International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 02 | Feb 2022 www.irjet.net p-ISSN: 2395-0072

Face Recognition System and its Applications

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Abstract - *Face Detection has one of the hottest topics of research and has many security and business applications in the field of image processing and pattern analysis. Availability of feasible technology as in addition to the growing demand for reliable security systems in the world today has been an encouraging many scientist to develop new methods for capturing of facial knowledge. A large number of scientists do different work for face detection from different fields such as image processing, neural networks, computer vision, psychology, computers graphics and pattern analysis and has also been increasingly accepted by the public for use in identification, security and law enforcement.*

The face recognition system has been described in three parts. The first describes the differences such as total aggregation, subtraction process and hybrid process. The second describes the application with examples, and finally the third discuss about future research in the field of face recognition.

Key Words: Computer Vision, Holistic Matching Methods, Feature-based Methods, Hybrid Methods

1. INTRODUCTION

Several face recognition algorithms and systems have emerged submitted and made significant progress in last two decades. The performance of the face analysis system has developed a new height in the case of recent developments. However, a much work has been left to fulfill the need of further improvement in the face recognition system. Some environmental challenges changes in lighting, body position, facial expressions, etc. Performance of facial analysis the system is directly related to the amount of change seen in the portrait. If we can eliminate these effects, it provides better face recognition results which lead a more reliable system [1].

The main criteria which can be producing a better result are listed below.

1.1 Illumination

The images of human face captured in different lightening condition like image taken in sun light, image taking in a room and image taking in night with different type of lighting will produce different images of same person. This may or may not weaken some of the facial features cause too bright or too dark objects in images. These images produce a different attributes of face parameters and decrease the performance of face recognitions system. (Fig. 1.)

Fig -1: Same image with different illumination

1.2 Head Position

In most cases face recognition systems are trained from the images in which whole face is visible but, in many cases, when we want to recognize the face of an unknown identity, it is not necessary that his/her face is fully captured in capturing device. Therefore, it is necessary that the image of a person will be taken in front of where the person is looking the camera.

1.3 Facial expression

As mentioned earlier, most face recognition algorithms are standard and neutral portrait. Facial accessories such as glasses, facial hair (beard and stubble), and emotional expressions such as laughter, smile, grin, change some it can affect facial symptoms and classification. Best for automatic to overcome this problem, a face recognition system is desired, for example by modifying it feature selection.

1.4 Occlusion

In general, people can know others even if they wear sunglasses and scarf. This is a challenge for automated facial recognition systems. Designed to replace the human brain. Another object, partial closure of person's face, sunglasses or scarf is a common problem with many facials analyzes application. These barriers cover some of the facial features and thus affect some of the facial features. The performance of the portrait may deteriorate. Many ways to solve this issue by splitting the closed parts of the image apart and ignoring them corresponding activity.

1.5 Inter-Class Similarities

It is not impossible to distinguish identical twins, but sometimes it's a tough job for parents. Therefore, similarity between classes is not just a challenge although it is a biometric authentication technology; it also faces the human brain. That's the problem to distinguish between two different subjects with very similar characteristics. Among many cases multi-biometric techniques such as combining face and fingerprint recognition increase performance.

2. FACE RECOGNITION METHODS

In the 1970s, facial recognition was seen as a two-dimensional cognitive problem [2]. Used to identify distances from key points of facial recognition, such as measuring differences in facial expressions. But the familiar face recognition should be automatic. Face recognition is a difficult but elaborate issue that appeals to researchers from diverse backgrounds: psychiatry, cognitive impairment, neural networks, computing view, and computer graphics.

In general, face recognition consists of two (2) stages, registration and identification / verification, as shown in Fig. 1. There are several modules, which are image detection, face recognition, training, knowledge and identification.

