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Match the Face and Recognition Face Using Artificial Neural Network

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***Abstract*— FACE recognition is an important research problem spanning numerous fields and disciplines. This because face recognition, in additional to having numerous practical applications such as bankcard identification, access control, Mug shots searching, security monitoring, and surveillance system, is a fundamental human behaviour that is essential for effective communications and interactions among people. The objective of this study is to research and test various types of face recognition software to identify an individual's photo from a photo database. Face Biometric Systems utilizes software to compare an individual's photos against a database of photos as a way to identify and/or authorize individuals. Algorithms measure key points of the face (nose, eyes, mouth, jaw, etc), head angle, skin tone, lighting, and create a template based on these measurements. The file is then compared to other files (still photos or video captures) that are enrolled into the software's database, searching for a match based on the "Similarity Rating" percentage. The closer the characteristics match, the higher the similarity rating. The software can also identify individuals over time for various facial expressions.**

***Keywords*— Face recognition, Neural Network, Artificial Neural Network, The back propagation algorithm, Artificial intelligence.**

I. INTRODUCTION

Humans have been using physical characteristics such as face, voice, gait, etc. to recognize each other for thousands of years. With new advances in technology, biometrics has become an emerging technology for recognizing individuals using their biological traits. Our face recognition technology uses faces as unique verification information. We offer facial recognition system that works in a wide range of operating environment from individual home environment to most common public places. Almost in any face recognition application, a face detection stage is needed. Although face detection poses also a very challenging problem, many techniques have been proposed with enough success to consider face detection a very mature field of research. However, although it is clear that face detection is far from being solved, it will not be considered in this position paper. Face recognition can be divided into two basic applications: identification and verification. In the identification problem, the face to be recognized is unknown and is matched against faces of a data base containing known individuals. In the verification problem the system confirms or rejects the claimed identity of the input face.

II. FACE RECOGNITION PROCESS

There are four steps in face recognition process:- for the face recognition we have need some steps apply like acquiring a sample, extracting feature, compression template, declare a match etc.

1. Acquiring a sample: In a complete, full implemented biometric system, a sensor takes an observation. The sensor might be a camera and the observation is a snapshot picture. In our system, a sensor will be ignored, and a 2D face picture "observation" will supplied manually.

2. Extracting Features: For this step, the relevant data is extracted from the predefined captured sample. This is can be done by the use of software where many algorithms are available. The outcome of this step is a biometric template which is a reduced set of data that represents the unique features of the enrolled user's face.

3. Comparison Templates: This depends on the application at hand. For identification purposes, this step will be a comparison between a given picture for the subject and all the biometric templates stored on a database. For verification, the biometric template of the claimed identity will be retrieved (either from a database or a storage medium presented by the subject) and this will be compared to a given picture.

4. Declaring a Match: The face recognition system will return a candidate match list of potential matches. In this case, the intervention of a human operator will be required in order to select the best fit from the candidate list.

An illustrative analogy is that of a walk-through metal detector, where if a person causes the detector to beep, a

human operator steps in and checks the person manually or with a hand-held detector.

III. OPERATION OF A FACE DETECTION SYSTEM TECHNOLOGY:-

As face detection can be mainly formulated as a pattern recognition problem, numerous algorithms have been proposed to learn their generic templates (e.g., Eigen face and statistical distribution) or discriminate classifiers (e.g., neural networks, Fisher linear discriminate, sparse network of Winnows). Typically, a good face detection system needs to be trained with several iterations. One common method to further improve the system is to bootstrap a trained face detector with test sets, and re-train the system with the false positive as well as negatives. This process is repeated several times in order to further improve the performance of a face detector. A survey on these topics can be found in, and the most recent advances are discussed in the next section.

Face recognition is a biometric approach that employs automated methods to verify or recognize the identity of a living person based on his/her physiological characteristics. In general, a biometric identification system makes use of either physiological characteristics (such as a fingerprint, iris pattern, or face) or behaviour patterns (such as hand-writing, voice, or key-stroke pattern) to identify a person. Because of human inherent protectiveness of his/her eyes, some people are reluctant to use eye identification systems. Face recognition has the benefit of being a passive, non intrusive system to verify personal identity in a "natural" and friendly way. In general, biometric devices can be explained with a three step procedure a sensor takes an observation. The type of sensor and its observation depend on the type of biometric devices used.

