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Face Detection and Tracking Using OpenCV : A Survey

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Abstract: Face detection is a computer technique that determines the positions and sizes of human faces in arbitrary video and images. It detects countenance and ignores anything like buildings, trees and bodies. Human vision awareness is currently a lively research area within the computer vision community. Human facial localization and identification is usually the primary step in applications like video monitoring, human computer interface, face recognition and image management. Identifying and tracking human faces may be a necessity for face recognition and / or countenance analysis, although there's often a generalized face image available. the matter of computer-based face recognition using unbiased facial data as an analysis remains a largely unexplained area of research. Given how humans perceive faces and the way they differ from verification machines, it should be fascinating to ascertain how machines favor different countenance, instead of presenting face recognition difficulties. . Therefore, this paper examines the question, which involves the thought of face recognition using incomplete facial information. The experiment is predicated on the utilization of Object Oriented programing language (OOP) with OPENCV (Open Computer Vision) for correct cla ssification and identification of the face. During this paper we shall implement a Har-Classifier for Face Detection and Tracking supported the Har features.

Keywords: *Imperfect facial data; face recognition; PYTHON, C++, OOP; OpenCV*

1.INTRODUCTION

Recent advances in automated face analysis, pattern recognition and machine learning have made it possible to develop automated face recognition systems to deal with these applications. On the one hand, recognizing the face may be a natural action because people usually roll in the hay effortlessly without much consciousness. On the opposite hand, the appliance of this process within the field of computer vision remains a difficult problem. Being a part of the biometric method, automatic face recognition has many desirable properties. they're supported important advantages - non-invasive. Various biometric methods are often divided into physiological (finger print, DNA, face) and behavioural (keystroke, voice print) categories. Physical procedures are more stable and non-oncologic variable apart from severe injuries. Behavioural mechanisms are more sensitive to the general condition of the person like stress, illness or fatigue. A brief analysis of face recognition techniques using effective statistical learning techniques is vital as a practical and robust solution.

Face detection performance may be a major issue, so non-frontal face detection techniques are going to be discussed. Subspace modelling and learning dimension based dimension reduction techniques are fundamental to current face recognition techniques. Another challenge during this area is to explore such sub-areas to uncover effective features and build robust classifications. Face recognition is characterized by both high accuracy and low penetration, so it's attracted the eye of researchers during a sort of fields, from psychology, image processing to computer vision. The first step is face recognition in an acquired image, no matter scale and site. It often uses a complicated filtering process to differentiate faces that represent faces and filter them with precise classifications. it's not worthy that the face recognition stage deals with all the interpretation, scaling and rotation variations..

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In the next step, the anthropometric data set pr based system evaluates the approximate location of key features like eyes, nose and mouth. In fact, the whole process is repeated, which is confirmed by the transmission statistic, to form predictions about the sub-attributes with reference to the most features and to reject any incorrect features. Dedicated anchor points are generated as a results of geometric combinations of the face image and this initiates the particular process of identification. This is often done by finding an area representation of the facial appearance at each of the anchor points. The scheme of representation depends on the policy. To affect such a complexity and to spot the proper impetus for identification, researchers have developed various recognition algorithms. There are several limitations to the present face recognition technology (FERET). This gave the initial benchmarks of face recognition technology. Under ideal conditions, performance is superb, and under different brightness, expression, resolution, distance, or aging conditions, performance are often significantly reduced. The face recognition system remains not very strong in terms of deviations from the perfect face image. Another problem is an efficient thanks to store and render facial code (or facial templates), which may be stored as a group of features and extracted from a picture or video. Considering the widely presented aspects of the complex process of face recognition, many limitations and shortcomings are often observed. They have clarity or replacement by new algorithms, techniques or technologies. In this chapter, we discuss face recognition processing, which incorporates key components like face detection, tracking, alignment, and have extraction, and

address the technical challenges in building a face recognition system. We specialise in the importance of the foremost successful solutions available thus far. We consider coordination system to recognise the human face and animal Many of the hypotheses and theories suggests by researchers in these disciplines are supported rather small sets of images. To increase the accuracy, the algorithm need to trained on huge data values or huge data set incorporating hundreds of thousands of positive and negative images. The training improves the algorithms' ability to determine whether there are faces in an image and where they are.

This research paper describes the methods and applications of selected face recognition and their use in reference to face recognition and the need for this study interact in further development face recognition.

