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PARTITION BASED FACE RECOGNITION SYSTEM

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Abstract: Criminal record generally contains personal information about particular person along with the photograph. To identify any criminal we need some identification regarding particular person or persons, which are given by eyewitnesses. Based on the details given by the eyewitnesses, the further investigation would be carried out. In most cases the quality and resolution of the recorded image segments is poor and hard to identify a face. In this paper, we have classified image processing operations into three categories; low, medium and high level to process and analyze a given face. This paper presents better results than conventional methods in use relating to the face recognition process that are used in criminal identification.

Keywords: pixels, operations, Discrete Fourier Transform (DFT), Eigen face.

INTRODUCTION

The advances in computing technology have facilitated the development of real-time vision modules that interact with humans in recent years. Examples abound, particularly in biometrics and human computer interaction as the information contained in faces needs to be analyzed for systems to react accordingly [1]. For biometric systems that use faces as non-intrusive input modules, it is imperative to locate faces in a scene before any recognition algorithm can be applied. An intelligent vision based user interface should be able to tell the focus of the user (i.e., where the user is looking at) in order to respond accordingly[2]. To detect facial features accurately for applications such as digital cosmetics, faces need to be located and registered first to facilitate further processing.

It is evident that face detection plays an important and critical role for the success of any face processing systems. The face detection problem is challenging as it needs to account for all the possible appearance variation caused by change in illumination, facial features, occlusions, etc. In addition, it has to detect faces that appear at different scale, pose, with in plane rotations. In spite of all these difficulties, tremendous progress has been made in the last decade and many systems have shown impressive real-time performance. The recent advances of these algorithms have also made significant contributions in detecting other objects such as humans/pedestrians, and cars. Image processing is widely used in many applications, including medical imaging, industrial manufacturing, and security systems. Often the size of the image is very large, the processing time has to be very small and usually real-time constraints have to be met. Therefore, during the last decades there has been an increasing interest in the development and the use of parallel algorithms in image processing. Face detection is attached with finding whether or not there are any faces in a given image (usually in gray scale) and, if present, return the image location and content of each face. This is the first step of any fully automatic system that analyzes the information contained in faces (e.g., identity, gender, expression, age, race and pose).This paper focuses on how to make parallel computations by partitioning the image into manageable and meaningful parts for efficient calculations and results.

CLASSIFICATION OF IMAGE OPERATIONS

Image processing operations can be classified as low-level, intermediate-level and high-level [9] based on this classification, it is possible to define a skeleton library for image operations in order to carry out image recognition operations.

Low-level image operations:

Low-level image processing operations use the values of image pixels to modify individual pixels in an image. They can be divided into point-to-point, neighborhood-to-point and global-to-point operations [10]. Point-to-point operations depend only on the values of the corresponding pixels from the input image and the parallelization is simple. Neighborhood operations produce an image in which the output pixels depend on a group of neighboring

pixels around the corresponding pixels from the input image. Operations like smoothing, sharpening, filtering, noise reduction and edge detection are highly parallelizable [5]. Global operations depend on all the pixels of the input image, like Discrete Fourier Transform (DFT) and they are also parallelizable.

Intermediate-level image operations:

Intermediate-level image processing operations work on images and output other data structures, such as detected objects (e.g., faces) or statistics, thereby reducing the amount of information. Operations such as Hough transform (to find a line in an image), center-of-gravity calculation, labeling an object, are examples of intermediate-level image operations. They are more limited from the aspect of data parallelism when compared to low-level operations. They can be defined as image to object operations.

High-level image operations:

High-level image processing operations work on vector data or objects in the image and return other vector data or objects [7]. They usually have irregular access patterns and thus are difficult to run data parallel. They can be divided into object-to-object or object-to-point operations. Position estimation and object recognition theory are examples of this category.

Skeletons for image operations:

It is possible to use the data-parallelism paradigm with the master-slave approach for low-level, intermediate-level and high-level image processing operations [11]. A master processor is selected for splitting and distributing the data to the slaves. The master can also process a part of the image (data). Each slave processes its received part of the image (data) and then, the master gathers and assembles the image (data) back.

FACE DETECTION AND RECOGNITION

For recognizing a face from an image, first, it is necessary to separate it from the image, and then, it should be recognized from a data base of known faces. So, the face recognition process can be divided in two parts [3].

