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Face Label Graph Matching For Character Identification

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Abstract: - **Being a successful application in the field of image analysis, face recognition is seeking most of the attention during the past few years. Automatic face identification of characters has drawn significant research interests and led to many interesting the applications. It is a difficult problem because of the huge variation in the appearance of each character and the weakness and ambiguity of available annotation. Although these existing methods demonstrate promising results in the clean environment and the performances are limited in the complex scenarios due to the noises can be generated during the face tracking and face clustering process. Face Name Graph Matching for Character Identification is used to detect the faces of the characters.**

Keywords: - *Automatic Face Detection, Face Recognition, Principal Component Analysis, ECGM.*

I INTRODUCTION

Conventionally, the management of identity was almost satisfactorily achieved through connection of attributed identifiers with biometric identifiers which were attached in existing local social relations. As population is growing, communities have become more fleeting and individuals have started more traveling. Thus, the management of individuals needs a system of character management that will be more robust and supple. As, passwords and PINs are difficult to recall every time and can be stolen or predicted; tokens, keys, cards and other similar tools can be misplaced, replicated or forgotten, purloined; magnetic cards may become corrupted and unreadable. On the other side, biological traits can never be forged, forgotten, replicated or stolen.[1]

Biometric technologies have emerged as promising tools to meet these challenges of Identification, based not only on the faith that "the body doesn't lie," but also on dramatic progress in a range of relevant technologies. Biometric based technologies include identification based on physiological characteristics (such as face, fingerprints, finger geometry, hand geometry, hand veins, palm, iris, retina, ear and voice) and behavioral traits (such as gait, signature and keystroke dynamics). Face recognition offers many advantages over other biometric methods. All other technologies need some voluntary action from user side but face recognition can be done without any explicit action or participation by user.

Almost all these technologies require some voluntary action by the user, i.e., the user needs to place his hand on a hand-rest for fingerprinting or hand geometry detection and has to stand in a fixed position in front of a camera for iris or retina identification. However, face recognition can be done passively without any explicit action or participation on the part of the user, thus to this need and using observations of human psychophysics, face recognition as a field emerged.

II RELATED WORK

Some of the related works about the automatic face identification and face expressions detection as follows:

Csaba Czirjek [2] proposed the content structuring is to build an index based on the reappearance of the main characters within the content. For news programs, this can be used for temporal segmentation into individual news stories based on the fact that the anchorperson, the main character in this scenario signals the beginning of a news item. For movie content, this could provide enhanced random access browsing functionality to the end user. In this thesis we propose an approach to news story segmentation that uses low-level features and three different algorithms for temporal segmentation. We then extend this system to perform anchor-person detection using automatic face detection and clustering algorithms. An extensive manually marked up test set has been used to validate each component of our overall approach.

Vinay Bettadapura [3] proposed the paper of the automatic recognition of facial expressions and has been an active research topic since the early nineties. The paper presents a time-line view of the advances made in this field, the applications of automatic face expression recognizers, the characteristics of an ideal system, the databases that have been used and the advances made in terms of their standardization and a detailed summary of the state of threat. The paper also discusses facial parameterization using FACS Action Units (AUs) and MPEG-4 Facial Animation Parameters (FAPs) and the recent advances in face detection, tracking and feature extraction methods.

Ognjen Arandjelovi´c and Andrew Zisserman [4] proposed that the objective of this work is to recognize all the frontal faces of a character in the closed world of a movie or situation comedy, given a small number of query faces. This is challenging because faces in a feature-length film are relatively uncontrolled with a wide variability of scale, pose, illumination, and expressions, and also may be partially occluded. They develop a recognition method based on a cascade of processing steps that normalize for the effects of the changing imaging environment.

Yi-Fan Zhang, ChangshengXu, Hanqing Lu and Yeh-Min Huang [5] approach the paper for Identification of characters in films, although very intuitive to humans, still poses a significant challenge to computer methods. In this paper, we investigate the problem of identifying characters in feature length films using video and film script. The contributions of our work include a graph matching method, an effective measure of face track distance and the relationship between characters is mined using social network analysis. The proposed framework is able to create a new experience on character-centered film browsing.

Mengdi XU, xiaotong Yuan, Jialie Shen and Shuicheng Yan proposed this work to recognize all the frontal faces of a character in the closed world of a movie or situation comedy, given a small number of query faces. This is challenging because faces in a feature-length film are relatively controlled with a wide variability of scale, pose, illumination, and expressions, and also may be partially occluded. We develop a recognition method based on a cascade of processing steps that normalize for the effects of the changing imaging environment.

