Face Search
Using Cloud Computing

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Abstract— **Face search system allows users to search for matching faces within large collection of facial images present in database. In recent years face search has received attention from both research communities and the market, but still remaining very challenging in real applications. Many face search algorithms, along with their modifications have been developed during past decades. Face search system is an application for automatically identifying and verifying a person face. There are many face search systems which compares the input face image to the facial images present in database and results a matched face to the user. Our proposed application is an enhancement to the traditional face search system, were the user is allowed to view the textual information related to the resultant matching facial image and also this application interfaces with Google images to collect many facial images and store it in database. Here, we can use Cloud Computing technology to store vast amount of facial images and for security concerns. Our application can be implemented of mobiles, so that any mobile can easily download our proposed face search application on their mobiles and can recognize unknown faces.**

Keywords— Face recognition, Facial image, Feature Extraction, Image Match, Facial Features, cloud computing.

I. INTRODUCTION

Face recognition [1] is a rapidly growing field today for its many uses in the fields of biometric authentication, security and many other areas. A facial recognition system is a computer application for automatically identifying or verifying a person from a digital image. This process can be done by comparing selected facial features from the image and a facial database. A person can come under a situation where the other person talking to him is forgotten by him. To deal with this we can have an application that can capture person face and match the image with an initially existing database, the result-set may include person name, relationship (who introduced that person), working status and many other things. Only if the captured facial feature matches with the face in the database, the details regarding person will be displayed. To do this initially, the details regarding the person should be stored in the database associated with his picture (face), later when the image is again captured; our proposed algorithm is being used. We propose an algorithm which can extract the facial features and compare with the images in the database. Face detection [2] is a computer technology that determines the locations and sizes of human faces in arbitrary digital images. This system can detect facial features and can

ignore things such as trees, buildings etc,. Face detection can be treated as a more general case of face localization, where the task in face localization is to find the locations and sizes of an known number of faces. Face detection can be regarded as a specific case of object-class detection. The task of object-class detection is to find the locations and sizes of all objects in an image that belong to a given class. There exits many problems due to many factors that can affect the photos. When processing images on must consider some measures like image quality, variations in light, facial expressions and the persons pose. In order to successfully be able to identify individuals correctly there must be some way to account for all these variations.

In this paper we propose an algorithm to successfully identify individuals (unknown person) and detect whether the facial features of unknown person match with any of the facial image present in database and if the image matches then the details regarding unknown face will be displayed. This algorithm is then being implemented in mobile application so that any mobile can easily download this face search system application on their mobiles and recognize the unknown person faces.

II. METHODOLOGY

This proposal makes use of cloud to store the initial set of faces.

The main goals are the followings:

- Initially, capture the facial image and store it in the database using cloud and also include the details of the person in database.

- Then when an unknown facial image is encountered, the proposed algorithm compares (image matching [3]) it to the faces stored in the database and it results the details regarding the matched face to the user. At last we develop a mobile application which supports the proposed face search system, to efficiently recognize the unknown person face.

III. MODEL/ALGORITHM

A face recognition system works efficiently if we extract the Facial features with the help of our proposed algorithm. The purpose of the feature extraction is to extract the feature vectors or information which represents the face. This system

interfaces with Google images [4] to store vast amount of facial images in training set, then processing is done to the image. When a user searches for an unknown face, then initially process the unknown face and compare it with the processed facial images present in training set. When the image match occurs then the details related to the unknown face is displayed to the user.

STEPS-

A. Training Set:

The steps for processing training set are as follows:

Consider the captured image I be the original image of dimension (R_x) stored in database.

Step1: Preprocessing of Captured image:

Apply preprocessing techniques [5] on the captured image I .Pre-processing is applied with images at the lowest level of abstraction; both input and output are intensity images. The aim of pre-processing is an improvement of image data that suppress unwanted distortions or enhances some image features important for further processing. Such pre-processing operations are also called filtration. Local pre-processing methods can be divided into groups such as-Smoothing, adjusting brightness, contrast and enhancement.

Let $I^{'}$ be the image after preprocessing.