Face Detection:

Detection aims at locating the human face within an image obtained by a video camera and taking that face and isolating it from the other objects captured with in the image. Software canvasses the captured images for general facial structures such as the eyes and nose, measures and determines the rest of the face [4]. After constructing an image of one's face, the software "cuts" away any background details leaving the image of one's in a rectangle frame called a binary mask as shown in the figure1.

Face Recognition:

Recognition is comparing the captured face to other faces that have been saved and stored in a database. The basic underlying recognition involves either eigen features or eigen faces as shown in figure 2. The German word "eigen" refers to recursive mathematics used to analyze unique facial characteristics. When a facial feature identification system utilizes an eigen face approach, the system interprets each facial image as a two-dimensional set of light and dark areas in a particular pattern. It is these light and dark areas that are considered the eigen faces.

The light and dark area patterns are then converted and represented as an algorithm, which is then temporarily stored as a combination of eigen faces. Finally, the current combination of eigen faces are is scanned by a facial identification system and is used to compare against saved eigen faces in a database. However, an eigen feature system approach strives to determine the distances between such facial features as the nose, eyes, bone structure, mouth and eyebrows. The distinction in this method is that the facial identification system captures one's face and then extracts certain eigen features in a database. As a final note, facial feature systems can also be categorized as continuous or triggered. Continuous systems are always active and are constantly scanning facial images. Triggered systems must be activated in some way in order for the system to scan one's face. In order to identify the criminal, face identification is very important as When a particular person has done the crime he can be easily identified using this particular technique.

As we know we have a database regarding the existing criminals in our records, it would become an easy task in collecting the information regarding the person who has a criminal record and is a suspect in this particular case. Now by seeing the situation we would have an eye-witness in which he could trace the suspected image and make it sure that the paint made by him is similar to the face which has been seen at the particular crime. Now, in order to compare the face with the existing database, firstly, we need to split the face in to five equal parts as head, eyes, nose, mouth and chin. By splitting the data it would become an easier task for face detection. Though the particular person has changed his face by adding additional mustache or anything else. It would become an easy task in identifying the criminal by separating the parts. In most of the cases it would be recognized while considered the split of images. A particular image is split into five equal parts as forehead, eyes, nose, mouth, chin as shown below in figure1.

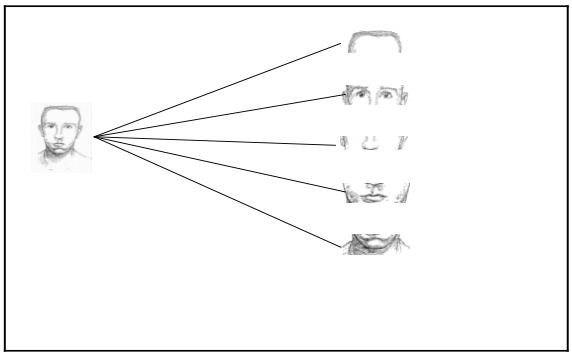

Figure 1. Spitting the face into number of segments

Now the face has been divided into parts. Which is an easy way to match the criminal with the database. Now let us take the eyes of the criminal image which is taken from the

witness. Let us compare the eyes of the criminal taken from the witness and compare it with the database as shown below in figure 2.

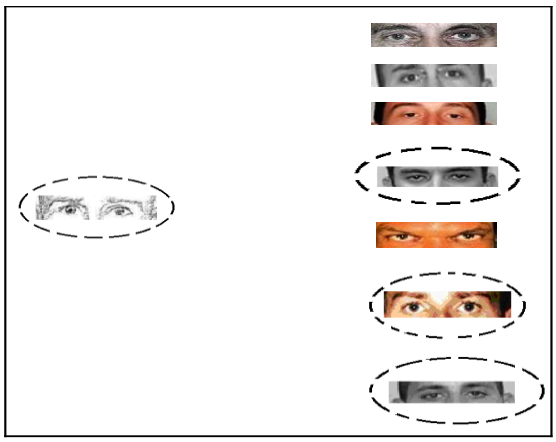

Figure 2. Matching the features from the database

As seen above we could say that the eyes of the witness which is compared with the eyes of the criminals in the database. As we have seen in the above figure 2 the pair of eyes under question has matched in the database with the three pairs of eyes. Now let us consider the remaining part of the face with all those three members[8]. It is clear that the pair of eyes which is taken as suspect person eyes is matched with the database. Now by considering that particular eyes we need to take the complete face image of that particular eyes and start matching the complete image with the three images which are having some similarities so that we could get the best match from the available database. Similarly each part of the face is to be checked within the database and finally a particular person outcome is shown on the screen. By this we can identify the existing criminal information regarding which it could become easy in identifying criminals.

