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Face naming using image processing: A Review

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Abstract— In past few years' recognition of face has an integral part of research. With advancement in progress in biometric applications in the field of banking, national identity and law enforcement has projected and popularized the need of face recognition technology into research field. Now the face recognition technology has evolved from basic methods to better techniques and mathematical representations for face matching and image analysis. The study exhibits the review of all approaches and techniques. The paper reflects the insights of various methodologies currently being implemented. Also, attempts are being done for using face recognition and identification applications to execute with accuracy considering the complexities encountered. Efforts have been put in to outline the aim for using face recognition applications along with ruling out the complexities.

Keywords: Face recognition, Biometrics, Image analysis,

INTRODUCTION

Recognition of human faces is relatable to the task of identification of faces in the database, detected either as a human face or as unknown face. Recognition and identification of fthe faces is done to perform analysis among set of images already stored and trained in database. Face detection and recognition are two sides of a same coin. Recognition of faces can be classified in two categories: verification and identification. In thre domain of image processing face identification is a very complicated and challenging task. Number of factors like different pose, illumination, pose variation are the major cause. A person with different angles most of the times is not identified by the application being used for the purpose of face detection and identification[1],[2]Face identification plays and important role in research domain of computer vision and image processing. Now a days this approach is being used in every possible field human can think of. It includes surveillance, security, banking sector and so many more.
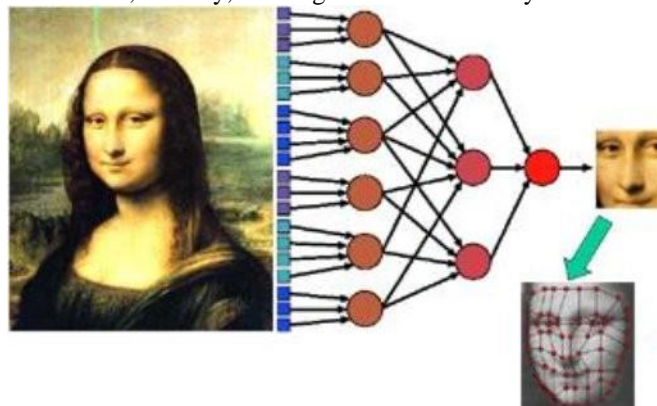

Fig 1. example of face recognition

Face recognition is a non-intrusive method and can be executed with digital cameras or may be with the combined application with CCTV . It has been seen that now the updated and advancement in techniques has made it easier to identify the faces from different angles. The factors like brightness have been over come. Any system having face identification tool can process and capture the images and compares them with stored database images. The images with faces stored in database or central repository then such faces and pictures are classified as identified or recognized set of images. Else the images are considered as unknown and further the algorithm is trained to handle such problem.

- Having an image at different angles, Differences in the look (different angle, pose, hairstyle, makeup, moustache, beard, etc.),
- Lighting,
- Aging.

Image processing and identification of image is done by identifying the features using various techniques and analysis can be done with reference to features like face, nose , cheeks etc. in the target image or face. Structure of the face is another important aspect to be considered. In

order to have accurate image analysis the structure and alignment of the face has to be done with very focused accuracy. Number of algorithms are designed and worked upon to handle the issues of face structuring and analysis of face on its basis which in turn is a complex task to be achieved[3].This paper studies and concludes about various face identification techniques based on past work done . A contrast among different methodologies is presented and evaluated.

RELATED WORK

A review is presented about image/face identification techniques that are studied in past. In other study Park et al, proposed a method called as key point method which was used for improving the efficiency and accuracy .the study was conducted on sample space of about thousands of images. In this study the mentioned method was found better than SIFT technique. Cassio et al. in another study objectified the subject of sample is enrolled or not in the face gallery. The techniques were identified on the basis of accuracy, scalability and sample size. For face recognition the approaches have been tested on standard databases namely FRGC and Pub fig83[9]. Another author proposed two techniques for identification of faces from sample size using histogram of LBP. The variation in angles of pose and non alignment were also considered for the work under study.

In a study by Sharma et al, an pose-invariant techniques for identification of faces was proposed. The study showed the evaluation of some old methods including eigen face and fisher face which performed better in certain particular scenario. Curtis dissimilarity as distant feature metric was chosen. A biometric system which was multi modal was given by Shyam et al. His representation stated the fusion of traditional and feature based matching score. Eigen faces with use of eigen vector are the part of PCA. Covariance matrix is to be calculated to use this approach. The different amount of variation of is represented in different forms with the use of eigen vectors. A combination termed as linear combination is used to represent face or image. Such combination is used to represent the faces called as eigen face. It can also be approximated using only the "best" eigenvectors with the largest eigenvalues. The different authors reported about 90 percent, 80percent, and 64 percent accuracy on the average rate on the parameters like effects of light , the angle of image, and size variations, respectively. Their database contained 2,500images of 16 individuals. The sample dataset of images contained images with background which affects the process to an extent. However it was observed the only complete face is not sufficient for a successful implementation[29]. Illumination, pose etc also plays a vital role. Illumination normalization [27] is usually necessary

for the eigenfaces approach.[13]. A predictive method of learning was achieved using support vector machine to handle classifications based learning. Due to higher efficiency and accuracy rate SVM was considered as the best amongst all studied techniques[14]. Edge feature is another way out technique is used to image data set for classification. although better performing technique is morphological edge detection. trhe above techniques are used in traffic scenarios for video based detections. in this presence of vehicle is detected by edge detection and was further processed using histogram.

