An Unswerving Approach For Recognizing Faces In Erratic Illuminations

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Abstract-- Application for identifying or authenticating a person from a digital image or a video frame from a source can be done by comparing the selected facial features from the image and database. The existing systems include poor face credits with illumination ailment and the methods for finding the varying face expressions is still an issue. YALE-B database provides new insights into the role of robust pre-processing methods played in dealing with difficult illumination conditions and thus being useful in the description of new methods for robust face recognition. The system derives important information regarding the image quality achieved during the acquisition of the image. This paper implements pre-processing tasks such as Gamma correction, Differences of Gaussian (DOG) filter Masking and Normalization by considering the overall composition of the images. A special form of dimensionality reduction called Feature Extraction is carried out. The features set will extract the relevant information from the input data in order to perform the desired task. A k-Nearest Neighbor (k-NN) classification procedure is adopted to recognize the unique and permanent facial characteristics of a single person and store these features in the database as face templates. Later on, whenever the individual revisits the ground, their faces are known by the system application automatically. The aim is to develop a system which helps in easy retrieval and classification of accurate face characteristics.

Keywords: *illuminations, digital image, recognitions, robust, acquisition, extraction, templates, reliability*

I. INTRODUCTION

Identifying or recognizing faces is a part of the capability of human being and it is the task of humans to perform routinely and effortlessly in daily lives. Real world face recognition in an unconstrained scenario and it is still a major challenge in biometrics. This paper describes a new context for face examination. The paper shows the benefits of image quality and reliability and it enhances the overall accuracy. The system shows the present variations in pose, expression, image quality and recognizes resolution for facial images using various Classification algorithms. The project focuses mainly on the issue of robustness to lighting variations and identifies different facial conditions caused by distortions and illuminations for reliable and efficient detection. In some of the recognition methods the face area is first divided into small regions from which Local Binary Pattern (LBP) histograms are mined and concatenated into a single, spatially enhanced feature histogram efficiently representing the face image. Different face recognition algorithms on a common and large database are to evaluate their performance against different factors such as facial expression, illumination changes, aging. Face Recognition against obstructions and expression discrepancies as a new method based on partitioned iterated function system. The small differences in the image due to uniqueness, facial expression, and so on, will become the dominant source of alteration in an image and can thus be investigated for recognition purposes.

II. LITERATURE SURVEY

A literature survey is a text written by someone to consider the perilous points of current facts including substantive findings as well as theoretical and methodological contributions to a particular topic. Pose invariant face recognition [1] using the pose alignment method is an effective normalization technique for robust face recognition. Pose subspace algorithm is employed in the pose alignment method performs the pose estimation. As the people are not always frontal to the camera, pose problem is a big obstacle for the recognition system.

The pose normalization algorithm based on the statistical transformation is presented which solves the pose invariant face recognition problem to some extent, especially when face rotation angle is less than 30 degree. More complicated and elaborated model may be studied to solve pose normalization in varying illuminations. It is very difficult to collect face images under various poses.

[2],[3] introduces Active Shape Model (ASM) and appearance based method to perform recognition of faces almost without error on the database, except on the most extreme lighting directions. [4] Points out a new technique for human face recognition. This technique uses an image-based method towards artificial Intelligence by eliminating redundant data from face images through image compression using the two-dimensional discrete cosine transform (2D-DCT). The DCT extracts features from face images based on skin color.

The main advantage of this method is its high-speed processing competency and low computational requirements, in terms of both speed and memory utilization. The system also uses self-organizing map(SOM) with an unsupervised learning technique to organize vectors into groups to distinguish if the subject in the input image is present or not present in the image database. The problem is further complicated by differing image qualities, facial expressions, facial furniture, background, and illumination conditions

III. EXISTING SYSTEM

The system existing only identifies a normal face without any distortion for recognizing authentication by comparing the match or mismatch using template matching. The existing algorithms are used to locate the features of the image is the, Extended Active shape model algorithm (STASM). It extracts all the region of interest from an image which is fed to STASM algorithm to identify relevant marks. Although it can be handled without any effort, pose and illumination changes are difficult. In some cases, ASM (active shape model) method does not deal with identifying image illumination or face distortion. In some of the methods the interest points are not identified and performance for authentication is limited.