2. Problem Definition

The overall description of the face recognition problem (in computer vision) are often formulated as follows: detecting or verifying one or more of a scene, identifying one or more persons within the scene employing a database stored by faces. Face recognition usually consists of two steps:-

2.1 Face Detection

Where the photograph is searched to seek out the face, the image is processed to chop and take the person's face for straightforward identification.

2.2 Face Recognition

The person's discovered and processed face is compared thereto face database, where the person is decided. Since 2002, face recognition are often made easier and more reliable because OpenCell's open source framework is named OpenCV. The structure features an inbuilt face detector, which works for 90-95% of candid photos of the person looking toward the camera. However, it's usually difficult to spot an individual's face when watching it from a perspective, and sometimes a 3D head estimation is required. additionally, the shortage of proper brightness of the image increases the problem of identifying the face, or the difference in shadow on the face, or perhaps the image is blurred or the person is wearing glasses.

Facial recognition is far less reliable than face recognition, usually with 30-70% accuracy. face recognition has been a robust field of research since the 1990s, but remains faraway from a reliable method of consumer authentication. More and more technologies are being developed annually. The eigenface technique is taken into account the only method of accurate face recognition, but many other (more complex) techniques or combinations of various techniques are more accurate

2.3 OpenCV

OpenCV has the advantage of being a multi-platform framework; It supports both Windows and Linux and, most recently, Mac OS X. OpenCV has so many capabilities that may seem overwhelming at first. The key to getting good results when using OpenCV is a good understanding of how it works. Fortunately, there are only a few who choose to get started. OpenCV's functionality is used in many modules for facial recognition**.**

3. Proposed Solution

When considering image quality and video image , there are plenty of factors that affect the accuracy of the system. It is important to apply various image pre-processing techniques to standardize the images you present to the face recognition system. Most facial recognition algorithms are very sensitive to light conditions, so if a person is trained to detect when in a dark room, it will not detect them in a bright room. Etc. This problem is "dependent on the brightness", and the pixels of the pictures. Face is very stable in pictures (such as the eyes being in the same pixel coordinates), consistent shape, rotation angle, hair and makeup Emotion (smiling, angry etc). The state of illumination (left or upward, etc.). It is important to use a good image pre-processing filter before face recognition.

For simplicity, the facial recognition system presented in this paper is eigenfaces using grayscale images. The paper shows that color images can be easily converted to grayscale (also known as 'grayscale'), and then automatically apply histogram equation to the brightness and contrast of your facial images to detect the face detetction and recoginition. There is a very simple method to standardize. For better results, you can use Color Face Recognition (ideally with color histogram fitting on HSV or any other color space instead of RGB) or perform more processing steps such as edge processing, contour detection, motion detection and more. Also, this code resizes images to a standard size, but it can change the aspect ratio of the face. One method is described how to change its size while keeping the aspect ratio of the image the same.

OpenCV uses a type of face detector library which called Haar CasCade. When looking at an photo that can come from a disk fille or live video, the Face Detector examines the location of each image and classifies it as "face" or "face"Because the faces in the image are smaller or larger than that, the classification moves around the image many times to search for faces within the classification criteria. This can take enormous processing, but thanks to the algorithmic techniques described in the sidebar, the classification is very fast, even when applied to multiple scales. The classifier uses data stored in the XML file to determine how to classify each image. OpenCV Download contains one of four flavors and profile faces of XML data for frontal facial recognition. It reqiures three non-face XML files - one for full body (pedestrian) Identification, one for the upper body and one for the lower body.

You need to tell the taxonomy where you want to find the data file you want to use. What I'm using is harcascade_frontalface_default.xml In OpenCV version 1.0, it is located at [OPENCV_ROOT] / data / haarcascades / haa

rcascade_frontalface_default.xml, where [OPENCV_ROOT] is the path to your OpenCV installation. For example, if you are on Windows 10, and you choose the default installation location, you use [OPENCV_ROOT] = "C: / Program Files / OpenCV" (Windows, if you have an older, 32-bit version instead of working, you can '/' It's best to find the XML file you want to use and make sure your code is correct before you code. . The rest of your face recognition program. It is easy to use a webcam stream as an input to the facial recognition system instead of a file list. Basically you need to grab the frame from the camera instead of the file and run it until the user wants to leave, without running until the file exits the list.

