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Facial Feature Extraction in Colour Images Based on Local Binary Pattern

Lakshmy. R[1], Asha A. S[2]

[1]PG Scholar, Department of Electronics and Communication Engineering
TKM Institute of Technology, Kollam, Kerala, India

[2]Assistant Professor, Department of Electronics and Communication Engineering
TKM Institute of Technology, Kollam, Kerala, India

Abstract: ***Face recognition is the most popular method in recent years. It has many applications in various fields such as to identify criminals, in airports etc. But identification under controlled environments are very accurate but uncontrolled environments such as different pose, illumination etc are not very accurate. In this method face identification is performed under uncontrolled environments by first image intensity is normalized then skin region is extracted and from the detected skin region different features are extracted for recognition purposes. Database used for recognition are FRGC and FERET.***

Keywords: Face recognition, Identification, Illumination, Normalization, Skin detection

1. Introduction

Biometry is the study of various behavioral and structural characteristics of human. For recognizing humans there are many techniques such as gait, fingerprint, sclera, eye etc. But apart from all these recognition techniques face is used as the most popular methods for recognition. Face recognition has been used in many applications such as crime investigation, in mug shot album etc. But all face recognition techniques provides high recognition rates under controlled situations but in uncontrolled conditions such as changes in illumination, pose etc do not provide high recognition rates [1]. In this paper face recognition under uncontrolled conditions are performed by different steps including illumination normalization, skin detection, and then from the detected skin region different feature are extracted.

Face recognition task can be divided into two. They are face identification and face verification. In face identification an unknown person is matched to a gallery of known people so this method is also called 1:N matching. In face verification he or she should accept his or her identity so this method is called 1:1 matching method. The basic face recognition can be performed by first acquiring an image from the database or by using a digital camera and the face detection is performed. From the detected face region several features are extracted finally these features are compared with the database for recognition. In this paper an image is acquired from the database and for further processing this image intensities are normalized and after normalization its skin regions are detected. These skin regions are detected using colour models and after this process it is invariant to illumination changes and finally features are extracted from the skin regions for further processing.

2. Related Works

There are many existing methods for face recognition but these methods are done for controlled environments, some of the existing methods for face recognition are using eigenfaces [2] ,recognition using a template[3].recognition based on gabor filters and geometrical feature matching method by calculating the distance between eyes, nose mouth etc[4] ,recognition based on 3 D morphable model[7] etc but all these methods have some disadvantages that illumination normalization is necessary for most of the techniques. This paper is structured as follows. In section II, block diagram for the proposed method which include acquisition of the image from the database, normalizing the intensities of the image, segmented skin region, feature extraction stage. Section III compliments the results with discussions. Conclusions are finally drawn in section IV.

3. Proposed Method

Here first describe about the intensity normalization ,skin detection and then the removal of noise from the skin detected region and the discussion about the feature extraction process. Block diagram of proposed method is shown in Figure 1.

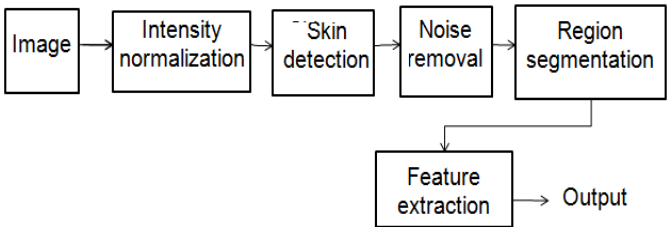

Figure 1: Block diagram of proposed method

3.1 Intensity Normalization

Normalization is the process of changing the range of pixel intensity values. Image which is acquired from the database may be not suitable for further processing because it may be darker so its intensity has to be normalized. The technique used to normalize the image is first an rgb image is converted to ycbcr and from this the luminance component is calculated. By finding the maximum and minimum values of luminance component find the average by this method we

can enhance the input image and referred this image as lighting compensation image.

