A Trigonometric Approach for Face Recognition System

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Abstract— A facial recognition biometric system is a computer based application for automatically identifying and verifying a person from a input image. One of the way is to do this is by comparing extracted facial features from the input image and a facial database image. It is mostly used in security application. This paper shows the readers the fast and efficient algorithm for the face recognition system. In this framework image of person is captured in control environment and store in the database. The authentication of user is also done in the control environment.

Key words: Trigonometric Approach, Face Recognition System

I. PROBLEM SPECIFICATION

The face recognition problem can be represented as follows: How to verify or determine the credentiality of the individual in the input image to the database image of known person.

II. INTRODUCTION OF BIOMETRIC SYSTEM

Biometric (Bios means Life and metrikes means to measure or measurement)is study of automated methods to uniquely and correctly recognize individuals based on distinguishing physiological and/or behavioural traits.

Biometric based techniques have become the need of organizations, businesses and government sectors. These techniques are most promising option for recognizing individuals.

Password and PIN number can not be remembered very easily and can be stolen or guessed by the hackers; Keys, Tokens and Cards can be misplaced, forgotten and duplicated; Magnetic card can be corrupted and unreadable by the system. However, an individual biological characteristic can't be misplaced, forgotten, stolen or forged.

III. TYPES OF BIOMETRIC SYSTEMS

There are two types are biometric system:
- Physiological Biometric Systems
- Behavioural Biometric Systems

A. Physiological Biometric Systems

Physiological Biometric Systems is related to shape of the body.
- Face Recognition System
- Finger Scanning
- Iris Scanning
- Retina Scanning
- Hand Scanning

B. Behavioral Biometric Systems

Behavioral Biometric Systems is related to the behaviour of the person.
- Voice Scan
- Signature Scan
- Keystroke Scan

IV. APPLICATIONS

A. General Identity Verification
- Electoral registration
- Banking,
- Electronic commerce
- Identifying newborns
- National IDs
- Passports
- Drivers' licenses
- Immigration control

B. Commercial Applications
- security – access control (doors, devices, networks, ATM)
- comfort and safety, e.g.,
- automotive sector
- e-Commerce

C. Forensic Applications
- criminal investigations
- corpse identification
- parenthood determination

V. ADVANTAGES OF FACE RECOGNITION SYSTEM OVER OTHER BIOMETRIC SYSTEMS

- Iris and retina identification require costly equipment and very cause sensitive to any body movement.
- Voice recognition is affected to background noises in public places.
- Signature can be forged and modified.
- Hand and fingers scanning system can become useless if the tissue of hand is damaged in some way i.e cracked or bruised.
- However face recognition can be done very passively without any action of user since face images can be captured from a distance by a camera.

VI. A GENERIC FACE RECOGNITION SYSTEM

The input data of a face recognition system always becomes an image or video frames (stream). The output of the system becomes an identification or verification of the person that is present in the image or video. The process of face recognition system is carried out in the three steps.
- Face Detection
- Feature Extraction
- Face Recognition

–   Face Detection and Feature Extraction phases can be run simultaneously.

A. *Face Detection*

Face detection is the process of identifying face portion from the input image and extracting faces from the image or scenes. Hence, the system positively recognizes a certain image area is the face region.

Face Detection method can be classified into following methods.

1) Knowledge-Based Method:

Ruled-based methods are used to encode our knowledge about human faces.

2) Template Matching Technique:

These approaches are used to compare input images to patterns of faces or features which are already stored in image library.

3) Feature-invariant approaches:

This is used to find invariant features of a face in spite of its angle or position.

4) Appearance-based approaches:

Appearance-based approaches are a template matching method, in this method a set of training image is used to learn pattern database.

B. *Feature Extraction*

Face recognition's core problem is to access information from picture. This feature extraction process can be described as the method of extracting pertaining information from a face image. The extracting information should be valuable to the subsequent step of identifying and verifying the subject with an considerable error rate. The performance of extraction process is measured in terms of execution time and memory consumption. This should be more efficient

C. *Face Recognition:*

The method for capturing face images depends upon the type of applications. For example, video camera are used in surveillance applications for capturing face images and a standard camera are used for database searching image which requires static intensity images. The 3D scanner or infra red imagery are used for high security applications.

1) Face Recognition from Intensity Images

Face recognition methods for intensity images comes into two important categories: feature-based and holistic techniques.

2) Feature-based technique:

Feature-based technique first manipulate the input image to identify and seperate (and measure) different facial features such as the nose ,eyes, mouth, lips, eyebrows etc., as well as other fiducially marks, and then compute the geometric relationships between these facial points, so that decreasing the input facial image to a array of geometric features. Then Standard statistical pattern identifying techniques are used to match faces using these measurements.

3) Holistic

Holistic approaches are not facial feature based approach. It uses entire image to recognise faces using global description, i.e., discriminations depends up on the entire image rather than on local facial features of the image.

VII. A TRIGONOMETRIC APPROACH FOR FACE RECOGNITION SYSTEM

This approach is fast and most efficient in face recognition system. This algorithm uses the approaches of feature based face recognition techniques.

A. *Triangle based method for Face Recognition System:*

In this method the face of the person is placed on fixed distance and image of the face is captured by the camera and then follow the following algorithm.

The face recognition system algorithms is divided into two phase

–   Face Detection and Data of Face Storing Algorithm
–   Face Detection and Face Recognition Algorithm

B. *Face Detection and Data of Face Storing Algorithm*

–   The face of person is positioned on a fixed distance from camera.
–   The image of the person is captured in fixed size.
–   The face of the person is detected from image using Knowledge-based methods.
–   The area of face from both eyebrow to chin and ear to ear is covered in the image.
–   The covered area is sectorized into the fixed size triangles and one remaining triangle which can be small or big to the fixed size triangle..
–   Perimeter of each triangles are calculated.
–   The no of triangle and perimeter of each triangle is stored in the separate field of database.

C. *Face Detection and Face Recognition Algorithm*

–   The face of person is positioned on a fixed distance from camera.
–   The image of the person is captured in fixed size.
–   The face of the person is detected from image using Knowledge-based methods.
–   The area of face from both eyebrow to chin and ear to ear is covered in the image.
–   The covered area is sectorized into the fixed size triangles and one remaining triangle which can be small or big to the fixed size triangle.
–   Perimeter of each triangle is calculated.
–   Using where clause the database of biometric system is searched for no of triangle and perimeter of each triangle.
–   If the match is found then
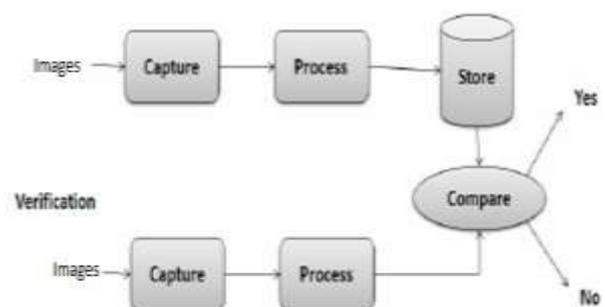–   The person is recognised by the system other unrecognised.

Fig. 1: Face Recognition System

VIII. CONCLUSION

The data of multiple face images are gathered by automated system, it found that each person has the different no of triangles of fixed size and one remaining triangle big/small has different perimeter value. Using system it is found that the system is most efficient and fast for authentication of person.

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