Enrique G. Ortiz, Alan Wright, and Mubarak Shah ,they presents an end-to-end video face recognition system, addressing the difficult problem of identifying a video face track using a large dictionary of still face images of a few hundred people, while rejecting unknown individuals. A straight forward application of the popular ℓ1-minimization for face recognition on a frame-by-frame basis is prohibitively expensive, so we propose a novel algorithm.

Mean Sequence SRC (MSSRC) that performs video face recognition using a joint optimization leveraging all of the available video data and the knowledge that the face track frames belong to the same individual. By adding a strict temporal constraint to the ℓ1-minimization that forces individual frames in a face track to all reconstruct a single identity, we show the optimization reduces to a single minimization over the mean of the face track.

III STEPS INVOLVE IN FACE DETECTION USING GRAPH MATCHING

The process of recognition of faces is of four interconnected steps. The procedure begins with detection of face which is followed by normalization. Then the features of the faces are extracted and finally recognition of face is done.

Step 1: Detecting a face. Face detection is an important part of face recognition as the first step of automatic face recognition. However, face detection is not straightforward because it has lots of variations of image appearance, such as pose variation (front, non-front), occlusion, image orientation, illuminating condition and facial expression. Many novel methods have been proposed to resolve each variation listed above. For example, the template-matching methods [6], [7] are used for face localization and detection by computing the correlation of an input image to a standard face pattern. The feature invariant approaches are used for feature detection [8], [9] of eyes, mouth, ears, nose, etc. The appearance-based methods are used for face detection with eigenface [10], [11], [12], neural network[13],[14], and information theoretical approach[15], [16]. Nevertheless, implementing the methods altogether is still a great challenge.

For detecting a face, the computer has to decide which pixels in the image are parts of the image and which are By adding some extra features we can improvise the system. For this purpose, the following algorithms are used.

1. *EGCM:* This is known as Error Correcting Graph Matching Algorithm. It is used for detection of faces and to reduce the noises present in the complicated movie scenes. ECGM is a powerful tool for graph matching with deformed inputs. It has various applications in prototype recognition and computer vision. In order to calculate the resemblance of two graphs, graph edit operations are defined, such as the deletion, insertion and substitution of vertexes and edges. Each of these operations is auxiliary assign a certain cost. The costs are application dependent and usually reflect the possibility of graph distortion. The more likely certain distortion is to occur, the slighter is its cost. Through error correcting graph matching, we can define proper graph edit operations according to the noise exploration and design the edit cost function to advance the concert. For explanation expediency, we provide some notations and definitions taken from. Let L be a finite alphabet of labels for vertexes and edges.

Notation: A graph is a triple g = (V, α, β), where V is the finite set of vertexes, α: V →L is vertex labeling function, and β: E →L is edge labeling function. The set of edges E is implicitly given by assuming that graphs are fully connected, i.e., E = V × V. For the notational convenience, node and edge labels come from the same alphabet.

2. *PCA –Eigen Faces*: This Principal Component Analysis technique converts the two dimensional images into a single dimensional vector. Every single component i.e. Eigenface has only one certain feature of the face. This feature may or may be present in the original image. Comparison of a probe image is done with the image in gallery by calculating the distance between their respective vectors. PCA is sensitive to the scale variations. In PCA, the gallery image must be similar to the probe image in terms of poses, illuminations and scales.

This section describes the eigenfaces approach. This approach for face recognition aims to decompose face images into small set of characteristic feature images called eigenfaces which used to represent both existing and new faces.

The training database consists of M images which is same size. The images are normalized by converting each image matrix to equivalent image vector $\mathbf{T_i}$. The training set matrix $\mathbf{T}$ is the set of image vectors with

Training set $T = [T_1\ T_2\ \ldots..\ T_M]$ (1)

The mean face (ψ) is the arithmetic average vector as given

$$\psi = 1/M \sum_{i=1}^{M} Ti \quad (2)$$

The deviation vector for each image Φi is given by:

$$\Phi i = Ti - \psi \qquad i = 1,2, \ldots\ M \quad (3)$$

Consider a difference matrix A= [$\Phi 1, \Phi 2, \ldots.\ \Phi M$] which keeps only the distinguishing features for face images and removes the common features. Then eigenfaces are calculated by find the Covariance matrix C of the training image vectors by:

$$C = A.A^T \quad (4)$$

Due to large dimension of matrix C ,we consider matrix L of size (M_t X M_t) which gives the same effect with reduces dimension.

