A Review on LBPH (Local Binary Patterns Histograms) based Enhanced Technique For Multiple Face Detection

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Abstract: Facial recognition has always gone through a consistent research area due to its non-modelling nature and its diverse applications. As a result, day-to-day activities are increasingly being carried out electronically rather than in pencil and paper. Today, computer vision is a comprehensive field that deals with a high level of programming by feeding the input images/videos to automatically perform tasks such as detection, recognition and classification. Even with deep learning techniques, they are better than the normal human visual system Recently, face recognition and its applications has been considered as one of the image analysis most successful applications, especially over the past several years. Face Recognition is a unique system that can be used by using unique facial features for identification or verification of a person from a digital image. In a face recognition system, there are many technique that can be used.

Keywords: Face recognition, feature extraction, OpenCV, Local Binary Pattern Histogram (LBPH)

1. Introduction:

The traditional method for taking attendance was laborious and time taking in case of crowded class rooms. The manual attendance is expensive, but due to new handy software's the records are preserved and by using advance tools we can generate the report of each student. To save the time taken by manual attendance system previously many real time camera based attendance system were proposed but due to the low prediction accuracy the models were not considered by the institutions. The previous models contained different machine learning and neural network matching models. The geometric feature matching method depends on the calculation of a set of geometric features of the facial image. The general specification is defined by a vector showing the position and size of the main facial features, for example, the eyebrows, nose, mouth and facial contours. SIFT based feature matching uses a multiple layers of Gaussian filter on the images as a part of preprocessing and then uses difference of Gaussians and the image pyramid. SURF feature matching is better than SIFT as it firstly recognizes the important local features and then matches with the fitted data set. CNN is better than the previous models as it is an excellent mathematical tool for complex calculations especially in 2D images. The neural network is so much simplified face recognition approach because of its non-linear architecture in the net system. Therefore, the features extraction phase is more effective than the linear technique, it selects a dimensionality reducing linear projection that increases the scatter of all expected models.

Face recognition is a non-invasive identification system and faster than other systems since multiple faces can be analyzed at the same time. The difference between face detection and identification is, face detection is to identify a face from an image and locate the face. Face recognition is making the decision "whose face is it?" using an image database. In this project both are accomplished using different techniques and are described below. The report begins with a brief history of face recognition. This is followed by the explanation of HAAR-cascades, Eigenface, Fisherface and Local binary pattern histogram (LBPH) algorithms. Next, the methodology and the results of the project are described.

2. Related Work:

"Student Attendance System in Crowded Classrooms Using a Smart phone Camera" (Domingo Mery, Ignacio Mackenney and Esteban Villalobos) [21], the manual management of the attendance sheets is laborious for crowded classrooms. This paper proposes and evaluate a general methodology for the automated student attendance system that can be used in crowded classrooms, in which the session images are taken by a smartphone camera. Building an autonomous smart attendance system using FaceNet . The system includes 5 major steps enrollment, capture of class room images, face detection and description, query data base and matching algorithm. The sqlite3 data base engine is used for storing the records of the students. A simple face detection method is used. For matching algorithm around 10 different matching algorithms were compared and then the deep learning based FaceNet was selected which had an accuracy of 95%. a realistic full-annotated dataset of images of a classroom with around 70 students in 25 sessions, taken during 15 weeks. Ten face recognition algorithms based on learned and handcrafted features are evaluated using a protocol that takes into account the number of face images per subject used in the gallery. In our experiments, the best one has been FaceNet, a method based on deep learning features, achieving around 95% of

accuracy with only one enrollment image per subject. this paper, we propose an automated student attendance system based on deep learning that can be used in crowded classrooms, where the session images are taken by a smart phone camera.