IV. PROPOSED SYSTEM

The Proposed system has been developed for implementing face recognition for authentication and security purpose with advanced features. Among other methods, the system addresses some of the challenges such as lighting or any abnormal condition in the face. The proposed systems recognize to verify a client at any time and in any place to identify every individual which ultimately produces efficient identification. In this project identifying face image can be done using additional algorithm named k-NN Classifier to gain better accuracy. The system derives important additional information regarding the image quality achieved during the acquisition of the biometric sample. After recognizing, the system implements preprocessing tasks by considering the overall composition of the images.

Gamma correction transform adjusts the overall brightness of an image and Gaussian filter can be utilized to increase the perceptibility of edges and other facet present in the image. Masking is applied at this point where some features are felt to be irrelevant or too variable. Sample Normalization phase integrated with a sample quality assessment and a matching phase matching followed by final response reliability. A special form of dimensionality reduction called Feature Extraction is carried. The features set will extract the relevant information from the input data in order to perform the desired task. Image quality are only applicable to face, reliability evaluation are completely independent.

A. System Architecture

The System Architecture includes the following main modules in the proposed paper:

1. Image Acquisition
2. Image Pre-processing
3. Normalization
4. Feature Extraction
5. Classification

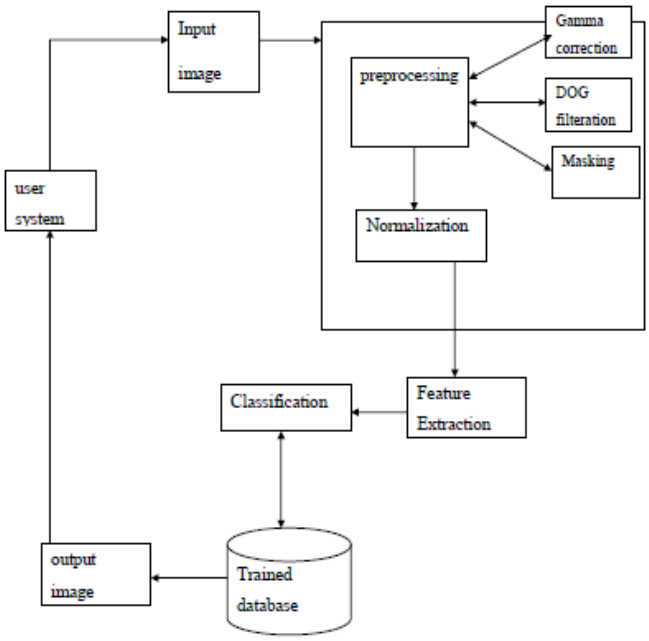

Fig 1. System Architecture

B. *Image Acquisition*

Image acquisition is the preliminary point of the system operation. The first stage of any vision method is the image acquisition stage. Image Acquirement Toolbox enables to acquire images and video from cameras and frame grabbers from the databank directly into MATLAB. After the image has been obtained, various methods of processing can be smeared to the image to accomplish many different vision tasks. However, if the image has not been acquired suitably then the envisioned tasks may not be attainable, even with the aid of some form of image enhancement.

C. Image Pre-processing

Pre-processing procedures use a small neighborhood of a pixel in an input image to get a new brightness value in the output appearance. Such pre-processing procedures are also called filtering. Pre-processing is a common name for operations with images at the lowest level of construct, both input and output are intensity images. The aim of pre-processing is a development of the image data that overwhelms unwanted distortions or enhances some image features important for further processing.

1) Gamma Correction

This method adjusts the overall brightness of an image. It also enhances the local active range of the image in dim or stalked regions while compressing it in bright regions and at highlights. Images that are not modified properly can look either faded out, or too murky. Trying to reproduce colors accurately also requires some information of gamma correction since varying the value of gamma changes not only the intensity, but also the proportions of red to green to blue in a hue image.

2) Differences of Gaussian (DOG) filter

This is a gray scale image enhancement process that involves the subtraction of one blurred version of an original gray scale image from another, less imprecise version of the novel. The unclear images are obtained by convolving the original grayscale image with Gaussian kernels having disparate standard deviations. Distorting an image using a Gaussian kernel suppresses only high-frequency spatial information. As an image enhancement algorithm, the Difference of Gaussian filter can be utilized to increase the perceptibility of edges and other facet present in a digital image.

3) Masking

This technique is to be applied to subdue facial areas that are handled to be unrelated and should be applied after DOG filtering and before contrast equalization. Some of the experiments on the YALE-B dataset use the standard elliptical mask supplied with the data to remove all but the central face region.