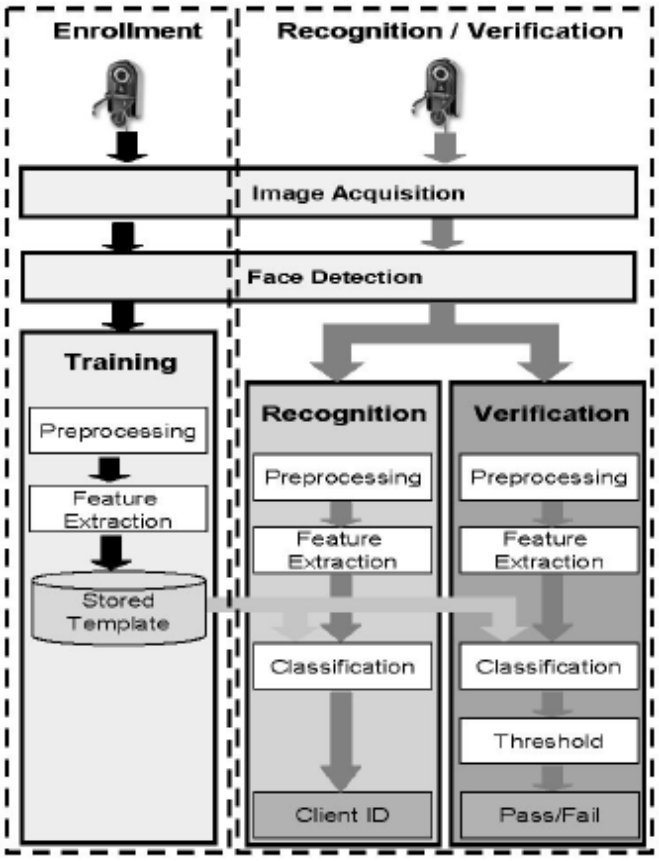

Fig -2: Block Diagram for the Face Recognition System

The list of face recognition methods are follows:-

1. Holistic Methods
2. Feature-based Methods
3. Hybrid Methods

2.1 Holistic Methods

In this approach, total face area is calculated as the input data for the face capture system. One of the best examples of holistic approaches is eigenfaces [8] (the most widely used facial recognition), keynote analysis, segregation analysis [7], and independent assessment, etc.

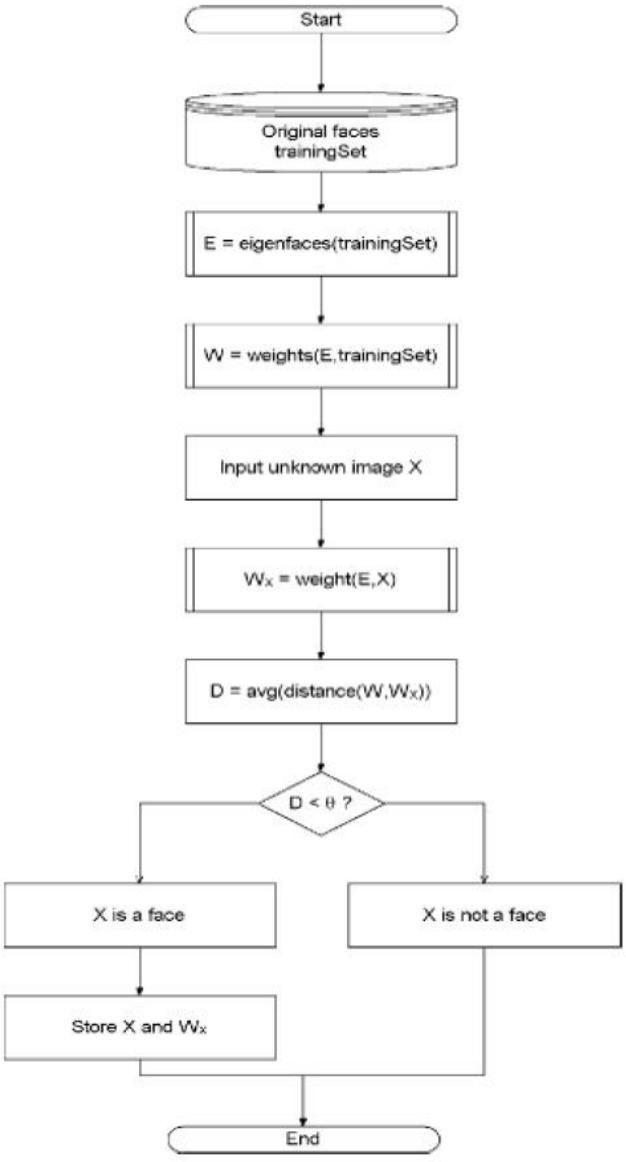

Fig -3: Face recognition method

2.2 Feature-based Methods

In this method features which are necessary for face recognition are extracted. A major challenge of the delete feature is the "back" feature, which is when the system tries to recover features that are not visible due to major changes, such as the head pose when we match the front image with profile picture. [5].

