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Robust Face Recognition Using Skin Color and Lips Position

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ABSTRACT

Security of a person is a crucial part of any industry. One of them is face recognition. Face recognition is an effective means of authenticating a person. This paper introduces a new approach to face detection systems using the skin color of a subject. This system can detect a face regardless of the background of the picture, which is an important phase for face identification. The images used in this system are color images which give additional information about the images than the gray images provide. The advantage of this approach is that, it enables us to detect changes in the face pattern of an individual to an appreciable extent. Hence face recognition can be used as a key factor in crime detection mainly to identify criminals. There are several approaches to face recognition of which Principal Component Analysis (PCA) has been incorporated in our project. The system consists of a database of a set of facial patterns for each individual. The characteristic features called 'Eigen faces' are extracted from the stored images using which the system is trained for subsequent recognition of new images. The entire project occurs in four different stages in which the first stage includes obtaining face region from the original image, the second stage includes mouth region extraction by background subtraction, the third stage includes key point's extraction by considering the lip centric as origin of co-ordinates and the fourth stage includes storing the obtained feature vector in the database. This project will increase the accuracy level of biometric systems.

Keywords — face recognition, Biometrics, Principal Component Analysis, Neural Networks, Eigen faces'.

I. INTRODUCTION

Security and authentication of a person is a crucial part of any industry. There are many techniques used for these purpose one of them is face recognition. Face recognition is an effective means of authenticating a person the advantage of this approach is that, it enables us to detect changes in the face pattern of an individual to an appreciable extent the recognition system can tolerate local variations in the face expressions of an individual. Hence face recognition can be used as a key factor in crime detection mainly to identify criminals there are several approaches to face recognition of which principal component (PCA) [11] and neural networks [1] have been incorporated in our project face recognition as many applicable areas. Moreover it can be categories into face recognition, face classification, one, or sex determination. The system consists of a database of a set of facial patterns for each individual. The characteristic features called 'Eigen faces' are extracted from the storage images using which the system is trained for subsequent recognition of new images.

The main objective of this system is to identify the speaker using the lip motion vectors which is a more reliable process. It also aims at conducting biometric speaker identification experiments using an audio-visual database and to analyze performance analysis of open-set speaker identification system which is done by Equal error rate (EER) [12] figure. The success of a lip based speaker identification system eventually depends how much of the obtained precision, that is useful for discrimination, is then included in the reduced low dimensional feature set [8].

When you are talking to a person, you usually look at his face; the expression of a person's face plays a very important role when communicating with other people. Due to its uniqueness, the face is also the most important and effective characteristics for recognizing a person. Images of faces vary considerably depending on lightning, occlusion, pose, facial expression, and identity. Color transforms must be implemented to deal with all remaining variation in distinguishing face skin color.

II. RELATED WORK ON FACE RECOGNITION

Face recognition biometrics is the science of programming a computer to recognize a human face. When a person is enrolled in a face recognition system, a video camera takes a series of snapshots of the face and then represents it by a unique holistic code. When someone has their face verified by the computer, it captures their current appearance and compares it with the facial codes already stored in the system. The faces match, the person receives authorization; otherwise, the person will not be identified. The existing face recognition system identifies only static face images that almost exactly match with one of the images stored in the database.

RGB is based on the Cartesian coordinate system which is an aid cube as shown in Figure 1. The cube has the RGB values in the three corners - colors like cyan, magenta and yellow and the other three corners - the black and white at the origin is at the corner farthest from the origin. The gray scale is located on the line joining black and white. They are called additive "primary" because the colors are summed to produce the desired color. Due to the high correlation between color components: red, green and blue, as each component is subject to the effect of luminance of the light intensity of the environment, so that suffers dissatisfaction on the part of many image processing applications. In practical, this model is not well suited to describe colors in terms of human interpretation [2].

The existing or traditional face recognition system has some limitations which can be overcome by adopting new methods of face recognition. The existing system cannot tolerate variations in the new face image. It requires the new image to be almost exactly matching with one of the images in the database which will otherwise result in denial of access for the individual. The performance level of the existing system is not appreciable.

III. PROPOSED SYSTEM

The face detection system is presented to detect a face image from any background. This system is important in many applications such as face recognition to increase the speed and accuracy of recognition process that is because it deletes any undesired information. The proposed face detection [5] system is depending on classifying the face as being either skin or non-skin [3]. The face images are file of image entered to the system with true color (24-bit). The sizes of images are free, so we resize them into (256*256) pixels. Then the image is decomposed into its original three color bands (Red, Green, and Blue) [4].

