APPLICATIONS OF IMAGE PROCESSING IN THE FIELD OF FACIAL RECOGNITION SOFTWRAE

Melvina J.S.M[1],Monisha.R[2],Divya Bharathi.R[3]

[1] *Student, Department of CSE, Panimalar Engineering College, TamilNadu, India.*
[2] *Student, Department of ECE, Panimalar Engineering College, TamilNadu, India.*
[3] *Student, Department of ECE, Panimalar Institute of Technology, TamilNadu, India.*

ABSTRACT

The recognition of a face from images or videos is a very popular topic in biometrics research. In many public places there are surveillance cameras for monitoring activities and these cameras have their significant value for security purposes. It is acknowledged that the face recognition has played a major role in the surveillance system as it doesn't require the object to be cooperative. The most important advantage of face based identification over other biometrics is owed to its uniqueness and acceptance. Since our human face is a dynamic object having higher degree of variability in its appearance, face detection becomes a complex problem from computer's vision. In this field, the major issue is accuracy and speed of identification. The aim of this paper is to put forward face detection and recognition method, provide complete solution for image based face detection and recognition with greater level of accuracy, better response rate as an initial step for video surveillance.

KEYWORD: *Facial Recognition Software, FaceIt, Local feature analysis (LFA), Gotcha.*

INTRODUCTION:

The amazing ability of a human being is to recognize and remember thousands of faces . The inborn ability of a human is to recognize and distinguish different faces for billions of years, while computers are just now catching up. The **Facial Recognition Software** helps us to know how the computer are turning your face into computer codes that it can be compared to millions of others faces. This software also finds its application in elections, investigation of criminals and also for the security of pc data.

THE FACE:

People are identified by their faces, because your face is an important part which tells whom you are. It would be rather absurd and difficult to recognize an individual if all faces looked alike. The most unique physical characteristic of a person is their face and an innate ability of a human is his ability to differentiate different faces for millions of years.

The system tries to implement the same procedure by picking out a person's face from a crowd, extracting that face from rest of the scene and evaluating it to a database which contains stored images. For the software to function properly it has to know how a basic face looks. FACEIT, is used to achieve the above function. A company in New Jersey, known as VISIONICS, has many developers of this technology.

This picture depicts how the criminal is caught in the mass crowd.

Facial recognition software, has the power to recognize the face first along with the measurement of the various features of each face. Any human face has a set of visible landmarks for identification and these landmarks makes up the unique facial features. Landmarks are referred as nodal points by VISIONICS. Human face has almost 80 such nodal points.

NODAL POINTS:

Below are few of the nodal points measured by VISIONICS

1. Eyes distance
2. Nose width
3. Eye sockets depth
4. Cheekbones
5. Jawline
6. Chin

A numerical code is generated with help of these nodal points, that represents the face in a database .Face-print is the code which is generated. For a complete recognition process about 14 to 22 nodal points alone is sufficient for this software. The upcoming section we will learn how the system detects, captures and stores faces.
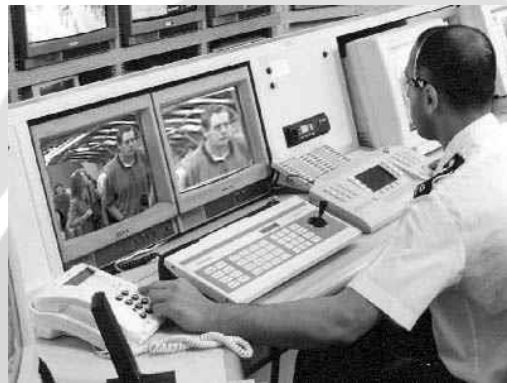
THE SOFTWARE:

This software falls under the large group of technology called **Biometrics.** Biometrics makes use of the biological information for identification. Everybody has a different properties that can be used to differentiate you from others, is the hidden basic concept used in biometrics.

Biometric authentication methods include

1. Scanning of your fingerprints
2. Scanning of your retina
3. Identification of voice

Methods to recognize the face may vary but generally it as series of steps presents to capture, analyse and compare our face to the stored image in a database.

Face-It systems basic process:

To identify someone, facial recognition software compares the stored images with the newly captured image. The basic process of this software is to capture and compare the image. The following are the steps include

1. **DETECTION-** This step includes the field of view of a video camera for faces searched by the recognition software when the system is connected to a video surveillance system. It takes only a fraction of second to view if there is any face in the view. Searching for faces in low resolution is done with the help of a multi-scale algorithm. An algorithm which is a program that provides a set of instruction to accomplish a specific task. Only after detecting head-like shape the system switches to a high –resolution.
2. **ALIGNMENT-**Once the face is detected, the position, size and pose is determined by the system. For the system to register the face needs to be turned at least **35 degrees** towards the camera.
3. **NORMALISATION-**The image is mapped into an appropriate size and pose only when the image of the head is scaled and rotated properly. Impact of light is not going to play a significant role in this process. Regardless of the location of the head and camera distance normalisation is performed.
4. **REPRESENTATION-**A unique code is obtained by the translation of the facial data by the system. Comparison of the newly acquired facial data to stored facial data is made easier by this coding process.
5. **MATCHING-**At least one stored facial representation is compared to the stored data and ideally linked to this.

