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Face Image Based Attendance Using DL

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ABSTRACT

A real time face recognition system is capable of identifying or verifying a person from a video frame. To recognize the face in a frame, first you need to detect whether the face is present in the frame. If it is present, mark it as a region of interest (ROI), extract the ROI and process it for facial recognition. Facial recognition is done using CNN features. The application prepared has 2 main steps, one is face registration and second is face recognition. Face registration capture the person face and train classifier while face recognition recognise face using trained classifier.

Keypoints: Face Recognition, Local Binary pattern, Face detection, ROI, Graphical User Interface.

INTRODUCTON

The face of a human being conveys a lot of information about identity and emotional state of the person. Face recognition is an interesting and challenging problem, and impacts important applications in many areas such as identification for law enforcement, authentication for banking and security system access, and personal identification among others. In our research work mainly consists of three parts, namely face representation, feature extraction and classification. Face representation represents how to model a face and determines the successive algorithms of detection and recognition images. Facial expression is one of the most powerful, natural and immediate means for human beings to communicate their emotions and intensions.

Face recognition is an interesting and challenging problem, and impacts important applications in many areas such as identification for law enforcement, authentication for banking and security system access, and also personal identification among others [1]. The face plays a major role in our social intercourse in conveying identity and emotion. The human ability to recognize faces is remarkable. Modern Civilization heavily depends on person authentication for several purposes. Face recognition has always a major focus of research because of its non-invasive nature and because it is peoples primary method of person identification. A face recognition system would allow user to be identified by simply walking past a surveillance camera.

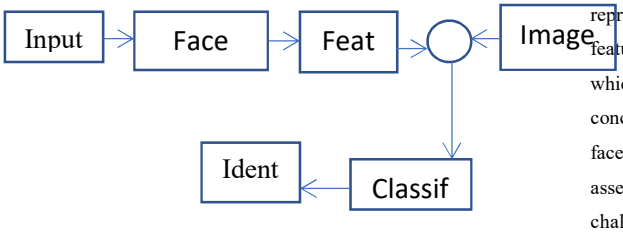
Human beings often recognize one another by unique facial characteristics. One of the latest biometric technologies, automatic facial recognition, is based on this phenomenon. Facial recognition is the most successful form of human surveillance. Facial recognition technology, is being used to improve human efficiency when recognizing faces, is one of the fastest growing fields in the biometric industry. Interest in facial recognition is being fueled by the availability and low cost of video hardware, the ever-increasing number of video cameras being placed in the workspace, and the noninvasive aspect of facial recognition systems.

In this area, the variations of light, gesture, expression, age or the imaging conditions in the face image have become a key challenge. For this extracting local structure based on texture and structural characteristics is important. In Local Binary Pattern (CNN) which is frequently used for texture classification, for each pixel, a binary code is produced by thresholding its value with the value of the centre pixel. A histogram is created to collect the occurrences of different binary patterns.

For face recognition, the face area is first divided into small regions from which Local Binary Pattern (CNN) histograms are extracted and concatenated into a single, spatially enhanced feature histogram efficiently representing the face image. Efficiency & the simplicity of the proposed method allows for very fast feature extraction. The textures of the facial regions are locally encoded by the CNN patterns while the whole shape of the face is recovered by the construction of the face feature histogram. The idea behind using the CNN features in face recognition is that the face images can be seen as composition of micro-patterns which are invariant with respect to monotonic grey scale transformations. Combining these

micro-patterns, a global description of the face image is obtained.

The research of face recognition technique based on local structure is to be characterized in the field of face classification in recent years. And the variations of light, gesture, expression, age or the imaging conditions have become a key challenge. But as an invariability feature of face image, texture and structural characteristics are not sensitive to illumination variations. Therefore, extracting local structure based on texture and structural characteristics is important. Local Binary Pattern (CNN) [1] operator has been proved to be a theoretically simple yet very effective multiresolution statistical texture descriptor in terms of the characteristics of the local structure.



LITERATURE SURVEY

1. **Unsang Park, "Face Recognition: face in video, age invariance, and facial marks" Michigan State University, 2009**

Automatic face recognition has been extensively studied over the past decades in various domains (e.g., 2D, 3D, and video) resulting in a dramatic improvement. However, face recognition performance severely degrades under pose, lighting and expression variations, occlusion, and aging. Pose and lighting variations along with low image resolutions are major sources of degradation of face recognition performance in surveillance video.