"Meerkat: A framework for developing presence monitoring software based on face recognition" (P.Assarasee, W.Krathu, T.Triyason, V.Vanijja, and C.Arpnikanondt.)[22]
To build a presence monitoring system with session recording feature.to develop a GUI based interface for the users. the Meerkat framework provides a feature for recording the presence of persons and a set of data management methods for users. The framework helps users reduce the number of steps in the implementation phase and provides a set of data management methods for users specifically in the form of the presence log. Furthermore, the framework can help users to apply the Face API to build a presence monitoring software faster and easier. It is based on face recognition which extends the Microsoft Cognitive Services. Software application can provide a good accuracy for face detection during an event period, which subsequently leads to a satisfactory presence monitoring capability of the software. The experiment with larger event is subject for further research. However, the limitation of Meerkat framework is the availability, because it depends on Microsoft Cognitive Services Face API. If Microsoft services are unavailable, the Meerkat framework will also be affected

"LBPH-based Enhanced Real-Time Face Recognition" (Farah Deeba1, Aftab Ahmed, Hira Memon, Fayaz Ali, Abddul Ghaffar) [23], computer vision is a comprehensive field that deals with a high level of programming by feeding the input images/videos to automatically perform tasks such as detection, recognition and classification. Even with deep learning techniques, they are better than the normal human visual system. To develop a facial recognition system based on the Local Binary Pattern Histogram (LBPH) method to treat the real-time recognition of the human face in the low and high-level images.The goal of face detection is to detect and locate faces in the image, to extract human face to use in other areas. LBPH algorithm is the combination of Local Binary Patterns (LBP) and Histograms of Oriented Gradients (HOG) descriptor. LBP is an easy but powerful way to extract and label the pixels of an image. Using the LBPH, we can easily represent face images with just a straightforward vector. LBPH is used for image recognition and face detection in the surveillance camera in a specific area. Having obtained good results from various experimental analyzes of this technique, they also provide valid results for occlusion, pose variation, and illumination.

"LBPH based improved face recognition at low resolution," (A. Ahmed, J. Guo, F. Ali, F. Deeba and A. Ahmed) [24], automatic face recognition system for blur conditions, illumination, resolution, and lighting are still the major

problems in face recognition. The image can be as low as 35px. To build a face recognition system for low resolution images. This paper employs the Local Binary Patterns Histogram (LBPH) algorithm architecture to address the human face recognition in real time at the low level of resolution. The proposed system operates better at the minimum low resolution of 35px to identify the human face in various angles, side poses and tracking the face during human motion. Dataset LR500 is for training and classification. This paper uses the Local Binary Patterns at low resolution for the face recognition. Where an accuracy of 94 % at 45px and 90% at 35px was obtained using LR500 data set.

Cox et al. [9] proposed a hybrid distance method for automatic face recognition. He scored 95% peak recognition accuracy on a dataset of 685 subjects. In the hybrid distance method, each face image shows 30 manual induced distances. B.S. Manjunath et al. [10] proposed the fragmentation process for the detection of feature units of every single facial image, which decreased the storing capacity of the database, and it generated 35-45 feature units per facial image. Face detection based on geometrical approaches based on the geometrical proportion between regular features by employing some statistical models. These models calculate the distances between features; they could be more beneficial for identifying expected matches in a large dataset. Geometric Feature-based algorithms have some advantages over other methods like rotation independently, faster with execution time, scaling [11]. Like geometrical feature matching and feature-based face recognition approach, graph matching face recognition approach is one of them [12]. Introduced dynamic link architecture to falsification invariable object identification, in this approach researcher utilize elastic graph matching approach for calculating the nearest saved graph. This approach called Dynamic link structure is an addition to standard ANN. Sparse graphs represented memorize objects. The vertices of sparse graphs are tagged through a multiresolution statement in the context of a local power spectrum, and their borders are tagged with geometric distance vectors. Recognizing the object from multimedia (Video, image) is called object recognition, can be identifying by employing any efficient method like elastic graph matching. Elastic graph matching process by matching the cost function randomly modified at every node. The better testing outcomes were obtained on the dataset of 87 subjects and a group of office objects containing various expressions with an alternation of 15 degrees. The matching procedure takes more computation time; it takes 25 secs to match with 87 saved objects on the symmetric device by 23 carriers. After that L. Wiskott [13] modified this approach and compared individual front view faces of 112 images. Probe pictures were deformed because of the rotation in depth and variation in facial appearance. Functional outcomes were achieved of facial images on big rotated angles. Resulting obtained 86.5% recognition percentage on testing of 111 face images at 15 degrees' rotation, and 66.4% recognition percentage on testing