3.2 Skin Detection

Skin detection process is typically a pre-processing step. It typically transforms a given pixel into an appropriate colour space. It represents a colour in a way that is insensitive to illumination changes. The appearance of skin in an image depends on the illumination conditions where the image was captured. The colour model used here is ycbcr from this we extract the cr component and the find the skin index row and column. As will be discussed shortly, the choice of the color space affects greatly the performance of any skin detector and its sensitivity to change in illumination conditions

3.3 Noise Removal

The detected skin region may contain some amount of unwanted portions that portion can be found by calculating the local sum of the detected skin region and for all regions where the local sum greater than a particular threshold or by using a filter we can remove these unwanted portion. based on mean and variance.

3.4 Region Segmentation

After removing noise from the image the skin region is converted back to colour image bu psuodocolouring. Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

3.5 Feature Extraction

Feature extractions are performed to do information packing dimension reduction and salient extraction of pixels, also known as super pixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics.

The different features which are extracted for recognition purposes are mean feature, texture, salient visual properties, and shape. The mean feature is obtained by averaging the intensities of pixel in an image .The texture region is obtained from LBP. The shape of the region is obtained from HoG and different salient visual properties are obtained using Gabor filter.

LBP (local binary pattern) is a texture descriptor. Face image is generated by dividing the image into rectangular grids and computing the histogram for each grid. . Its original version labels the pixels of an image by thresholding the 3 *3 neighborhood with intensity with respect to its intensity of the centre pixel, that defines1) The LBP pattern of the image neighborhood is obtained by summing the corresponding thresholded values weighted by a binomial factor of as LBP (2) Finally, a 256-bin histogram of the resulting labels is used as a feature descriptor for a patch of the image.

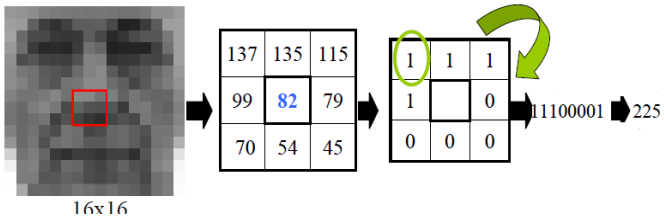

Figure 2: Local Binary Pattern

HoG (Histogram oriented gradients) is an object recognition descriptor it captures edge or gradient structures that are characteristics of local shape. Image is divided into small concatenated cells and for each cell histogram of edge orientation is computed.

4. Experimental Results

Images are acquired from the database. The database used for the project is FRGC and FERET database. The tool used for the project is MATLAB R2010a version. FRGC (Face recognition grand challenge) consists of two sets of images target and query sets. The size of the image used is 250*180*3 and the image obtained from the database is an rgb image. The different steps involved are first an rgb image is intensity normalized using the colour model and the model used is ycbcr model. After that skin regions are extracted but this may contain some amount of noises after removing the noises the region is segmented back and finally the different features are extracted from the skin regions.

Figure 3: Original image

Figure 4: Normalized image

Figure 5: Skin detected output

Figure 6:.Noise removal and segmented output

Figure 7: LBP output

5. Conclusion

Face recognition is a challenging problem in the field of image analysis and computer vision that has received a great deal of attention over the last few years because of its many applications in various domains. Research has been conducted vigorously in this area for the past four decades or so, and though huge progress has been made, encouraging results have been obtained and current face recognition systems have reached a certain degree of maturity when operating under constrained conditions; however, they are far from achieving the ideal of being able to perform adequately in all the various situations that are commonly encountered by applications utilizing these techniques in practical life. Face identification deals with the identification of the face under uncontrolled environments. In this work a face region is acquired from the database and its intensity is normalized and skin regions are extracted from the normalized image. In feature extraction stage LBP extracted from the face image. In future by extracting more features we can improve the accuracy of the face recognition system.

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Author Profile

Lakshmy.R received B. Tech. Degree in Applied Electronics and Instrumentation Engineering from Kerala University in the year 2010. She is now pursuing M. Tech. degree (CUSAT) from TKM Institute of Technology, Kerala.

Asha A.S received B. Tech Degree in Electronics and Communication Engineering from Kerala University and M.Tech degree in Communication System from Anna University in the year 2006 and 2012 respectively. She is now working as an Assistant Professor in TKM Institute of Technology, Kerala.