Chapter 13

A Study on Different Facial Features Extraction Technique

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ABSTRACT

Facial recognition is the most natural means of biometric identification as it deals with the measurement of a biological relevance. Since, faces varies from each and every person, therefore, it can be used for security purpose. Face recognition is a very challenging problem, where the human face changes over time, as it depends on the pose, expression, occlusion, aging, etc. It can be used in many areas such as for surveillance purposes, security, general identity verification, criminal justice system, smart cards, etc. The most important part of the face recognition is the evaluation of facial features. With the help of facial feature, the system usually looks for the position of eyes, nose and mouth and distances between them can be detected and computed. This chapter will discuss some of the techniques that can be used to extract important facial features.

1. INTRODUCTION

Face recognition involves an evaluation of facial features. The system usually look for some fiducially for the positioning of eyes, nose and mouth and distances between these features. Face plays an important role in our social interactions, validating the identity of a person. The skin color of a face can change depending on the exposure while it imaged, that is the different of the same face when exposed to sunlight or in the dark room, etc. It can also depend on the emotion of a person. It may change when there are any cuts, scrapes bandages from injuries, beard, mustache, etc. and also wrinkles, weight loss, weight gain caused by aging.

DOI: 10.4018/978-1-4666-8737-0.ch013
1. Various Factors Affecting Face Recognition

Face recognition is susceptible to a variety of factors, such as pose and lighting variations, expression variations, age variations.

1. **Pose Variation:** While capturing a face image of different pose, images taken at two different viewpoints of the same person (intra-user variation) may appear more different than two images taken from the same view point for two different people (inter-user variation).

2. **Lighting Variation:** The difference in face images of the same person due to severe lighting variation. The skin color of a face can change depending on the exposure while it imaged, that is the different of the same face when exposed to sunlight or in the dark room, etc.

3. **Expression:** Facial expression is an internal variation that causes large intra-class variation. The recognition of facial expressions is an active research area in human computer interaction and communications.

4. **Age Variation:** Aging related changes on the face appear in a number of different ways such as:
   - Wrinkles
   - Weight loss and gain, and
   - Change in shape of face primitives

5. **Occlusion:** Face images often appear occluded by other objects or by the face itself (i.e., self-occlusion). It may depend on the emotion of a person and also it may change when there is any cuts, scrapes bandages from injuries, beard, mustache, etc.

2. BACKGROUND

Face plays an important role in our social interactions, especially in conveying people’s identity. Face recognition have applicability in the following areas:

1. It can be used as a security for accessing controls as in airports, ATM machines, email authentication, system authentication, etc.
2. It can also be used as an identity of a person in electoral registration, passports, driver license, student’s identity, etc.
3. It can also be used in police department as criminal investigation, etc.

Therefore the needs of a face recognition system are important, where each and every organization is used for security, as each and every people want to protect their own identities.

There are three stages of face recognition. The three stages are shown in the block diagram shown in figure 1.

1. **Face Detection:** At first, face will be captured using camera. Then face will be detected from the captured photography.
2. **Feature Extraction:** Features are required to extract for reducing the dimension and also removing the noise and distortion for better computation.