

Cross-Correlation Based Face Recognition Scheme – A Review

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Abstract: *The face recognition systems are used to recognize the person by using merely a person's image. The face detection scheme is the primary method which is used to extract the region of interest (ROI). The ROI is further processed under the face recognition scheme. In the proposed model, we are going to use the cross-correlation algorithm along with the viola jones for the purpose of face recognition to recognize the person. The proposed model is proposed using the Cross-correlation algorithm along with cross correlation scheme in order to recognize the person by evaluating the facial features.*

Keywords: Face recognition, Face detection, Cross correlation, Face detection, Viola Jones

1. Introduction

Face detection is a technique what refer to the detection of the face automatically by digital camera. Face Recognition is a term used for recognition of a person automatically by computerized systems by taking a look at his/her face. Face detection is a popular feature used in biometrics, digital cameras and social tagging. Face detection and recognition has gained more research attentions in last some years. There are many good uses of this face detection and recognition feature: **1)** It can be used as biometric authentication; **2)** It can be used in digital camera for best picture contrast; **3)** It can be used for social tagging. Biometrics are automatic methods of recognizing a person based on a physiological or behavioral characteristic. Major authentication methods used are as following: 1. Something you know: Like passwords, PIN 2. Something you have: smart card, token or card key, 3. Something you are: finger print, finger vein. Face detection is an almost unique biometric identity. There are very few chances of having two similar faces. So it can be used in the biometric identity based authentications systems. For security hardening it can be used in combination with smart card or key card. Face detection is very important feature in digital cameras and social tagging. In digital cameras, Face detection is used because it controls the contrast on face in the clicked picture and can also help to view the clearer face than the click without face detection. In social tagging, face tagging is used to tag the people in the picture or post. In existing face detection algorithms, various face detection algorithm methods use various face detection methods like knowledge-based method, feature invariant approaches, template matching method and appearance based methods. In this proposed algorithm we are using template matching face detection method. Knowledge based methods uses the already programmed characteristics to detection the face, whereas appearance based method learn the face shapes by reading various training templates. Feature invariant method uses the object features for the feature detection in an image. Template based method uses the active template comparison, which provide the most accurate results in case of face detection.

In signal processing or image processing, there are a number of methods for template matching are used for various purposes. In example of Google image search, the algorithm used is a image template matching algorithm. In speaker detection application, there are various voice template matching algorithms are used for various properties of voice. All of these template matching techniques consist of various small feature code segments. These feature code segments may offer noise reduction, light normalization, computer vision anti blurring, feature extraction, feature analysis or feature detection. Out of these all template matching features, the popular among all is cross correlation and there are various cross correlation algorithms used for the template matching. There are normalized cross-correlation and generalized cross-correlation. Normalized cross-correlation for image-processing applications in which the brightness of the image and template can vary due to lighting and exposure conditions, the images can be first normalized. This is typically done at every step by subtracting the mean and dividing by the standard deviation. Image cross-correlation compares two image matrices based on various mathematical techniques. Cross correlation in images can be based upon various image characteristics like color patterns, color pixels, matrix coordinates, etc.

2. Literature Review

C. Saravanan have worked upon an algorithm for Face Matching using the Cross Correlation with normalization features. This paper proposes a face matching algorithm that allows a template called extracted face of person which is the Region of Interest from one image and start search for matching with the different image of same person taken at different times, from different viewpoints, or by different sensors using Normalized Cross-Correlation (NCC). Zhiwei Zhang and Dong Yi have worked on regularizing the transfer boosting for face detection across spectrum. In this research, authors have proposed a face detection technique to tackle the issue of multispectral face detection by proposing a combination of existing large scale visible face images and a few multispectral face images. They have cast the problem of face detection across spectrum into the transfer learning framework and try to learn the robust

multispectral face detector by exploring relevant knowledge from visible data domain. Xinjun Ma et. al. have developed a face detection algorithm based on modified skin-color model. In this paper, Authors have proposed an improvement in the traditional skin-color model by experiments and apply the proposed model to design a fast eye location algorithm on frontal view face. Additionally, authors have used the limited distance of face and the camera passive face detection related to the distribution of skin-color and the distance of two eyes. Different from the conventional methods, this algorithm makes full use of the relationship between the distance of two eyes and the distance between face and camera to assist in face detection, it devises a feasible way to promote efficiency in lip-reading and other non-specific face recognition applications.

Zakaria Z. and Sunandi S.A. have worked upon the face detection using combination of Neural Network and Adaboost. This paper presents a combination of two well known algorithms, Adaboost and Neural Network, to detect face in static images which is able to reduce the false-positives drastically. This method utilizes Haar-like features to extract the face rapidly using integral image. A cascade Adaboost classifier is used to increase the facedetection speed. Due to using only this cascade Adaboost produces high false-positives, neural network is used as the final classifier to verify face or non-face. For a faster processing time, hierarchical Neural Network is used to increase the face detection rate. El-Bakry H.M. and Hamada M. have developed a fast principle component analysis for face detection using cross-correlation and image decomposition. This approach is developed to reduce the computation steps required by fast PCA. The principle of divide and conquer strategy is applied through image decomposition. Each image is divided into small in size sub-images and then each one is tested separately by using a single fast PCA processor. In contrast to using only fast PCA, the speed up ratio is increased with the size of the input image when using fast PCA and image decomposition. Simulation results demonstrate that our proposal is faster than the conventional and fast PCA.

3. Problem Formulation

CCTV cameras are deployed in larger numbers and centralized on a single location for the monitoring purposes. A number of people are included in the monitoring teams to monitor the camera monitors continuously. The human's tendency of mind diversion can many times miss the monitors which may miss a criminal captured on the camera. CCTV recording is generally replayed only when there is a suspicion of some criminal activities in a particular area or building. Otherwise there is always a fear of missing those wanted culprits roaming around the cities without any fear of getting caught. In this paper, we are proposing a novel and robust method to detect and recognize the faces automatically, which are appearing on the CCTV cameras.

4. Proposed Model

In this research, we are offering a novel and robust viola-jones and cross correlation based face detection and face parts detections for the general CCTV camera networks to

find and recognize the person. This technique will be developed for the advanced computer vision based system for the detection of wanted criminals automatically. This system can prevent the mistakes done by human on the CCTV monitoring console because human minds are prone to fatigue or concentration lag (lack of concentration). Two novel methods will be used to detect and recognize the faces, first viola-jones for face detection and an improved and robust cross correlation method for face recognition.

5. Methodology

At first stage, a detailed literature study would be conducted on the existing face detection and recognition techniques. Literature study will lead us towards refining the structure of the proposed algorithm. The literature for face detection and cross correlation would be studied and different aspects would be learnt from the perspective of face detection. Afterwards, the proposed algorithm will be implemented in the MATLAB simulator and a thorough performance analysis would be performed. Obtained results would be analyzed and compared with the existing techniques.

6. Conclusion

The system begins with the image acquisition process in which the image is loaded in the MATLAB, which has to be used with the new algorithm. The face detection method is used to detect and extract the face from the image to perform the further computations. The ROI has to be perfectly fetched out of the loaded image to get the better results. The next step is to detect the person after the face region extraction from the original image. The face recognition is the process used to identify the people by analyzing their face properties automatically using computer driven algorithms. The cross correlation mechanism will be used for the face recognition process. The face recognition technique will produce the results by matching the face features (low-level, color based and shape based features) with the template database. The proposed algorithm would be implemented in the future using the MATLAB simulator.

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