Figure 3a. Image Matched

As the remaining part of the suspect criminal face is compared with the data base images as depicted in figure 3a and figure 3b the third picture is the best match for the suspected criminal.

Figure 3b. Image Matched and pinned

As seen above we could see it clearly that the image is a match for the suspected criminal. Thus, it is been a good task in identifying the criminal with the underlying algorithm proposed in this paper. Generally the image considered from the eye witness is a manually painted one. By using this particular painted picture we need to identify the exact picture of the criminal. If the particular image person is not available in the database, then the investigation team now starts the actual campaigning in finding out the criminal by considering the case details. If the face details are matched with the database then by just giving the input of the data as a face image it would display the complete bio-data of the criminal by using this proposed method [12]. This would help the investigating team in gaining some or the other details which would help in tracing out the criminal. So before concluding we would focus on the failures of existing mechanisms and a new method through the proposed algorithm.

EXISTING SYSTEM

Criminal record generally contains personal information about particular person along with photograph. To identify any criminal we need some identification regarding person, which are given by eyewitnesses [6]. Based on the details given by eyewitnesses, the criminal who did the crime will be identified manually.

Problems in existing system:

a. In most cases the quality and resolution of the recorded image segments are poor and hard to identify a face.
b. If a eyewitnesses observe a criminal only from single direction, it may not be possible to recognize him.
c. The photograph, which is a hard copy, cannot be able to divide or split into different modules. So it is very difficult to find, unless we get full-fledged details.
d. Some times the eyewitness may not be able to draw, the face of criminal [9].
e. Sometimes, if we maintain the criminal details manually and physically. After a time span, the photographs and other details may tend to tare and ware-out.

THE PROPOSED SYSTEM AND IMPLEMENTATION

Feature extraction domain has plenty of collection of generalized face features from several images of the same subject. Then, each face image is processed, features are extracted and the collection of features are analyzed and combined in to a single generalized features collection, which is written to the database. This way, the enrolled

feature template is more reliable and the face recognition quality increases considerably. We have proposed this algorithm assuming that existing approaches have failed to attained a reasonable solution. Identification can be done in many ways like fingerprints, eyes, DNA etc. One of the applications is face identification.

The face is our primary focus of attention in social inter course playing a major role in conveying identification and emotion. Although the ability to infer intelligence or character from facial appearance is a guess but still the human ability to recognize faces is remarkable. This analogy would give us enough scope to envisage a new algorithm. There are mainly three important ways in construction of the face i.e., by using the eyewitness function, adding details and clipping image. This offers us a face as finally identification parameter to know who has committed the crime.

The Image Partition Algorithm:

Step1: Split the image into five equal parts as forehead, eyes, nose, mouth, chin

Step2: Now the face has been divided into parts, Which is an easy way to match the criminal with the database.

Step3: Consider the eye segment as a first basic for analysis obtained from the witness.

Step4: Compare the eyes of the criminal taken from the witness the database available. It would generate a list of matched responses from the database i.e. may be more that one.

Step5: Consider remaining parts of the face for further comparison and with all provided features.

Step 6: Initiate a process of comparison to match the complete image with the three images which are having some similarities so that we could get the best match from the available database.

Step 7: Thus with recursive match computations done to all the parts of the image against database images. We would arrive at a particular image which showcases maximum matches. Thus, emerges an image that is a perfect match of the suspected criminal.

Advantages of the proposed system:

a. Fast and accurate face location for reliable detection of multiple faces in the video streams and still images.
b. Simultaneous multiple face processing identification in a single frame.
c. It can handle large face databases.

CONCLUSION

All current face recognition algorithms fail under vastly varying conditions underneath which humans need probing and are able to identify other people. In the next generation to come the recognition systems would need to recognize people in real-time and also in much less constrained situations.

The approach presented in this paper uses image partition algorithm in which input image is scanned at almost every pixel location and scale, to boost the performance of the detector along with the enhanced accuracy. In this paper, we have classified image processing operations into three categories, low, medium and high level. Basing the face recognition process under proposed system this paper has suggested better approach for identification used in criminal identification.

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