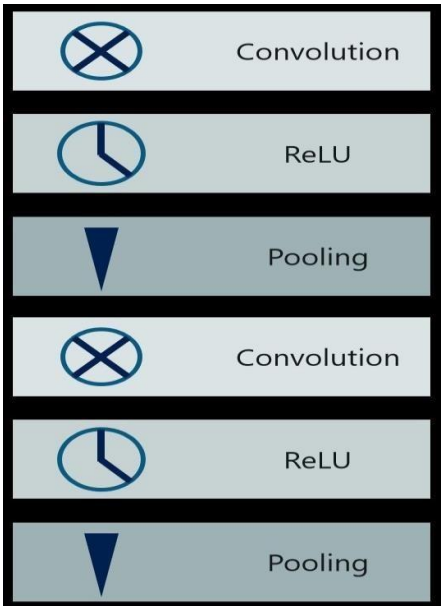

Figure 3: CNN Layers

There exist three possible types of output to the given system

i.e. 1. Twins found; 2. Same person found and; 3 Different persons found. The output after executing the testing module may be one among the three possible outputs. If the features

matches with the correct twins over the cloud data, then the GUI is updated to show that the "Twins found" as shown in figure 4. If both the features of cloud matches to an individual image feature, then the output is displayed as "Same person found" as shown in the figure 5. If the features match to totally different persons in the cloud, then the output displayed to the GUI is the "Different person found" as shown in the figure 6.

Figure 4: Output 1: Twins found

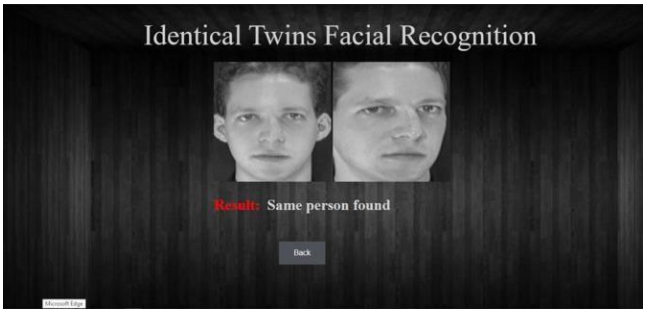

Figure 5: Output 2: Same person found

Figure 6: Output 3: Different person found

5. Conclusions

The current research work mainly concentrates on identifying the identical looking twins on basis of

the features extracted. The proposed system uses Python as the programming language for development of the project. The proposed system uses various number of frame works like Open Computer Vision Library (OpenCV), TesnorFlow, NumPy, Keras module and Convolutional Neural Networks (CNN) algorithm. Flask frame work is used to build a Graphical User Interface for the system. MySQLYog is used to connect to cloud and store in the database using the queries. Amazon Public Cloud is used to store the features in the cloud. Service used is Database as a service. CNN algorithm is designed to process data through multiple layers as shown in figure 3. This type of neural networks is used in applications like image recognition or face recognition systems.

The practical performance of this project is analyzed and it shows that the system works perfectly for the limited dataset. This proposed work recognizes the identical twins and displays the result on the bases of features extracted, which may be any one among the three possible outputs of the system.

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