We propose a video-based face recognition framework using 3D face modelling and Pan-Tilt-Zoom (PTZ) cameras to overcome the pose/lighting variations and low resolution problems. We propose a 3D aging modeling technique and show how it can be used to compensate for age variations to improve face recognition performance. The aging modeling technique adapts view invariant 3D face models to the given 2D face aging database. We also propose an automatic facial mark detection method and a fusion scheme that combines the facial mark matching with a commercial face recognition matcher.

The proposed approach can be used i) as an indexing scheme for a face image retrieval system and ii) to augment global facial features to improve the recognition performance. Experimental results show i) high recognition accuracy (>99%) on a large scale video data (>200 subjects), ii) ~10% improvement in recognition accuracy using the proposed aging model, and iii) ~0.94% improvement in the recognition accuracy by utilizing facial marks.

2. **T. Ahonen, A. Hadid and M. Pietikainen, "Face description with Local Binary Patterns", Application to Face Recognition. Machine Vision Group, University of Oulu, Finland, 2006**

This paper presents a novel and efficient facial image representation based on local binary pattern (CNN) texture features. The face image is divided into several regions from which the CNN feature distributions are extracted and concatenated into an enhanced feature vector to be used as a face descriptor. The performance of the proposed method is assessed in the face recognition problem under different challenges. Other applications and several extensions are also discussed.

3. **T. Ahonen, A. Hadid, M. Pietikainen and T. M aenpaa. "Face recognition based on the appearance of local regions", In Proceedings of the 17th International Conference on Pattern Recognition, 2004.**

In this paper, we propose a novel descriptor for face recognition on grayscale images, depth images and 2D+depth images. It is a compact and effective descriptor computed from the magnitude and the direction difference. It can be concatenated with conventional descriptors such as well-known Local Binary Pattern (CNN) and Weber Local Binary Pattern (WCNN), to enhance their discrimination capability.

To evaluate the performance of our descriptor, we conducted extensive experiments on three types of images using four different databases. The experimental results demonstrate the robustness and superiority of our approach, and the performances of our new descriptor surpass that without magnitude and direction difference. At the end, we further compare our descriptor with Convolution Neural Network (CNN) to show the compactness and effectiveness of the proposed approach

4. **R. Gottumukkal and V.K. Asari, "An Improved Face Recognition Technique Based on Modular PCA Approach" Pattern Recognition Letters, vol. 25, pp. 429- 436, Mar. 2004.**

A face recognition algorithm based on modular PCA approach is presented in this paper. The proposed algorithm when compared with conventional PCA algorithm has an improved recognition rate for face images with large variations in lighting direction and facial expression. In the proposed technique, the face images are divided into smaller sub-images and the PCA approach is applied to each of these sub-images.

Since some of the local facial features of an individual do not vary even when the pose, lighting direction and facial expression vary, we expect the proposed method to be able to cope with these variations. The accuracy of the conventional PCA method and modular PCA method are evaluated under the conditions of varying expression, illumination and pose using standard face databases.

PROPOSED METHOD

Face recognition is not a simple problem since an unknown face image seen in the extraction phase is usually different from the face image seen in the classification phase. Although local binary features has been extracted from the face image for face recognition that there are several face image uses in the database that compared with the input face image. The face image depends on viewing lighting and environmental conditions. In addition the face image changes according to the expressions. In the research work, which is flexible and efficient, should be solved the problems.

To implement the face recognition in this research work, we proposed the Local Binary patterns methodology. Local Binary Pattern works on local features that uses CNN operator which summarizes the local special structure of a face image [11]. CNN is defined as an orders set of binary comparisons of pixels intensities between the center pixels and its eight surrounding pixels.

The Face Recognition Algorithm Input: Training Image set. Output: Feature extracted from face image and compared with centre pixel and recognition with unknown face image.

1. Initialize temp = 0

2. FOR each image I in the training image set

3. Initialize the pattern histogram, H = 0

4. FOR each center pixel tc ϵ I

5. Compute the pattern label of tc, CNN (1)

6. Increase the corresponding bin by 1.

7. END FOR

8. Find the highest CNN feature for each face image and combined into single vector.

9. Compare with test face image.

10. If it match it most similar face in database then successfully recognized.

Algorithm We start by summarizing the main common steps of the algorithms used in this work. Then we describe each step in detail. The proposed face recognition process consists of four main parts:

1) **Preprocessing:**
We begin by applying the Tan and Triggs' illumination normalization algorithm to compensate for illumination variation in the face image. No further preprocessing, such as for example face alignment, is performed in the preprocessing.

