

Face Recognition System Using Genetic Algorithm

Abstract

Face recognition is one of the most challenging aspect in the field of image analysis. Face recognition has been a topic of active research since the 1980's, proposing solutions to several practical problems. Face recognition is probably the biometric method that is used to identify people mainly from their faces. However, the recognition process used by the human brain for identifying faces is very challenging. In this paper, a Genetic Algorithm (GA) based approach is proposed for face recognition. The proposed algorithm recognizes an unknown image by comparing it with the known training images stored in the database and gives information regarding the person recognized. The proposed algorithm is then compared with other known face recognition algorithms viz: Principal Component Analysis(PCA) and Linear Discriminate Analysis (LDA) algorithms. It has been observed that the recognition rate of the proposed algorithm is better.

Keywords: Face Recognition; UMIST; ORL; PCA; LDA; Genetic Algorithm.

1. Introduction

Face recognition is a task of pattern recognition that is specifically performed on faces. In other words, it can be described as classifying a face either known or unknown by comparing a face with stored known individuals in the database. It is also desirable to have a system that has the ability of learning to recognize unknown faces. People have a good ability to recognize and distinguish between faces but recognizing human face automatically by computer is very difficult. The main goal of face recognition technology is to match a given face image against the stored database of images. Face recognition technique uses several other disciplines such as image processing, computer vision, pattern recognition, neural networks and psychology. With the current perceived world security situations, governments as well as businesses require reliable methods to accurately identify individuals, without overly infringing on rights to privacy or requiring significant compliance on the part of the individual being recognized.

1.1. Framework for Face Recognition

Face recognition is a technique that takes the image of a person (query image) and compares it with the previously recorded images in the database. This is done by comparing the invariant features obtained from the techniques that capture the representative variability of the faces or the structure, the shape and the face attributes like distance between

the eye centers and nose, upper outlines of the eyes, width of eyebrows, etc. Face recognition has the benefit of being a

passive, non intrusive system to verify personal identity in a natural and friendly way. The main benefit of this technique

over other biometric approaches is that the face images can be taken from a distance even without the knowledge of the

individual being observed as might be required in identifying the presence of the criminals in a bank or government offices, etc.

1.2. Applications of Face Recognition System

It has become one of the most active research areas especially in recent years as it has a variety of wide applications in the areas:

- Public security
- Law enforcement and commerce
- Credit card verification
- Criminal identification
- Access control
- Human-computer intelligent interaction
- Digital libraries and information security

1.3. Challenges in the Field of Face Recognition

The challenges associated with face recognition can be attributed to the following factors:

- Presence or absence of structural components: Facial features such as beards, mustaches, and glasses may or may not be present and there is a great deal of variability among these components including shape, color and size.
- Pose: The images of a face vary due to the relative camera-face pose (frontal, tilted, profile, upside down).
- Facial expression and emotions: The appearance of faces is directly affected by a person's facial expression and emotions.
- Occlusion: Faces may be partially occluded by other objects. For an example, in an image with a group of people, some faces may partially occlude other faces (face identification).