4. Eigen-Faces

Eigenfaces may be a known term that represents the many features or principal components of human faces. Each feature or component is represented as an eigenvector. These eigenvectors don't correspond to the physical entities at the face (e.g., eye, nose, mouth, etc.). within the process of recognizing human faces, each face is projected into a group of Eigenface features. Weighted eigenvectors Usually, the sum of those weights is a good representation of a given face. Recognition approaches that use Eigenfaces for recognition ignore the 3D information and base their models on two dimensional information only and its use 2D matrix . the inspiration of using Eigenfaces in face recognition is predicated on the very fact that every image are often represented as a matrix. A matrix features a set of eigenvectors that represent the principal components of the matrix. Eigenfaces are the eigenvectors of the covariance matrix of all faces fetch by database . Similar faces are often described during a space with lower dimensionality. Most of the research on Eigenfaces cares with one pose and on rotating the image about the image centre. a set of various pictures of various angles or emotions of a same person is required to estimate the actual face. The more sample picture of an individual is given; the higher accuracy are going to be found to acknowledge that person.

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5. Eigen Vectors

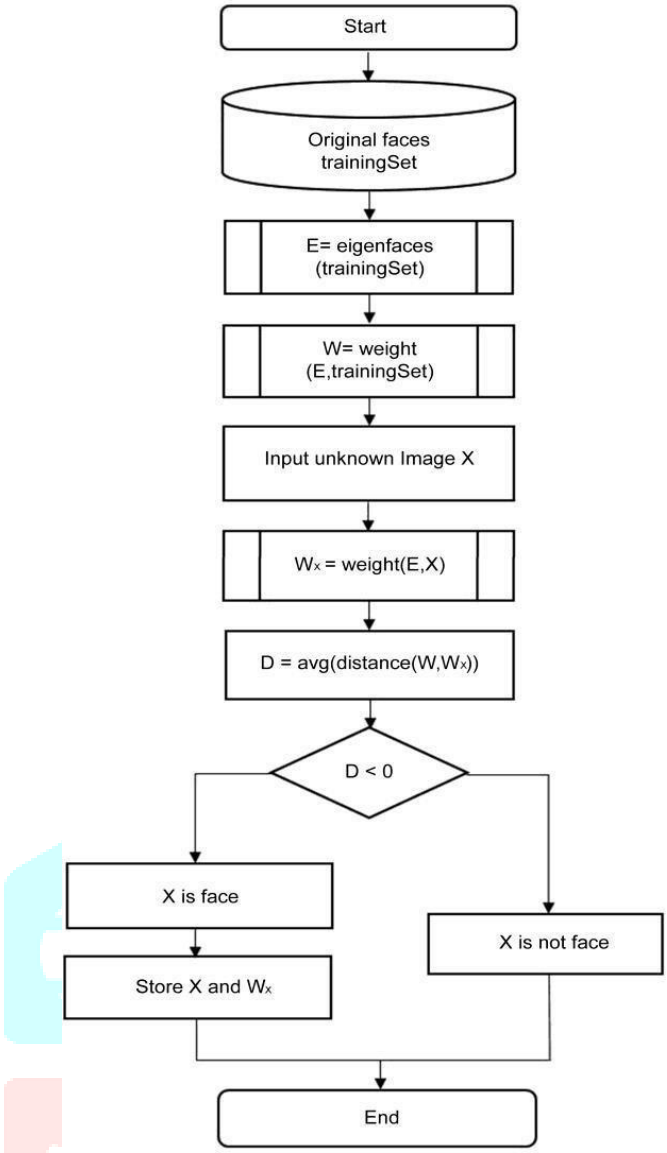
An eigenvector of a matrix has a vector such, if multiplied with the matrix, the result's always an integer multiple of that vector. This integer value of the corresponding eigenvalue of the eigenvector.

This relationship is described by the equation $M \times u = \lambda \times u$, where u is an eigenvector λ of the matrix

M and λ is that the corresponding eigenvalue.

Eigenvectors possess following properties:

- They are determined just for square matrices
- There shall be n eigenvectors (and corresponding Eigenvalues) in a $n \times n$ matrix.
- All eigenvectors are perpendicular.



6. CONCLUSION

Face detectiom uses in various area like security and tracking of human . It is depend upon improve identity performance, there are many things that can be improved here, some of which are easy to implement. For example, you can add color processing, edge detection, and so on.

By taking more and more photos of each person a, you can take better decision on dataset and improve the facial recognition accuracy, especially in different angles and lighting conditions. If you can't take more pictures, there are several simple techniques you can use to create more training pictures by creating new images from your current images: You can make mirror copies of your facial images so that your pass training images are doubled and not biased to the left or right. You can translate or resize images of your face or rotate a little to create several alternative images for training, making it less sensitive to precise conditions.

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