Local feature analysis (LFA) algorithm is the heart of the Face-It facial recognition system. It's a mathematical technique used to encode faces by system. The facial form is read by the system and a unique numerical code called the faceprint, which is an 84-byte file, is created for that face. Once this process is completed, the comparison can be made to the other numerous faceprints which are already located in our database.

The system is capable of rendering multiple faceprint matches at about sixty million in a minute's time from its memory or about fifteen million from its hard disk. As the matching process is performed, a comparison value from a scale of 1 to 10 is assigned to it. The pictures which are matched are then viewed by the operator to prove the certainty of the system.

Facial recognition, among other forms of biometrics, is expected to emerge as a powerful technology with varied uses in the forthcoming years. In the following section, we will take a look at its current applications.

GOTCHA!

The preliminary applications of this software has been implemented in law enforcement agencies. They store the facial records (facial prints) of the criminals in their databases. This is then used to compare with people in crowds in order to identify matches. Apart from these agencies, the software can also be used in :

- Identifying duplicate vote registrations

- Security surveillance

- Check-cashing identity verification

- Providing security to computer files

ATM MACHINES

A notable application of this facial recognition technology was the filtering of the **duplicate vote registrations** during the time of their elections. This was employed by the Mexican Government. Usually, people forge votes favouring a particular candidate illegally by registering themselves a number of times under several names. This enables them to exercise their right to vote more than once. Trying to spot these criminals using conventional techniques is highly tedious. Thus by making use of our technology, the officials can track through the person's identity during the time of his/her registration in order to avoid such fraudulent actions. The system recognizes the same person who attempts to register himself more than once by comparing his facial print with the prints already stored in its database. Thus this proves as an efficient method to catch hold of such criminals efficiently.

Some of the areas where we can implement this technology on a daily basis include the Automated Teller Machine and also the check-cashing security. Our software efficiently recognizes and verifies a customer's face within a short duration of time. Once the user gets consented, their facial photographs get captured as a digital photo using which a faceprint gets generated which will help in protecting the customers from identity threats and other fraudulent transactions. Thus with the help of our software, we are free from the requirement of conventional identities such as a picture ID or a PIN number. Thus our facial recognition technology serves to eliminate possible criminal activities.
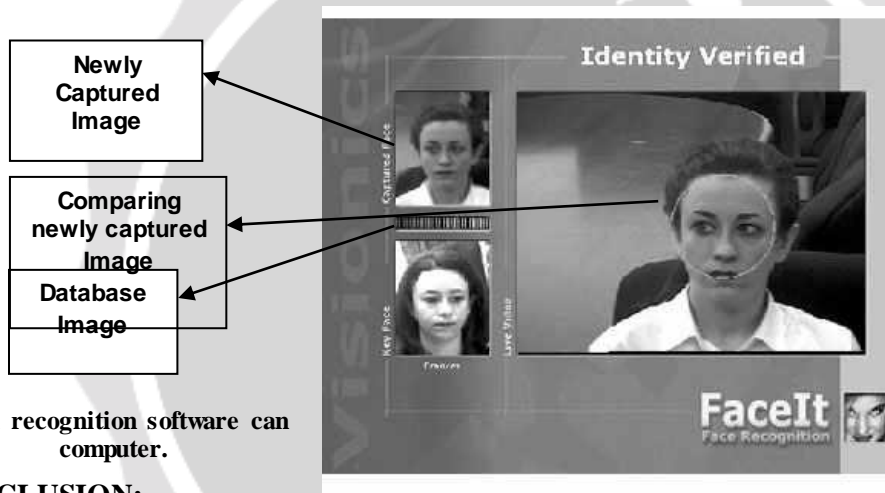
Webcam and Facial   **Recognition**
Software installed

We can efficiently implement this technology to provide security for our files in our computer. This can be made possible by installing a webcam to the system along with the facial recognition software. This enables the face itself as the password to access the files. This technology has been implemented by IBM for its A,T and X series ThinkPad laptops .

Newly Captured Image

Comparing newly captured Image

Database Image

Facial recognition software can   **be used to lock your**
computer.

CONCLUSION:

The facial recognition software, in addition to being used in security systems, can also be used in a number of other applications such as unlocking applications on mobile devices and other biometric usages. Modern digital cameras often incorporate facial detection systems which helps to measure the exposure on the face of the system which helps to better focus the face for a focussed portrait. Some cameras, in addition, incorporate a smile shutter, or automatically recapture a photograph if someone blinks during exposure. As a result of certain limitations of fingerprint recognition systems, the facial recognition systems are employed as an alternative to confirm staff attendance at work for the claimed hours. Even though the facial recognition software is generally agreed upon to be the most reliable and efficient one amongst the other biometric techniques, however controversies have arisen on its effectiveness in cases of railway and airport security. The system can thus be further subjected to enhancements on better adaptations to varying facial expressions, objects partially covering the subject's face (like sunglasses) and lighting condition variations.

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