of 110 face images at 30 degrees' rotation of a 112 neutral frontal views [14]. Generally, dynamic link structure is dominant on various facial recognition approaches in the context of rotation stability; though, the matching procedure is extensive in terms of computation. The neural network is so much simplified face recognition approach because of its non-linear architecture in the net system. Therefore, the features extraction phase is more effective than the linear technique, it selects a dimensionality reducing linear projection that increases the scatter of all expected models [15]. ORL database contains 40 objects, with 400 images of each object, recognition accuracy was 96.2% obtained on this dataset. It takes 4 hours of training time and less than 0.5 seconds for classification and provides limited invariance to transformation, variation, scale, and distortion. Though, the number of the individual is proportional to computing time. Increase in the number of people, the computation time also increases. Generally, neural networks approach gets difficulties when the number of people increases. Furthermore, a neural networks approach is not appropriate for only a single model image recognition experiment, since various model pictures per individual subject are required to train the system at ―optimum‖ parameters setting. SIFT is the most well-known and widely adopted technique for feature extraction. This technique jointly uses the difference of Gaussians (DOG) and image pyramid concepts. By employing this technique, image is processed at different scales by the Gaussian filter. This technique gives excellent achievement if there are any illumination or viewpoint variations presents, it is also invariant to the rotation as well as a scaling factor [16]. Under the SIFT feature matching technique, each feature of the test images is compared to the dataset images. Euclidean distance gives best extracted feature vector. SIFT algorithm has four primary phases for the feature matching process named as Scale-Space Extreme Detection, Key Point Localization, Orientation Assignment and Key Point Descriptor‖ [17]. SIFT algorithm is straightforward and gives better results, but one drawback is of its computational complexity and time. SURF is a features indicator in an input image. SURF detects the local features of the face image. The SURF features detector is more efficient and robust than the SIFT features detector. Comparing to the SIFT, SURF provides excellent results. SURF indicators determine the interest points in the face image. For the detection of interest points, SURF uses decimal number estimation of the determinant of Hessian blob indicator that could be calculated by three decimal numbers actions by utilizing a pre-calculated integral picture [18]. CNN is a very excellent and mathematical tool used for complex computation for multimedia object images videos, for many tasks like recognition, segmentation, etc. CNN is also handy for the study of 2D variability shapes. In CNN

Local features with some share, weights are combined [19] which is also used for sub-sampling purposes such as for shifting the level, scale-invariance, and deformation. Gabor wavelet frequency and alignment demonstrations based on human graphical method, it is more suitable for representing texture learning. Extracting the feature from particular positions are also supported by Gabor wavelet, also perform image analysis at different scale and orientations. Frequency and rotations variations are also handled in these techniques [26]. By using the Gaussian envelope, the Gabor wavelet is an accentuated [27]. The principal component analysis is a traditional algorithm, broadly employed in machine vision and pattern recognition technology as well as used in feature extraction purpose [28]. In this algorithm, it is stated that ―any face image can be reconstructed nearly as a weighted sum of a small set of images which define a facial base (Eigen images), and an average image of the face.‖ In 1991, Eigenfaces technique was suggested by Turk and Pentland [28]. Eigenfaces were also proposed for facial images recognition. Meanwhile, PCA became best effective algorithm for facial recognition. The PCA was frequently used for features extraction and dimension reduction.

3. Conclusion:

For face recognition, we used Local Binary Patterns. It contains three main parts, i.e. facial representation, extraction of features, and finally classification. While the input of face behaves is described in Face representation and, moreover, it limits the detection and recognition algorithms. Furthermore, this LBP histogram has produced a new result for feature extraction and finally we can categorize detected face input as compared to the DATASET proposed. Then we can examine either a known person or an unknown person recognized by our system. In the coming future, this proposed model will be more advantageous in identifying criminals with criminal records in the database for security agencies.

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