Face Detection and Recognition using Enhanced- LBP Feature Extraction in Digital Images

Aman Deep[1] Rachna Rajput[2]
[1,2]Guru Kashi University

Abstract— We present a new approach to face detection and recognition from digital images which considers both shape and texture information to represent face images. The face area in any digital image is first divided into small regions from which Enhanced Local Binary Pattern (E-LBP) histograms are extracted and concatenated into a single, spatially enhanced feature histogram efficiently representing the face image. The recognition is performed utilizing a closest neighbor classifier as a part of the figured element space with Chi square as a difference measure. Extensive experiments clearly show the superiority of the proposed scheme over all considered methods (PCA, Bayesian Intra/extra personal Classifier and Elastic Bunch Graph Matching) on FERET tests which include testing the robustness of the method against different facial expressions, lighting and aging of the subjects. In addition to its efficiency, the simplicity of the proposed method allows for very fast feature extraction.

Key words: Face Detection, Face Recognition, Enhanced LBP, Feature Extraction

I. INTRODUCTION

The face is our primary focus of attention in social life playing an important role in conveying identity and emotions. We can recognize a number of faces learned throughout our lifespan and identify faces at a glance even after years of separation. Human face detection is an important research area with several applications in video conferencing, human-computer interaction, content-based image retrieval, and automatic authorization. Face detection problem can be stated as, determining whether there are human faces in the image, and if there are, returning the location of each human face in the image, regardless of its position, scale, orientation and lighting condition.

Face detection problem can be described as follows: given an arbitrary image, which can be a digitized video signal or a scanned photograph, determining whether there are human faces in the images, and if there are, returning the location of each human face in the image. A related problem to face detection is face recognition, which can be described as comparing the input face against a library of known faces and reporting if a match is found.

II. PROBLEM IN FACE DETECTION AND RECOGNITION

Face detection is difficult due to three main reasons. First, there is a large component of non-rigidity and textural differences among faces. Facial appearance differs from face to face. Second, face detection is also made difficult because of additional features, such as glasses or a moustache, which can either be present or totally absent from a face. All these additional features increase the variability of the face patterns that a face detection system should handle. Third, the presence of unpredictable imaging conditions in an unconstrained environment increases the difficulty of the task. A change in light source distribution can cause a significant change in the appearance of the face image.

The problem of face recognition is all about face detection. This is a fact that seems quite bizarre to new researchers in this area. However, before face recognition is possible, one must be able to reliably find a face and its landmarks. This is essentially a segmentation problem and in practical systems, most of the effort goes into solving this task. In fact the actual recognition based on features extracted from these facial landmarks is only a minor last step.

There are two types of face detection problems:

- Face detection in images and
- Real-time face detection

A. Face Detection In Images

Most face detection systems attempt to extract a fraction of the whole face, thereby eliminating most of the background and other areas of an individual's head such as hair that are not necessary for the face recognition task. With static images, this is often done by running a 'window' across the image. The face detection system then judges if a face is present inside the window. Unfortunately, with static images there is a very large search space of possible locations of a face in an image. Faces may be large or small and be positioned anywhere from the upper left to the lower right of the image.

B. Real-Time Face Detection

Real-time face detection involves detection of a face from a series of frames from a video capturing device. While the hardware requirements for such a system are far more stringent, from a computer vision stand point, real-time face detection is actually a far simpler process than detecting a face in a static image. This is because unlike most of our surrounding environment, people are continually moving. We walk around, blink, fidget, wave our hands about, etc.

III. FACE RECOGNITION

Over the last few decades many techniques have been proposed for face recognition. Many of the techniques proposed during the early stages of computer vision cannot be considered successful, but almost all of the recent approaches to the face recognition problem have been creditable. All approaches to human face recognition can be divided into two strategies:

- Geometrical features and
- Template matching.

A. Face Recognition using Geometrical Features

This technique involves computation of a set of geometrical features such as nose width and length, mouth position and chin shape, etc. from the picture of the face we want to recognize. This set of features is then matched with the features of known individuals. A suitable metric such as Euclidean distance (finding the closest vector) can be used

to find the closest match. Most pioneering work in face recognition was done using geometric features.

The advantage of using geometrical features as a basis for face recognition is that recognition is possible even at very low resolutions and with noisy images (images with many disorderly pixel intensities). Although the face cannot be viewed in detail its overall geometrical configuration can be extracted for face recognition. The technique's main disadvantage is that automated extraction of the facial geometrical features is very hard.

B. Face Recognition Using Template Matching

This is similar the template matching technique used in face detection, except here we are not trying to classify an image as a 'face' or 'non-face' but are trying to recognize a face. The basis of the template matching strategy is to extract whole facial regions (matrix of pixels) and compare these with the stored images of known individuals. Once again Euclidean distance can be used to find the closest match. However there are far more sophisticated methods of template matching for face recognition. These involve extensive pre-processing and transformation of the extracted grey-level intensity values.

IV. LITERATURE SURVEY

Thai Hoang Le et.al., The paper will present a novel approach for solving face recognition problem. Our method combines 2D Principal Component Analysis (2DPCA), one of the prominent methods for extracting feature vectors, and Support Vector Machine (SVM), the most powerful discriminative method for classification. Experiments based on proposed method have been conducted on two public data sets FERET and AT&T; the results show that the proposed method could improve the classification rates.