2.3 Hybrid Methods

Hybrid face recognition technology combines holistic and feature extraction methods. Usually 3D graphics are used for mixing. The image of the face is captured in 3D, allowing the system to record the curves of the eye, such as the image of the chin or forehead. Even the face in contours can be used because the system uses depth and measuring axes, which provide enough information to create the whole face. 3D technology generally does this: capture, locate, measure, represent and compete. Capture - Capture faces by copying photos or capturing them in real time. Position - Determine the position, size and angle of the head. Measurements - Measure each curve of the face to model, carefully observing the outside of the eye, the inside of the eye, and the angle of the nose. Representation - converting models into numbers - digital representation and face-to-face comparison - comparing data received with faces in existing data.

If you want to compare 3D images with existing 3D images, there is no need to make any changes. Most, however, images are rendered in 2D, which requires some modification to the 3D image.

3. FACE RECOGNITION APPLICATIONS

Face recognition system may be very useful in human-computer interaction, virtual reality, data recovery, multimedia, computer entertainment, information security, and more. Other. Work Procedures, Medical Records, Internet Banking, Biometrics, such as Personal Information - Passports, Driver's License, Automatic Self-Assessment - Border Control, Policy Private, e.g. Video Surveillance, Investigations, Personal Security - Driver Surveillance, and Home Video Surveillance.

3.1 Face Identification

Facial recognition teaches people through facial expressions. Face recognition creates an authorized account rather than just checking if an ID card (ID) or key is valid, or if the user knows a unique identifier (Pins) or password. The following is an example.

Eliminate the national electoral balance because there is more than one election. Face recognition is directly compared to the face of voters without the use of a different ID number. When two faces are similar in question, then it is necessary to differentiate between the persons.

3.2 Access Control

Facial recognitions systems are very useful in access control applications like using computer access. The size of the crowd to identify is small. The shape of the face is also taken in a natural way, e.g. Front and interior lighting.

3.3 Security

Today, more than ever today, safety is a major concern at airports, as well as in airport office workers and passengers. Airport defense systems using face recognition technology have been used in many airports.

Anyone who is accredited by the system will be further investigated by the public safety authorities. To prevent others from exchanging information or exchanging information with others when an authorized person leaves the computer terminal for a short period of time, the user will be constantly monitored whether the person in front of the computer screen or at the user is the same person authorized who is logged in.

3.4 Image database investigations

Search for photo databases of licensed drivers, beneficiaries, missing children, immigrants and booking authorities.

3.5 Proof of identity

Elections, financial services, e-commerce, newborn identification, national ID card, passport, working ID card.

3.6 Surveillance

Like the security application in public places, monitoring user satisfaction with face recognition is less or less. White lighting, face guidance, and other classifications all make using face recognition for weather monitoring a daunting task. Below are some examples of facial observations.

To upgrade the city's surveillance system in London Newham City, 300 cameras were connected to a closed-circuit television (CCTV) control room. The city council says the device has helped reduce crime by 34 percent since its inception. There are similar ordinances in Birmingham, UK. In 1999, Visionics received a contract from the National Institute of Justice to develop CCTV smart devices.

4. CONCLUSIONS

In this research paper, we present the concepts of facial recognition and their applications. This research paper can give the reader a better understanding of the process and the use of face recognition system. Different type of face recognitions algorithms and techniques are discussed in this paper.

In the future, two dimensional and three dimensional face recognition and major applications such as student ID card, electronic commerce, driving license, aadhar card and voter ID card is a viable option. Hard work in face recognition and this topic needs further research.

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