

Feature Based Face Recognition and Detection

Prof. Vaishali Bhagat[#], Rashmi R. Atkare^{*}

CSE Department ,Amravati University,
PRPCE,India

¹Bhagatvaishali2@yahoo.com

²rashmi.atkare21@gmail.com

Abstract— Faces represent complex, multidimensional, meaningful visual stimuli and developing a computational model for face recognition is difficult. Face recognition is the biometric method, to identify given face image using main features of faces. This system based on Feature based approach. There has been significant progress in improving the performance of computer-based face recognition algorithms over the last decade. Although algorithms have been tested and compared extensively with each other, there has been remarkably little work comparing the accuracy of computer-based face recognition systems with humans. Over the last ten years or so, face recognition has become a popular area of research in computer vision and one of the most successful applications of image analysis and understanding. Because of the nature of the problem, not only computer science researchers are interested in it, but neuroscientists and psychologists also.

Keywords- *Face detection, face recognition, Facial feature, generic framework.*

I. INTRODUCTION

A face recognition system [11] is a computer vision and it automatically identifies a human face from database image. Face is our primary focus of interaction with the society. This can be observed in interaction among animals as well as between animals and humans. Face communicates identity, emotion, race, and age. It is also quite useful for judging gender, size and perhaps even character of the person. The face recognition problem is challenging as it needs to account for all possible appearance variation caused by change in illumination, facial features. It has often been observed that human ability to recognize faces is quite remarkable. Faces are complex visual stimuli that are not easily described by shapes and patterns; yet people have the ability to recognize faces even after years of separation. Faces are so important in human interaction that no other avenue to person identification is as convincing as face recognition. The ability to recognize people by their facial characteristics is nothing but the *Face recognition*.

Face detection is a computer technology that determines the locations and sizes of human faces in arbitrary (digital) images.[1]

II. IMPORTANCE OF FACE RECOGNITION OVER BIOMETRICS

There are number reasons to choose face recognition. This includes the following:([9],[3])

1. It requires no physical interaction on behalf of the user.
2. It is accurate and allows for high enrolment and verification rates.
3. It does not require an expert to interpret the comparison result.
4. It can use your existing hardware infrastructure; existing cameras and image capture devices will work with no problems.
5. It is the only biometric that allow you to perform passive identification in a one too many environment (eg: identifying a terrorist in a busy Airport terminal.)

III. GENERIC FRAMEWORK

Facial Recognition analyzes the characteristics of a person's face images input through a digital video camera. It measures the overall facial structure, including distances between eyes, nose & mouth and jaw edges. These measurements are retained in a database and used for comparisons when a user stands before the camera.[4]

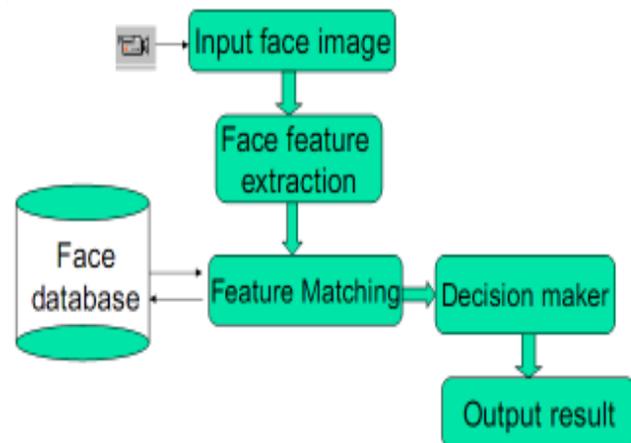


Fig 1: Generic framework for face recognition system

Figure 1 depicts the face recognition system. It will take the image from camera i.e. input to the system. Then it will extract the facial features from input image. The extracted feature is then match with images in database on the basis of features. From that result system will take the decision and face recognition and detection is done.

IV. FEATURE-BASED APPROACH

It is based on the extraction of the properties of individual organs located on a face such as eyes, nose and mouth, [4] as well as their relationships with each other. Effective features that can be used in feature based face recognition can be classified as follows:

A. First-order features values:

Discrete features such as eyes, eyebrows, mouth, chin, and nose, [4] which have been found to be important in face identification and are specified without reference to other facial features, are called first-order features. Some of the examples are listed in table I.

TABLE I:
First Order Features

Measurement	Facial Location
Area, angle	Left eyebrow Right eyebrow Left eye Right eye Mouth Face
Distance	Length of left eyebrow Length of right eyebrow Length of left eye Length of right eye Length of face Height of face

B. Second-order features values:

Another configurable set of features that characterize the spatial relationships between the positions of

the first-order features and information about the shape of the face are called second order features. [5]

This approach is simple to implement and heuristics can be applied easily but it is not a robust method for face recognition. This method is heavily dependent on the external environment features.

Table II describes some of the important second order features.

TABLE II
Second order features

Measurement	Facial Location
Distance	Left eyebrow ↔ Right eyebrow
	Left eye ↔ Right eye
	Left eyebrow ↔ Left eye
	Right eyebrow ↔ Right eye
	Left eyebrow ↔ Mouth
	Right eyebrow ↔ Mouth
	Left eye ↔ Mouth
	Right eye ↔ Mouth
Angle	Eyebrow ↔ Side of
	Left eyebrow – Left eye – Left eyebrow
	Right eyebrow – Right eye – Right eyebrow
	Left eye – Mouth – right eye
	Left eyebrow – Left eye – Mouth
	Right eyebrow – Right eye – Mouth

V. CONCLUSION

Face recognition has received substantial attention from researches in biometrics, pattern recognition field and computer vision communities. Face recognition is being solved problem by feature based approach. The progress during the past decade on the face recognition has been encouraging. Other appearance-based approaches must be coupled with feature or shape based approaches to recognition in order to build system that will be robust. Generic framework gives a brief idea about face recognition and detection. Face recognition can be applied in Security measure at Air ports, Passport verification and Criminals list

verification in police department, Visa processing and Card Security measure at ATM's. From these we conclude that, face recognition and detection provides a security and its accuracy is quite remarkable.

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