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Review of an Efficient Face Recognition System Using Hybrid Methodology

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Abstract: At one of the most successful object of images analysis and understanding, face recognition has recently received significant attention, especially during the past few years. Facial recognition System (FRS) has emerged as an attractive solution to address many contemporary needs for identification and the frication of identity claims. It brings together the promise of other biometric systems, which attempt to identity to individually distinctive features of the body. Recognizing frontal countenance of human beings by a computer system is an interesting and challenging problem. Facial recognition System has emerged as an delicious solution to address many instant needs for identification and the verification of identity claims.

It brings together the port end of other biometric systems, which attempt to tie identity to individually distinctive features of the body. Facial feature extraction consists in restraining the most characteristic face appearance such as eyes, nose, and mouth regions within the face images that portray the human faces. In this research work , the two most well-known algorithms i.e. LBP algorithm is used as feature ex- tractor of the face image. LBP is used for their resistance against changing frontal facial expressions. PCA algorithm is used for dimension reduction of the countenance vector. The complete approach has been tested on databases of people under different facial expressions.

Keywords: *Face Recognition, Local Binary Pattern, Principal Component Analysis*

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1. INTRODUCTION

Face recognition is one of the most relevant applications of image analysis. Face detection is included as a pre-processing step for face recognition, and as an issue by itself, because it presents its own difficulties and challenges, sometimes quite different from face recognition. It is a challenge to build an automated system which commensurate human ability to recognize faces. Although humans are quite good in identifying known faces, we are not able to recognize or deal with a large amount of unknown faces. The computers, with an almost limitless memory and computational speed, should overcome the problem of identifying humans limitations.

2. LITERATURE SURVEY

Many analyzer tried to understand how humans recognize faces, most of them when the automatic face recognition problem ensue, looking for design inspiration. It seems important to understand how we do this task, how we perceive humans[1].Then this knowledge could be applied in automatic face recognition systems. However, many algorithms don't use this information, using just mathematical tools. One early paper that answered this question was published by Diamond and Carey back in 1986 [2]. They presented four experiments. They analyzed to know if the difficulties of recognizing tangled faces was also common in other class of stimuli. At the same time, they tried to isolate the cause of this difficulty. They concluded that faces were no unique in the sense of being represented in memory in terms of singular features. This may suggested that, consequently, face recognition has not a special spot in brain. More recent studies demonstrated that face recognition is a dedicated process in our brains[3]. They suggested that there is a special process in our brains, and a special part of it, dedicated to recognize human faces. This question remains unanswered and it is still a much about issue. The dedication of the form face area (FFA) as a face processing module seems to be very strong. However, it may be responsible for performing subordinate or expert-level categorization of non-specific objects [4]. We can conclude that there is a huge possibility that humans have a specialized face recognition mechanism. It could be interesting to know if humans can extract facial expression independently from the identity of the subject and vice versa. Is facial expression an important constraint or condition in face recognition? Thus, can a biological execution of a computerized face recognition system identify faces in spite of facial expression? Many studies propose that identity and expression processes separate early in the facial perception procedure [4]. Whether face recognition algorithm designers can find this information useful or not, that its another matter. Many face recognition algorithms don't use color as attribute . However, it could be interesting to know if color play a key role in human face recognition process. It is widely accepted that color cues do not impart diagnostic information for recognition, but they are not completely unrelated to face recognition systems. They could be nearly irrelevant when we try to recognize