2) **CNN operator application:**
In the 2nd stage CNN are computed for each pixel, making a fine scale textural description of the image.

3) **Local feature extraction process:**
Local features are produced by computing histograms of CNN over local image regions.

4) **Classification:**
Each face image in test set is classified by comparing it against the face images in the training set. The comparison is performed using the local features obtained in the previous step in the algorithm.

The first two steps are shared by all the algorithms. The algorithms we explore in this work vary in how they perform the last two steps. [7] Face recognition is not a simple problem since an unknown face image seen in the extraction phase is usually different from the face image seen in the been extracted from the face image for face recognition that there are several face image uses in the database that compared with the input face image. The face image depends on viewing lighting and environmental conditions. In addition the face image changes according to the expressions. In the research work,

which is flexible and efficient, should be solved the desired problems. [12-15]To implement the face recognition in this research work, we proposed the Local Binary patterns methodology. Local Binary Pattern works on local features that uses CNN operator which summarizes the local special structure of a face image. [8] CNN is defined as an orders set of binary comparisons of pixels intensities between the center pixels and its eight surrounding pixels in the image

RESULT

This implementation is used to test the performance of the CNN-method on different kind of face images. Several parameters, like the CNN operator (P and R), non-weighted or weighted regions and the dividing of the regions, are varied to see the influence of these parameters on the performance. For this experiment we have collected lots of face images, some of them are collected from photographs taken with a Canon Power shot A610 camera and some are taken from A4Tech webcams. And also collected face images from the face database [14]. In the proposed algorithm, different types of face images have been recognized. Based on algorithm, the face image of an unknown identity is compared with face images of known individuals from a large database. In the figure 1.8 we can see the input facial images used for input for face recognition are given below:

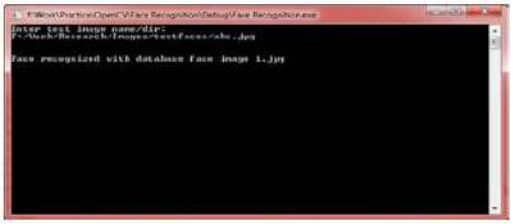
Figure 4.1: Different Input Facial Images

And also in the figure 1.9 we can see the facial images that are stored in the database which compared with the input facial images. If the input face images are found or the more similarities face images are matched in the database then we say the face image is successfully recognized.

Figure 4.2: Facial Image from the Database

In the experiment we can train the face images in the database. That the facial images are successfully trained shown in the window mode in the bellow:

Based on the algorithm the input face images are compared with database facial images for identification. The face recognition results are shown in below in window mode:



The following table shows overall face recognition rate:

Table 1:

Recognition rate of the Research

Number of face images stored in database	Number of input face images compared with database	Recognized Image	Unrecognized Image	Recognition Rate
2000	2000	1980	20	99%

In the table 1 the recognition rate is above 100%. We recognize the face images from the database face images by comparing between input face image and database image. From the experimental result, it is seen that the research satisfies all the requirements to recognize the face images.

Proposed algorithm was demonstrated successfully using MATLAB. Experimental Results obtained using the local image face database shows that the percentage of the CNN face recognition varies from 65.281%to 100 % with overall average of about76.96%. The face recognition rate is about99%. It is found that the face recognition efficiency of the traditional face

recognition approaches, CA and LDA, decreases while facing the face variations on pose, illumination and expression. Compared with PCA and LDA, the CNNalgorithm is more robust to face conditions, and gets the better recognition performance. In addition, all the algorithms perform better on expression variation than on illumination condition, which means illumination variation is more challenging for face recognition.

CONCLUSON

In this research has been done to the performance of a face recognition system by making use of feature extraction with Local Binary Patterns [12]. It mainly consists of three parts, namely face representation, feature extraction and classification. Face representation represents how to model a face and determines the successive algorithms of detection and recognition. The most useful and unique features of the face image are extracted in the feature extraction phase. In the classification the face image is compared with the images from the database. This method represents the local feature of the face and matches it with the most similar face image in database. The accuracy of the system is above 100% by the Local Binary Patterns algorithm.

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