A. Eigen face-Based Face Recognition

In this method the main features of the face are extracted and eigenvectors are formed. The images forming the training set (database) are projected onto the major eigenvectors and the projection values are computed. In the recognition stage the projection value of the input image is also found and the distance from the known projection values is calculated to identify who the individual is all Eigen values and eigenvectors satisfy the equation

$$Ax = \lambda x$$

In other words, an eigenvector of a matrix is a vector such that, if multiplied with the matrix, the result is always an integer multiple of that vector. This integer value is the corresponding Eigen value of the eigenvector. Let's consider an example.

ALGORITHM

1. Resize the original face image into(256*256)
2. Separate the RGB bars into R, G, and B
3. Transform the RGB space into (login)
4. Transform the (login) into (login)
5. Skin color to detect

    If

    Color > 1The pixel indicate skin color tone

    Else

    The pixel is not skin color tone
6. Extract minimum bounding box containing detected face

The step by step instructions along with the formulas for the recognition of faces using Principal Component Analysis (PCA) are as follows:

STEP 1: Prepare the Data

The first step is to obtain a set S with M face images. Each image is transformed into a vector of size N and placed into the set.

$S = \{r1, r2, r3,\ldots,rM\}$…………………………...…(1)

STEP 2: Obtain the Mean

After obtaining the set, the mean image ¥ has to be obtained as,

¥ $= 1/M\sum_{M=1}^{m} ra$……………………………….. (2)

STEP 3: Subtract the Mean from Original Image

The difference between the input image and the mean image has to be calculated and the result is stored in

$\Phi\, i = r\, i - \varphi$…………………………………….. (3)

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STEP 4: Calculate the Covariance Matrix
The covariance matrix **C** is calculated in the following manner

$C = 1/M \sum_{M=1}^{m} \varphi_n \varphi_n^t$

$= A A^t$

A = {φ1, φ2, φ3, ……. φ n}……...(4)

B. Face Recognition And Classification
Rabbinic et al [7] described the simplest method for determining face class [10], provides the best description to find the face class k that minimizes the Euclidean Distance. The Euclidean Distance [6] is the straight line Distance between two pixels. The distance between the two pixels can be computed using distance function d(x, y) where, x and y are image pixels such that *x = {x1, x2, …, xn}* and *y = {y1, y2,…, yn}*.The Euclidean distance function is :

$d_g(x, y) = \sum_{i=1}^{N} \sqrt{x_i^2 - y_i^2}$ …….. (5)

$\bar{x} = 1/N \sum_{i=1}^{N} x_i$ …….. (6)

$\sigma(x) = \sqrt{1/N \sum_{i=1}^{N} (x_i - \bar{x})^2}$ …….. (7)

This distance measure used to identify the Alikeness of different items in the database. Once a similarity measure is defined, each feature will be compared to each predefined feature which is extracted by LTP technique. Figure 1 illustrates a process for k–NN classification [9] with Principal Component Analysis.

K – NN with PCA ALGORITHM
Step 1:- Consider T is the training set and *d is* the input data.
Step 2:- Each tupelo *t* compared with each element of training data.
Step 3:- Find the set of neighbors N for the tupelo *t*.
Step 4:- Then compute the similarity measure, if n Є N, such that the similarity (*t, T*) ≤ similarity (*t, d*).
Step 5:- Then classification is done with tupelos which are same or closest to Input image and then image is recognized.
Figure 1 K – NN with PCA can be run by above steps.

IV. EXPERIMENTS AND RESULTS

The result of using perimeter of lip is given billow.

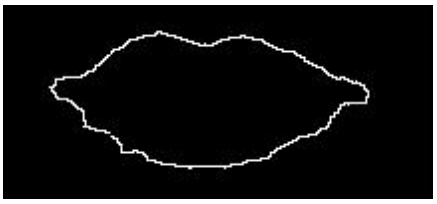

Figure. 1 Perimeter of Lips

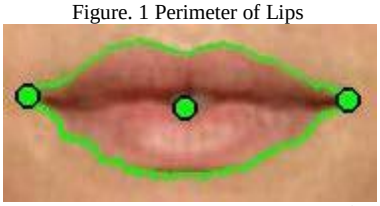

Figure 2 Fig. 10 Corner point and centric of Lips

V. CONCLUSION AND FUTURE ENHANCEMENT

We introduced a new biometric identification system based on lip shape, a field in which little research has being done. In this project, we have presented robust and accurate lip segmentation method. Then five points are fitted to the outer lip boundary. Its high flexibility enables very accurate results. This is considered as good result and for its use combined with other biometrics systems. A system to extract and analyze robust lip-motion features is presented for the open-set speaker identification problem. Therefore, if available, accurate and robust lip motion information is to improve the performance of unmoral (i.e. speech-only) systems, which are mostly corrupted by noise in real-life. The proposed lip features can be used in conjunction with audio to improve the performance of the multimodal speaker identification systems. Person authentication can be realized by solely using visual lip features, the uses of shape-based lip features do not warrant acceptable performance.

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