Step2: Removal of background:

Now in the next step we remove the background of the preprocessed image ($I^{'}$). Let the resulting image after removing the background is $I^{''}$.

B. Recognizing an unknown face:

The steps for recognizing an unknown face are as follows:

Let $I_{.}$ be the face of unknown person.

Step1: Skew the image:

We can skew an image [7] by specifying destination points for the upper-left, upper-right and lower-left corners of an original image. The three destination points determine an affine transformation that maps the original rectangular image to a parallelogram.

Skew an image $I_{.}$ to the ratio of 'θ', where θ is the ratio to be skewed. After skewing we get $I_{.}^{'}(\theta)$.

Step2: Defining continuity of the outline:

Continuity of the outline of an image gets disturbed after skewing. To define continuity of outline of an image we apply,

$$\int_{pt=1}^{pt=n} I_{.}^{'}(\theta)\, pt$$

Where *pt*=pixel and *n* is the last pixel in an image.

After defining continuity we get $I_{.}^{''}(\theta)$

Step3: Removing the background:

After defining the continuity of the outline, now we remove the background for the above resultant image.

Removing the background [6] of the image

$$I_{.}^{''}(\theta)$$

Let the resultant image after removing background be

$$I_{.}^{'''}(\theta)$$

Step4: Comparison:

Now compare (mapping) to images $I^{''}$ and $I_{.}^{'''}(\theta)$

Using natural join

$$I^{''} \infty I_{.}^{'''}(\theta) \Rightarrow \Delta pt$$

Where '*pt*' is the possible matching features.

Step5: Thresholding:

Thresholding [8] is any model where a single threshold value, or set of threshold values, is used to distinguish ranges of values where the behavior predicted by the model varies in some important way.

Consider a threshold value as $\emptyset$,

Now if

$$\left| \Delta pt - R_x \right| < \phi$$, There is no match in faces.

IV. WHY CLOUD?

One of the main advantages of Cloud Computing is that the whole software is given to the user as the Internet service. The user need not have to spent time and nerves to create and manage the infrastructure, operating system and computer software rather any user can have a constant access to his own data. The Internet can be called as a great cloud, because one can find everything in the internet and gets access to any kind of data, so that one does not need to possess a powerful PC which can contain vast amount of data, because he can simply have access to a certain server and find the data.

Cloud Computing [9] provides computing and storage resources remotely in a pay-as-you-go manner. Cloud Computing is based on the fundamental concept of sharing resources among locally and globally available cloud servers to improve QoS and application performance. In this proposed system images containing faces and their associated identities are stored remotely on cloud, which allows users to dynamically search for faces. Another feature our proposed face search system possesses is the ability to access the application via mobile phones, so cloud allows users to download this application remotely. Using cloud improves the scalability so that many users can be connected to app simultaneously whenever needed. Cloud has efficient storage mechanisms i.e., stores the captured images in different locations, so if any data center fails to retrieve images, it can be retrieved from other data center which acts as backup and also improves performance. Using Cloud Computing is a better way to store facial images, especially if images are obtained by interfacing with Google images.

V.   IMPACT

A. SOCIAL IMPACT:

Human sees so many people face's repeatedly in his life. Whenever he meets someone, he may not remember them. To react spontaneously in this situation we have an mobile application which is built on cloud, which has database containing all the facial images captured by owner and its associated text which tells about name of the person and who had introduced that person etc,. By this system many people can recognize others without using their memory.

B. TECHNICAL IMPACT:

Transferring of data and images can be done easily because Cloud Computing allows users to capture data easily and rapidly. *Compatibility-*   This face search system based on cloud can be compatible with existing face recognition system and as this is implemented on mobile application it supports maximum of mobile operating systems such as Android, Windows etc,.

VI.   CONCLUSION

The traditional face recognition system which is used nowadays displays the output as image, if the match for a given input image is found in database. To enhance this we propose a Cloud based Face Search system based on Cloud Computing technologies that provides high storage capabilities and reliable solutions. The system stores images in an efficient way in training set and later when the user makes search for a specific face, the text regarding person will be displayed only if the input face matches with any of the face stored in database. The user can access the information through the application downloaded on mobiles. This system also provides a facility to integrate with the existing system.

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