Face Detection and Recognization by Fuzzification

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Abstract: **The profile is one of the easiest ways to distinguish the individual identity of each other. identity verification is a personal identification system that uses the person's identity. Identity verification procedure basically consist of two phases namely face detection where this process takes place very rapidly in humans. Excluding under conditions where the object is find at short distance away, which acknowledge a face of individuals. Eigen face and fisher face method are kinds of methods that are currently popular in developed identity verification.**

Keywords: **Face recognition, Linear discriminant analysis, Principal component analysis.**

1. Introduction

Facial recollection is a biostatics operating system request capable of especial pinpoint a person by contrast and examine designs found on the human face outline. While commencing a form of data processor request, it has seen spacious utilize in fresh times on mobile manifesto and in extra shape of mechanics, such as machine learning. It is customarily used as attack control in security systems and can be contrast to other biometrics such as thumbprint or optic iris acknowledgement structure. It is extensively acquired because of its non-contact and interfering event. There are non-identical face identification methods in utilize, such as the unspecialised complement face observation procedure and the flexible zonal combine matching procedure. Identity verification structure cause based on the non-identical tipping point on a fleshy profile. Utility compute in case of the irregular equate with points of a person's face help in remarkable recognize the human. The most expected spotting while in face confirmation, identified a face likeness and estimation of the spotting, the structure to tell true or false about the guess.

2. Problem Statement

A facial recognition system is a technology capable of spotting a person from a digital image. It is a system that can be remarkable for identify a person based on the person's facial textures and shape. The proposed system integrates face recognition and machine learning. The existing face recognition methods are insensitive to substantial variations in light direction and there is an issue of low recognition rate for small datasets. The methodologies used in the proposed system are the Fisherface method and eye- blink detection.

3. Methodology

The methodology for doing the project is the next aspect to be considered once the research has been completed. There are different methods that can be used to achieve the same goal however the one which produces the most efficient solution has to be opted. The proposed project is based on facial recognition by implementing techniques of image processing and machine learning. The system will be able to recognize a person's face effectively since the recognition rate of the Fisherface method is high. Software requirements include IDLE IDE which is an Integrated Development Environment for developing and implementing the facial recognition system. This is the platform on which a python code works with the WebCam to process the image. The face recognition technique and machine learning technique are used by the said python code. The code also includes an eye-blink detection module that is to authenticate users. The python code helps to capture facial data and recognise the face with one of the facial data stored in the database whilst dealing with numerous faces in various scenarios by employing machine learning techniques.
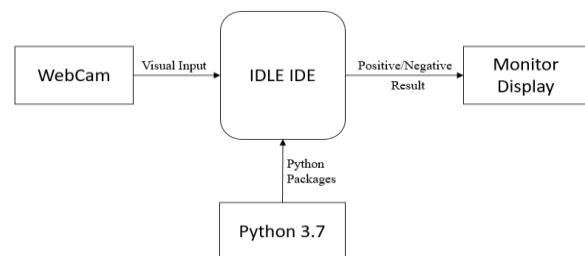

Fig. 1. Block diagram

4. Results

The face recognition module makes use of raw images as its test cases and aims at classifying the faces that are detected within the image. The test cases considered are shown in Figures 2 and Figure 3. Test Case 1 for Face Recognition aims

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to test the module for single face images in the video stream while Test Case 2 aims at testing it for multiple face images.

Fig. 2. Face Recognition - Test Case 1

Fig. 3. Face Recognition - Test Case 2

On the other hand, the authentication module takes the live video stream as input. The different test cases for this module are:

- Eyes open
- Eyes closed

The Eyes open test case is tested with live video stream where the live face with open eyes for a fixed duration is detected as an unauthorized person thus preventing spoof attacks. The live video stream is run for certain time period for user authentication.

Fig. 4. Unsuccessful Authentication - Test Case 1

Referring to figure 4, if the person does not blink his eyes within the given time period it will be detected as "Blink not detected" thus causing the authentication of that user to fail. The Eyes closed test case is tested with live video stream where the live face with closed eyes for a fixed duration will be detected as an authorized person. The live video stream will run for a certain time period in order to authenticate the user. Referring to figure 5 if the person blinks his eyes within the given time period it will be detected as "Authentication successful". The eye-blink detection method counts eye blinks in the video stream using the 68-facial landmarks method. This method uses a metric called Eye Aspect Ratio (EAR) which is the ratio of vertical distance to the horizontal distance. This metric is used to count the number of eye blinks in the video stream. The blink count is then used to determine the liveliness of the user thus preventing spoofing.

Fig. 5. Successful Authentication - Test Case 2

5. Applications, Advantages and Future Enhancement

A. Applications

- It is used in payments.
- It is used in health centers for recognizing individuals
- It is used in accessibility and security purpose

B. Advantages

- Public security will be improved
- Noninvasive identity

C. Future enhancement

- Very effective
- More secure

6. Conclusion

In recent years, there has been a growing interest in Facial Recognition Systems for authentication purposes. A facial recognition system is a technology capable of identifying or verifying a person from a face image. It is a system that can uniquely identify a person based on the person's facial textures and shape. The main aim of the proposed system is to uniquely identify a person's face in a real-time video stream and authenticate the user by employing eye-blink detection method.

The Face Recognition System includes a Machine Learning module that is used to classify faces correctly and make appropriate predictions by using the training samples. The system shows a real-time video stream and continuously tries to detect face in the frame. A non-existent face is shown as 'Stranger' and may be added by clicking pictures and then training the Machine Learning Module. Detected users can

authenticate themselves by blinking their eye multiple times to ensure that they are not spoofing somebody's identity.

The results obtained from the system are quite accurate for the test cases that have been taken into consideration. On careful analysis of the obtained results, it is found that the recognition rate of the system depends on the size of dataset. The recognition rate is low for small datasets, so the performance of the algorithm is decreased. Once the system is trained with a large data set, the performance and recognition rate of the system increases.

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