Dr. Pramod Kumar et.al., Face recognition presents a challenging problem in the field of image analysis and computer vision, and as such has received a great deal of attention over the last few years because of its many applications in various domains. This paper focuses on the meaning of face recognition system, human face features that use to identify the face, face recognition types including two- dimensional system (2D) and three-dimensional system(3D)& the explanation of three-dimensional recognition procedures Authors also explained our new idea for recognizing the human face. This paper is an attempt to give an idea of the state of the art of face recognition technology.

Navin Prakash et.al., Face recognition is a challenging problem in the field of image Processing, and as such has received a great attention over the last few years because of it has many applications in various fields. This paper presents the comparison of different biometric traits and world wide revenues collected by different biometric techniques. After that various face recognition applications with face recognition process describe. Illustrate some challenges encountered in face recognition in current systems. Also state, an overview of some of the well-known algorithm in face recognition and their good marks in this field. Finally, mentions some of the most recent algorithms combined with Support Vector Machine for better result.

N. Revathy et.al., The problem in face recognition is to find the best match of an unknown image against a database of face models or to determine whether it does not match any of them well. In this method, authors use back propagation neural network for implementation. It is an information processing system that has been developed as a generalization of the mathematical model of human recognition. The function of a neural network is to produce an output pattern when presented with an input pattern. The back propagation type of neural network is a feed forward system with training input pattern and weight adjustment with the associated error. The input neurons receive input signal and propagates into each hidden neuron, which again computes the activation to obtain the net output. This face recognition system is implemented using a MATLAB software package. In this authors used the neural networks tool box in matlab. Authors found the transformation for different inputs and compared with unknown face that the given face is in database or not.

V. PROPOSED METHODOLOGY

The proposed system works in four modules which are described as below:

- Load Image
- Preprocessing
- Feature Extraction
- Multi SVM
- Performance Evaluation

A. Load Image:

In this module we will load the test image from the test image folder which is to be recognize. Then the loaded test image is converted into gray scale image**.**

B. Preprocessing:

After the gray scale conversion we apply median filter to that image. The Median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing. Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise.

1) Median Filter:

- Returns the median value of the pixels in a neighborhood Is non-linear
- Is similar to a uniform blurring filter which returns the mean value of the pixels in a neighborhood of a pixel
- Unlike a mean value filter the median tends to preserve step edges.

C. Feature Extraction:

1) Test Image Feature Extraction:

The feature values are extracted from the filtered test image. We extract the gabor feature for the input image. Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for shape representation and discrimination.

2) Training Image Feature Extraction:

The feature values for training images are extracted by using Gabor feature extraction method. Gabor filters are similar to those of the human visual system, and they have been found to be particularly appropriate for shape representation and discrimination. A set of Gabor filters with different

frequencies and orientations used for extracting useful features from an image.

D. Classification:

Multi SVM classification method is used to recognize the input image. To achieve this we train the Multi SVM by using the three parameters namely LABEL, Training features and Test features. By learning, the SVM classifies the age of the test image.

VI. Results and Discussion

The proposed system is tested on various inputs consist of different faces and results are very effective and accurate. We have tested the system on 50 different faces. The accuracy of the proposed system is comes out to be 94%.

A. Conclusion and Future Scope

In the proposed work, we have detect and recognize the face from a digital image using Enhanced LBP Technique. Proposed system is tested on various faces to evaluate the performance of the system. The performance of the proposed work is evaluated to be better than that of existing techniques. In future, a new algorithm that can detect and recognize face from a video file input.

References

[1] Thai Hoang Le, Len Bui: Face Recognition Based on SVM and 2DPCA
[2] Dr. Pramod Kumar, Mrs. Monika Agarwal, Miss. Stuti Nagar : A Survey on Face Recognition System - A Challenge
[3] Navin Prakash, Dr. Yash Pal Singh, Dr.D.Rai: Emerging Trends of Face Recognition: A Review
[4] N. Revathy, T.Guhan: FACE RECOGNITION SYSTEM USING BACK PROPAGATION ARTIFICIAL NEURAL NETWORKS
[5] S. Muruganantham, Member IACSIT and Dr. T. Jebarajan: A Comprehensive Review of Significant Researches on Face Recognition Based on Various Conditions
[6] K. Susheel Kumar, Shitala Prasad, Vijay Bhaskar Semwal, R C Tripathi: REAL TIME FACE RECOGNITION USING ADABOOST IMPROVED FAST PCA ALGORITHM
[7] Ognjen Arandjelovic´ n, RobertoCipolla : Achieving robust face recognition from video by combining a weak photometric model and a learnt generic face invariant
[8] Aruni Singh, Sanjay Kumar Singh, Shrikant Tiwari: Comparison of face Recognition Algorithms on Dummy Faces
[9] Aruni Singh, Sanjay Kumar Singh: EFFECT OF FACE TAMPERING ON FACE RECOGNITION
[10] Omaima N. A. AL-Allaf: REVIEW OF FACE DETECTION SYSTEMS BASED ARTIFICIAL NEURAL NETWORKS ALGORITHMS
[11] Pushpaja V. Saudagare, D.S. Chaudhari: Facial Expression Recognition using Neural Network –An Overview
[12] Erik Hjelm°as, Boon Kee Low: Face Detection: A Survey
[13] Cha Zhang and Zhengyou Zhang: A Survey of Recent Advances in Face Detection
[14] Steve Lawrence,C. Lee Giles, Ah Chung Tsoi,Andrew D. Back: Face Recognition: A Convolutional Neural Network Approach