The eigenvectors of C (Matrix U) can be obtained by using the eigenvectors of L (Matrix V) as given by:

$$Ui = AVi \qquad (5)$$

The eigenfaces are:

$$\text{Eigenface}= [U1, U2, U3........Um] \qquad (6)$$

Instead of using M eigenfaces, the highest m ' <= M is chosen as the eigenspace. Then the weight of each eigenvector ωi to represent the image in the eigenfaces space, as given by:

$$\omega i = U_i^T (T-\psi), i=1,2,...m' \qquad (7)$$

$$\text{Weight Matrix } \Omega = [\omega 1, \omega 2.....\omega m']_T \qquad (8)$$

$$\text{Average class projection } \Omega\psi = 1/Xi\sum_{i=1}^{Xi}\Omega i \qquad (9)$$

The euclidean distance δi (8) is used to find out the distance between two face keys vectors and is given by:

$$\delta i = \| \Omega - \Omega\psi i \| = \sum_{k=1}^{M}(\Omega k - \Omega\psi iK) \qquad (10)$$

The smallest distance is considered to be the face match score result.

Step 2: Normalization of faces:
After the face has been detected, it needs to be normalized i.e. the main landmarks of a face must be positioned accurately and then the images for a little variation are corrected. These corrections are done on the basis of statistical interferences which may not be entirely precise.

Step 3 and 4: Feature Extraction of faces and Facial Recognition:
Extracting the facial features is done by a mathematical Demonstration which produces a biometric template. This biological reference is then stored in the database and forms the basis of facial recognition tasks. It is necessary for to take the maximum information to make the biometric template unique. It will help in a successful facial recognition.

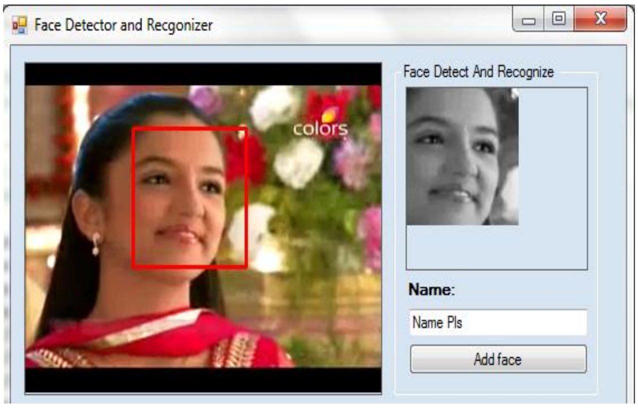
IV IMPLEMENTATION

Testing Parameters:

A video is input to the application, to detect and recognize the face or faces present in it using PCA, the background calculation include to fing the eigen vectors from the eigen space of the training image extracted from the video content. An object recognizer is created with the help of training data. The eigen value is obtained which is used for reconstructing grey image of the projected image, we usually opt for converting image to grey image as it is easier to apply computation over grey images in image processing.

Expression of the face detect is also reflected as it is at real time which means the frame which shows the gray image of the face detected changes the images in real time as and when the expression of the face is changed in the original video. Few output screens are show below stating the same.

Number of face detected in the current frame is displayed as 2, as seen in the original video, name of the person present in the scene is not shown because we have not yet put those face name in the database.



V CONCLUSION AND FUTURE SCOPE

The main objective of the paper is to understand the basic steps carried out in Face detection and recognition be it in image or videos. Since it has been widely used in various (person, face) identification applications. We can overcome the limitations of previous system by improving results for clustering and identifying the faces extracted from uncontrolled videos. Using sensitivity analysis, we can identify schemes that have better robustness to the noises in constructing affinity graphs than the traditional methods. Any face recognition system could not provide 100% efficiency till now, but the system with the above approach would provide efficiency up to 90% and thus error rate declines. The future enhancements of this system include that the face-name matching technique should be developed in live video surveillance. Also, the system can be extended to detect faces in cases of external items like spectacles, helmet, cap etc. Further, the system can be extended to match even if the person is in case of age progression or disguise. Detecting the face of the person should be displayed with the details of the person in a small time interval.

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