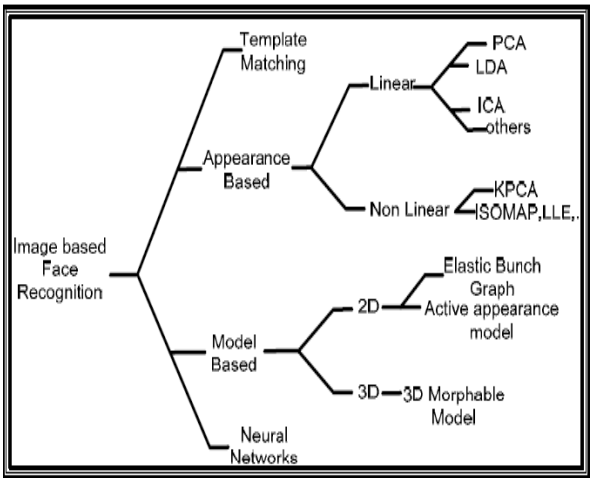

Figure 1:- Classification of Face Recognition Methods

Face recognition starts with the detection of face patterns in sometimes cluttered scenes, proceeds by normalizing the face images to account for geometrical and illumination changes, possibly using information about the location and appearance of facial landmarks, identifies the faces using appropriate classification algorithms, and post processes the results using model-based schemes and logistic feedback.

IV. RECOGNITION FROM INTENSITY IMAGES

Many methods of face recognition have been proposed during the past 30 years. Face recognition is such a challenging yet interesting problem that it has attracted researchers who have different backgrounds: psychology, pattern recognition, neural networks, computer vision, and computer graphics. It is due to this fact that the literature on face recognition is vast and diverse. Often, a single system involves techniques motivated by different principles. The usage of a mixture of techniques makes it difficult to classify these systems based purely on what types of techniques they use for feature representation or classification. To have a clear and high-level categorization, we instead follow a guideline suggested by the psychological study of how humans use holistic and local features. Specifically, we have the following categorization:

(1) *Holistic matching methods.* These methods use the whole face region as the raw input to a recognition system. One of the most widely used representations of the face region is Eigen pictures, which are based on principal component analysis.

(2) *Feature-based (structural) matching methods.* Typically, in these methods, local features such as the eyes, nose, and mouth are first extracted and their locations and local statistics (geometric and/or appearance) are fed into a structural classifier.

(3) *Hybrid methods.* Just as the human perception system uses both local features and the whole face region to recognize a face, a machine recognition system should use both. One can argue that these methods could potentially offer the best of the two types of methods.

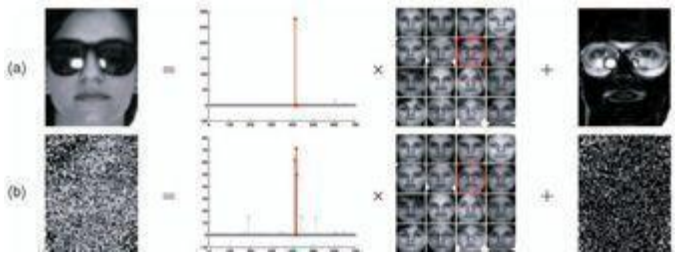

Figure 2:- Overview of our approach. Our method represents a test image (left), which is (a) potentially occluded or (b) corrupted, as a sparse linear combination of all the training images (middle) plus sparse errors (right) due to occlusion or corruption. Red (darker) coefficients correspond to training images of the correct individual.

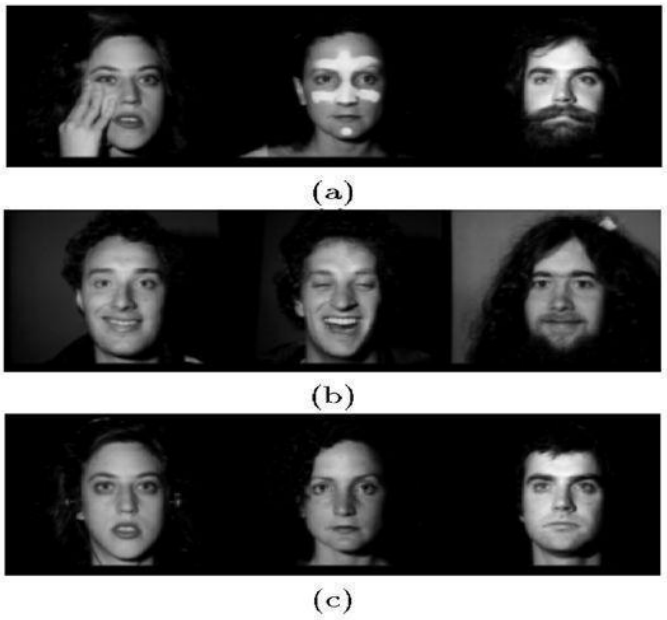

Figure 3:- Comparison of matching: (a) test views, (b) eigenface matches, (c) eigenfeature matches.

V. ALGORITHM USED FOR FACE RECOGNITION

Algorithms measure key points of the face (nose, eyes, mouth, jaw, etc), head angle, skin tone, lighting, and create a template based on these measurements. The file is then compared to other files (still photos or video captures) that are enrolled into the software's database, searching for a match based on the "Similarity Rating" percentage. The closer the characteristics match, the higher the similarity rating. The software can also identify individuals over time for various facial expressions.