D. Normalization

Normalization is a process that changes the range of pixel intensity values. Normalization is occasionally called contrast stretching or histogram stretching. An individual's identity, however, is captured by small variations alone and is not specified by the variance due to the large rigid body motion and illumination of the face, it is necessary to compensate or normalize a face for position and illumination. The method is useful in pictures with foregrounds and backgrounds that are both bright or both dark.

E. Feature Extraction

Features extracted are carefully chosen to expect that the features set will extract the relevant information from the input data in order to perform the desired task. After the normalization process is done features are extracted for the relevant facial image in the trained data set. It involves simplifying the amount of resources required to describe a large set of data accurately.

F. Classification

Matching is a technique in image processing for finding small parts of an image which contest a stencil image. It can be used in engineering as a part of quality control, a way to detect edges in images. The acquired and processed image is suitable to compare the overall reliability of image in the database which shows a match or a miss-match. The k-Nearest Neighbor algorithm is a method for classifying objects based on closest training examples in the feature space.

k-NN classification divides data into a test set and a training set. For each row of the trial set the k nearest (in Euclidean distance) training set objects are found and the classification is determined by popular vote with ties broken at arbitrary. If there are ties for the Kthnearest vector all candidates are included in the vote. If the number of pre-classified points is large it makes good sense to use, instead of the single nearest neighbor, the popular vote of the nearest k neighbors. This method is referred to as the k-NN rule.

Result from recognition

The number *k* should be:

1) Large to minimize the probability of misclassifying *x*.

2) Small (with respect to the number of examples) so that the points are ends enough to *x* to give an accurate estimate of the true class of *x*.

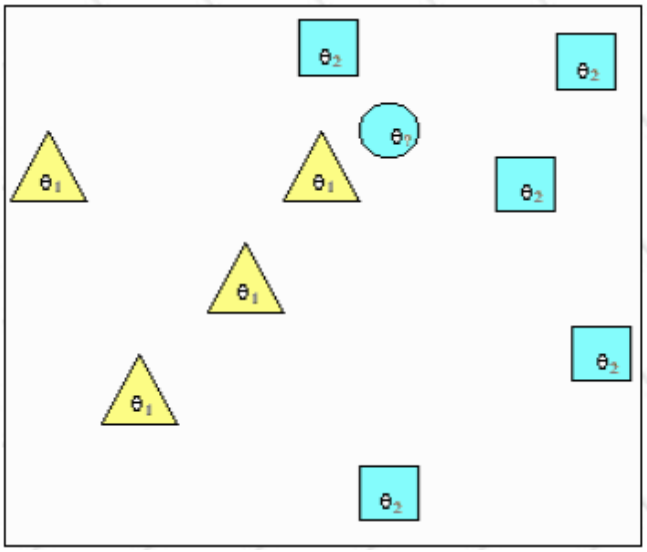

Fig 2.K-NN rule with k=3

The figure shows an example of the k-NN rule, with k=3. As before, there are two classes. They are θ1 and θ2. The circle represents the unknown sample x and as two of its nearest neighbors come from class θ2, it is labeled class θ2.

V. IMPLEMENTATION

The implementation was done using MATLAB working with image. Mat lab is a both a commanding computational atmosphere and a software design language that easily handles matrix and complex arithmetic .It is a large software suite that has many unconventional features built-in , and it has become a standard tool for many working in science or engineering disciplines. When using Mat lab's built in editor, there are simple debugging tools that can emanate in close when your programs twitch getting great and complicated. It is a high-level language and interactive location for data examination and mathematical figuring functions and provides interactive tools for 3D plotting functions.

The input image retrieved from the database containing different faces will be processed in a gray scale format. It is more efficient to process a gray image than a colored image. The retrieved face contains all the necessary characteristics for identification under different conditions of lighting environments. DOG filter involves the subtraction of one unclear version of an original grayscale image from another one. The masked images are found to estimate the condition in which the image is processed. Normalization Window shows the compensation to normalize a face for position and illumination.

Fig 3. Pre-processing window

Only after normalization work is completed, Feature extraction and image classification is done efficiently.