characterize similar objects. On the other hand, it has been demonstrated that their contribution is essential under degraded conditions [5]. So, color cues play an important role especially when shape cues are degraded. This attribute could be extrapolated to face recognition system design. From both neurological and computational point of view the answer is the same: yes. It has been demonstrated that an exceptional size reduction can be made by taking into account facial symmetry [6]. The cited study also concludes that there are less than 70 size for human recognition system. This result is smaller than the previously proposed 100 size. The cause is the relevance of human face similarity. The identification of a person by their facial images can be done in a number of different ways such as by identify an image of the face in the visible spectrum using an inexpensive camera or by using the infrared patterns of facial heat emission. Facial Recognition in visible light typically model key attribute from the central portion of the facial image using a wide assortment of cameras in visible light system extract features from the identify images that do not change over time while avoiding super cool features such as facial expression or hair [7]. Several approaches to model facial images in the visible spectrum are Principal Component Analysis (PCA),Local binary Pattern (LBP). The challenges of facial recognition in the visible spectrum include reducing the impact of variable lightning and detecting a mask or photograph. Some facial recognition systems may need a stationary or posed user in order to capture image through many systems, though many systems use a real time process to attract a person's head and locate the face automatically. Major benefits of facial recognition are that it is non intrusive, hand free, continuous and accepted by most users [7]. Nowadays some applications of Face Recognition do not require face detection. In some cases, face images stored in the data bases are already normalized. There is a standard image input format, so there is no need for a awareness step. An example of this could be a criminal data base. There, the law enforcement agency stores faces of people with a villain report. If there is new subject and the police has his or her passport photograph, face detection is not necessary. However, the conventional input image of computer vision systems are not that suitable. They can contain many faces. In these cases face detection is mandatory. It is also unavoidable if we want to develop an automated face tracking system. For example, video surveillance systems try to include face detection, purposes and recognizing. So, it is reasonable to assume face detection as part of the more substantial face recognition problem. Face detection must deal with several well known challenges [9] [8]. They are usually present in images captured in uncontrolled environments, such as surveillance video systems. Steps in the facial recognition process The facial recognition process normally has four interrelated phases or steps. The step is face detection, the second is normalization, the third is feature extraction, and the cumulative step is face recognition. These steps depend on each other and often use similar techniques. They may also be described as separate components of a typical FRS. Nevertheless, it is useful to keep them conceptually separate for the cause of clarity. Each of these steps poses very significant challenges to the successful operation of a FRS. Figure 2.3 indicates the logical sequence of the different steps.

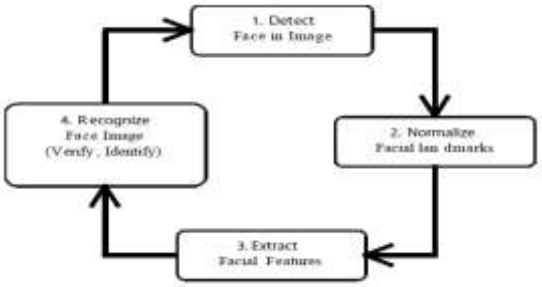

Figure 2.3 logical sequences of the different steps.

Steps in the facial recognition process.

- Detecting Frontal Face in given Input Image
- Normalizing facial landmarks for given Image
- Extract facial features for given Image
- Reduce Dimension of generated feature vector
- Identify or Recognize face images

3. PROPOSED METHOD

Union of Local Binary Pattern and Principal Component Analysis for the face recognition. LBP helps to recognize face image with small orientation, illumination variances and expression. PCA will reduce the length of the feature vector. LBP operator works with 8 neighbors of pixel, using value of circle pixel as a threshold. All neighbors that have values higher than the value of circle pixel will be given value 1 and all those that have lower or equal to value of central pixel will be given value 0.The eight binary numbers associated with 8 neighbors are then read regular in the clockwise direction to form a binary number. This binary number or its equivalent in decimal system may be assigned to central pixel. The LBP feature vector, in its simplest form, Divide the examined window to cells (e.g. 3328 pixels for each cell). For each pixel in a cell, compare the pixel to each of its 8 neighbors. Where the center pixel's value is greater than the neighbor, write "1". Otherwise, write "0". This will give an 8-digit binary number (which is usually converted to decimal for convenience). This binary number will be considered in clockwise direction. Compute the histogram, over the cell, of the density of each "number" occurring (i.e., each combination of which pixels are smaller and which are greater than the center). Optionally normalize

the histogram. Link together normalized histograms of all cells. This will give the feature vector for the window. Local Binary Pattern has been applied to normal images under varying illuminations and expression. PCA has been considered as a simple, efficient linear subspace method, many nonlinear techniques such as kernel PCA can be used. Certain nonlinear methods with certain classier do yield better performances consistently than others. The following works can be carried out in future to improve the face recognition. In this approach we used Training dataset consists of 760 images of size 180200 of 152 different faces with 5 variations in expressions. Test dataset which is used as input consists of 304 images of dimension 180200 of 152 different faces with 2 variations in expressions. Facial features are extracted from the LBP face image and then image is divided into 10 regions LBP histograms are generated for each window area. The generated vector values is input PCA for dimension reduction.

1. CONCLUSION

This work has presented the different algorithms, the proposed approach and variant algorithms with their efficiency. The algorithms PCA, implemented the results were analyzed and from that we can conclude that though the LBP need less processing memory, and if we have large number of image database the required processing memory as compare to PCA would be less. The hybrid approach will make some good difference in terms of reduction to processing memory as compare to these existing algorithms. Face recognition systems used today work very well under constrained conditions, although all systems work more improve with frontal images and constant lighting. Face recognition systems used today work very well under constrained conditions, although all systems work more improve with frontal picture and constant lighting. Technology used in smart environments has to be restrained and allow users to act freely. Therefore, it is not just a unresolved problem but also the source of new applications and challenges.

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