Face Recognition software allows a user to create their own biometric face identification security for Windows.

The software uses a neural network Back Propagation Algorithm combined with more Artificial Intelligence tool added for imaging optimization.

VI. THE BACKPROPAGATION ALGORITHM

The BP learning process works in small iterative steps: one of the example cases is applied to the network, and the network produces some output based on the current state of its synaptic weights (initially, the output will be random).

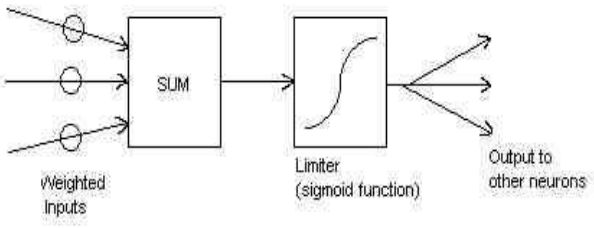

Figure 4: structure of a neuron

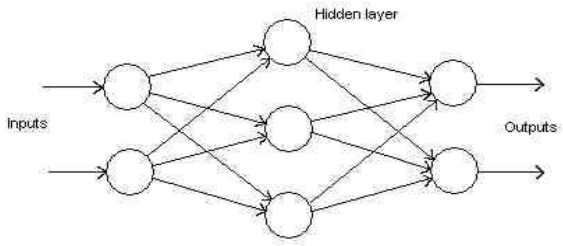

Figure 5: structure of neuron (input and output)

VII. ADVANTAGE OF FACE RECOGNITION

- **Simultaneous multiple face processing**. Our biometric face recognition system performs fast and accurate detection of multiple faces in live video streams and still images. All faces on the current frame are detected in 0.07 sec. and then each face is processed in 0.13 sec.
- **Live face detection.** A conventional face identification system can be easily cheated by placing a photo of another person in front of a camera. Our face recognition system is able to prevent this kind of security breach by determining whether a face in a video stream belongs to a real human or is a photo.
- **Face image quality determination.** A quality threshold can be used during face enrolment to ensure that only the best quality face template will be stored into database. Tolerance to face posture. face recognition system has certain tolerance to face posture that assures face enrolment convenience: rotation of a head can be up to 10 degrees from frontal in each direction (nodded up/down, rotated left/right, tilted left/right).
- **Multiple samples of the same face.** Biometric template record can contain multiple face samples belonging to the same person. These samples can be enrolled with different face postures and expressions, from different sources and in different time thus allowing to improve matching quality. Identification capability. System functions can be used in 1-to-1 matching (verification), as well as 1-to-**many** mode (identification).
- **Fast face matching.** face template matching algorithm compares 100,000 faces per second. Compact face features template. A face features template occupies only 2.3 Kilobytes, thus our applications can handle large face databases.

VIII. PROBLEM AND SOLUTION

Face recognition has been and will continue to be a very challenging and difficult problem. In spite of the great work done in the last 30 years, we can be sure that the face recognition research community will have work to do during, at least, the next 30 years to completely *solve* the problem. Strong and coordinated effort between the computer visions, signal processing and psychophysics and neurosciences communities are needed.

Face recognition is a both challenging and important recognition technique. Among all the biometric techniques, face recognition approach possesses one great advantage, which is its user-friendliness (or non-intrusiveness). In this paper, we have given an introductory survey for the face recognition technology. We have covered issues such as the generic framework for face recognition, factors that may affect the performance of the recognizer, and several state-of-the-art face recognition algorithms. We hope this paper can provide the readers a better understanding about face recognition, and we encourage the readers who are interested in this topic to go to the references for more detailed study.

IX.**CONCLUSION**

The computer based face recognition industry has made much useful advancement in the past decade, however, the need for higher accuracy system remains. Through the determination and commitment of industry, government evolutions, and organized standards bodies, growth and progress will continue, raising the bar for face recognition system. Computer based face recognition system is very useful for the police, industries, and for government for various security regions.

This project gives a more accuracy than other traditional way of recognize the face and less time consuming. It has numerous applications in areas like surveillance and security control systems, content based image retrieval, video conferencing and intelligent human computer interfaces.

Figure 6:- A face detector who detects frontal faces only.

Figure 6.2: Difficult scenario: low quality image with multiple faces

ACKNOWLEDGMENT

Face recognition systems used today work very well under constrained conditions, although all systems work much better with frontal mug-shot images and constant lighting. All current face recognition algorithms fail under the vastly varying conditions under which humans need to and are able to identify other people. Next generation person recognition systems will need to recognize people in real-time and in much less constrained situations.

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