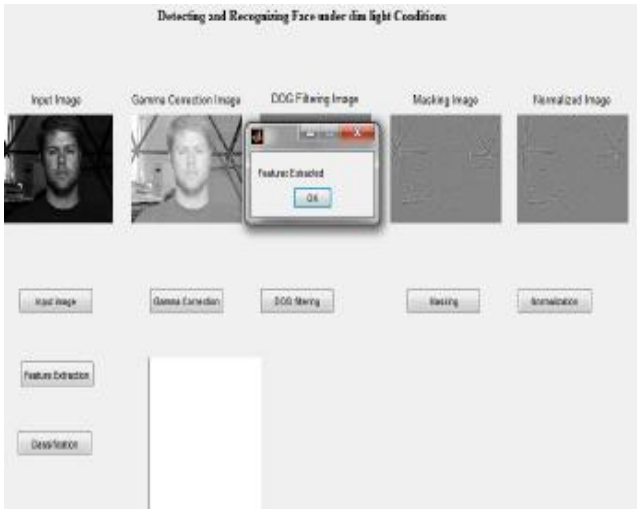

Fig 4. Feature Extraction window

A number of classifiers are used and each classifier is found appropriate to group a specific kind of feature vectors depending upon their characteristics. The classifier used universally is Nearest Neighbor classifier. This nearest neighbor classifier is used to compare the feature vector of the prototype with image feature vectors stored in the database. It is obtained by finding the distance between the pattern image and the database.

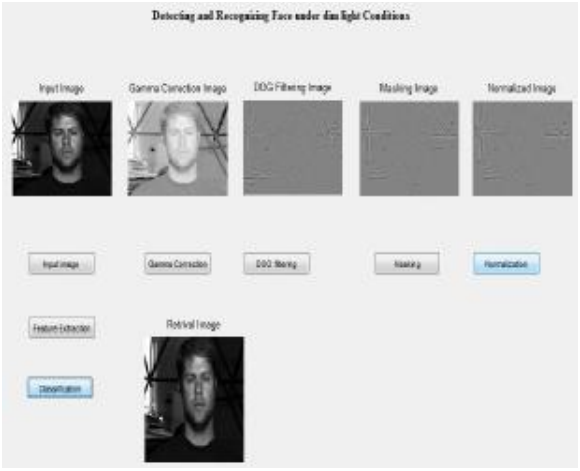

Fig 5. Result window (Classification)

The objective of image classification is to automatically classify all pixels in an image into terrestrial shield classes or information themes. The result window shows the image after classification is performed. A number of classifiers are used to suitably classify a particular kind of feature vectors depending upon their characteristics. Features are then made to be compared with the trained set in the database and obtain the retrieved image successfully.

VI. FUTURE ENCHANCEMENT AND APPLICATIONS

Face recognition is an innovative method in the field of security. It helps in accurate identity verification. It can recognize the unique and permanent facial physiognomies of a single and store these characteristics in the database as face templates. Later on, whenever the individual reenters the ground, their faces are recognized by the system application automatically. This project focuses mainly on the issue of robustness to lighting variations. Unfortunately, facial appearance depends strongly on the ambient lighting. This remains one of the major challenges for current face recognition systems.

To overcome the above problem, k-Nearest Neighbor classifier is used in this project. The k-NN classifier is the most successful method for face recognition. In this classifier, an optimal hyper plane is determined as the decision boundary in order to determine face or non-face regions. The future work of this system would be to interface it to a face acquisition camera rather than having a fixed set of face images from a database. Also advanced features like information of iris can be included for effective analysis of face identification.

Other standard database for recognizing faces may be created and trained effectively for a better identification of different kind of facial images.

The applications of the project are:

- Residential Security: Alert homeowners of the approaching personnel
- Internet, E-commerce: Verify identity for Internet purchases
- Healthcare: Minimizes the unauthorized person by verifying identity
- Voter verification: Minimizes fraudulent by verifying identity
- Banking: Minimizes fraud by verifying identity.
- Credit-card: For authentication
- Automobile Ignition and Unlocking: Used in anti-theft devices
- Internet security: Control of access to privileged information
- Anti-terrorism: For example, security screening at airports and public places
- Driving licenses: other personal certificates
- Computer login: Using the face as a living password

VII. CONCLUSION

This paper describes a new framework for face analysis including Classification. It improves accuracy of performance compared to other methods for uncontrolled situations when the image procurement conditions are not ideal. The methods and techniques used in this paper have access to multiple gallery instances and require expensive training. Effective recognition methods are implemented to classify images based on trained features.

A simple and efficient image pre-processing method was presented whose practical recognition performance is better than the current illumination normalization methods. YALE-B,a standard database provides new insights into the role of robust pre-processing methods played in dealing with difficult lighting conditions and thus being beneficial in the description of new approaches for robust face recognition. Future changes to this implementation would provide better identification even in video processing.

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