In the past few years the goal and aim of research has been focused more upon deep learning. Convolutional neural network is the approach being adopted typically for the purpose of face identification . It may include categories like simple CNN or he other categories of CNN depending upon the classification to be performed[26]. Motivated and inspird the outcome of performance by CNN wgich includes deep face , deep ID etc , human face identification using computer vision has reached another level[27].

Machine learning has given a new dimension to face recognition systems.algorithms like viola jones, LBP were developed in past years .the algorithms have shown a remarkable outputs in terms of efficiency and accuracy[28]. The algorithm have shown remarkable performance in feature extraction.

TECHNIQUES

This section gives an overall view about the techniques used for face recognition mostly applied on front faces. Benefits and disadvantages of all the techniques are mentioned herewith. The face recognition methodologies consist of the following categories. First is detection of faces and their normalization and second is identification of respective faces. All face recognition algorithms consistent of two major parts: (1) face detection and normalization and (2) face identification. We can categorize these methods in two categories. Se or may be certain particular region of the human face. Former methods use holistic texture features that are applied to either whole-face or specific regions in a face image whereas latter methods employ shape and texture of the face. Earlier holistic based features and methods were mostly used. The algorithm which can do detection alongwith identification are called as fully automatic algorithm. Categories of methodologies for face recognition are as follows:

1. Appearance-based Face Recognition Methods
Recognition of Face is considered as a searching problem classified as space- searching problem. It is implemented with machine learning. PCA and LDA are appearance based recognition techniques which are widely used. The projection vector is used in PCA which finds a set of projection vectors h that samples do not loose any important information and it resembles the original sample[6] The principal component

analysis and Linear Discriminant Analysis have been observed with good rate of accuracy in face detection methods[7].

There are various advantages and disadvantages among appearance based techniques which includes face space problem, where various statistical techniques can be experimented. The advantage of such approach is that it can work with low resolution data and poor quality images.

2. Model-based Face Recognition Methods

This approach is targeted at the construction model of human face for easier and efficient face detection.therefore the various facial features are extracted. Supervised classification is used to designiven by Shyam etal. and model the face recognition. For example, feature-based matching derives distance and relative position features from the placement of internal facial elements (e.g., eyes). In the recent studies it was found that in a system based on feature graph matching technique was by Wiskott et al. by integrating both shape and texture, Cootes et al. developed a 2D morphable face model. In this system face variation and types was learned[8]. The pros and cons of model-based face recognition methods are as follows.: the structure had the relationship with the real faces . An explicit modeling of face variations, such as pose, illumination and expression gives the possibility to handle these variabilities in practice. Another complex task is to model and design part. Facial feature points are difficult to extract automatically with robustness.

A hybrid technique was proposed in which adaboost was combined with neural network to get enhanced results. it increased the speed for detection of human faces. The technique also ignored the non human faces or objects. It was a real time approach. because the algorithms are combined therefore it has certain drawbacks also.

On the same approach fuzzy logic can also be combined with other algorithms like genetic algorithm etc to get enhanced results. But it might also have certain drawbacks as it can affect the sped of recognition therefore the parameters like speed and efficiency have to kept in mind.

3. Feature Based Approaches

In such approaches, firstly the points called as fiducial points are checked for and detected. Then the distance based technique is used to extract the features from the face[15] in a study Euclidean distance was used for matching between 15 feature vectors which were extracted based on a database of 30 sample data with 5photos per person and got a performance rate of about 70 percent . The feature based tracking is used to identify an object to track basic identical points of the object. Such techniques help in object detection and analysis on different parameters. it detects the features previously detected during training phase. It is a kind of pattern recognition step. Motion based and features based on model are basic techniques for such analysis. Image sequencing to 3Dimensional models mostly use model based approached. such techniques can be used to track objects efficiently.

CHALLENGES

There are number of factors which affects and limits the performance of many real time applications.

1). 3 Dimensional head pose variations are certain problems which cannot be avoided in practical scenario. The reason for the same is that the face is not always in the front position in front of camera. There are two major factors. First is same face with multiple poses and second is multiple face with same pose. First criteria is more complex comparatively. Therefore it becomes difficult for the application to identify the faces.

2). Illumination variations due to color of skin due to illumination and radiance factor is another chsallenge. The real time face identification applications encounters difficulty in face recognition and detection. Light in background makes it more complex when there is diversity in pose as well.

3). Facial expression: Faces may have large deformation and changes under facial expressions in extreme scenario. This is another challenge for algorithm of face recognition.

4). Occlusion: when a face is captured at different angles and cannot be identified due to hindrance of any kind or any change of face , then detection becomes difficult part.

5).Time Delay: Faces of humans may change over time. The changes may be due make up, beard in case of men, glasses etc.

CONCLUSION

Recognition and identification of faces is the main focus in computer vision in the recent times. A lot of research is going on in this field. However we still have to reach a level where we can have a strong and robust system. Computer vision and image proceesing field is needs more rigorous research to enhance the methodologies and techniques . there are number of challenges to be resolved if a sustainable system is to be developed. Face make up , different hair styles, blurness of images and faces are few common challenges. It is being observed that still the accuracy could not be reached to the threshold it should be. Face recognition application needs to be worked upon a lot. The mentioned results and outputs can become the guidance note for new algorithm development and in return which can foster the human computer interaction to another level. also in future modifications can be done as false detections can be reduced further to get better accuracy and efficiency.

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