Chapter 17
Face Recognition using Fast Fourier Transform

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ABSTRACT

Biometrics refers to metrics related to human characteristics and Traits. Face Recognition is the process of identification of a person by their facial image. It has been an active area of research for several decades, but still remains a challenging problem because of the complexity of the human face. The objective is to authenticate a person, to have a FAR and FRR very low. This project introduces a new approach for face recognition system using FFT algorithm. The database that contains the images is named as train database and the test image which is stored in test database is compared with the created train database. For further processing RGB data is converted into grayscale, thus reduces the matrix dimension. FFT is applied to the entire database and mean value of the images is computed and the same is repeated on test database also. Based on the threshold value of the test image, face recognition is done. Performance evaluation of Biometrics is done for normal image, skin color image, ageing image and blur image using False Acceptance Rate(FAR), False Rejection Rate(FRR), Equal Error Rate(EER) and also calculated the accuracy of different images.

1. INTRODUCTION

1.1 Biometrics

Biometrics is an emerging field of information technology which aims to identification of an individual. Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals (Jain, Hong, & Pankanti, 2000). Biometric identifiers are often categorized as physiological versus behavioral characteristics (Jain, & Ross, 2008). It has been shown that information characteristics of each individual can be extracted in order to verify the identity of that individual in a population. Biometric
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Biometrics authentication (or realistic authentication) is used in computer science as a form of identification and access control (Jain, Ross, Nandakumar, 2009). It is also used to identify individuals in groups that are under surveillance. Biometric authentication requires comparing a registered or enrolled biometric sample (biometric template or identifier) against a newly captured biometric sample (for example, captured image during a login). During enrollment a sample of the biometric trait is captured, processed by a computer, and stored for later comparison.

Biometric recognition can be used in mode, where the biometric system identifies a person from the entire enrolled population by searching a database for a match based solely on the biometric. Sometime identification is called “one-to-many” matching. A system can also be used in mode, where the biometric system authenticates a person claimed identity from their previously enrolled pattern this is also called “one-to-one matching. In most computer access or network access environments, verification mode would be used. The main advantages of biometrics over other standard security systems are that biometric traits cannot be forgotten or lost. They are difficult to copy, share and distribute and they require the person to be present at the time of authentication.

1.2 Face as a Biometric

Facial images are the most common biometric characteristic used by humans to make a personal recognition, hence the idea to use this biometric in technology. Face verification involves extracting a feature set from a two-dimensional image of the user’s face and one method to proceed by comparing selected facial features from the image and a facial database. Face recognition is a challenging task for the researchers, on one side its applications is used for verification and recognition on other side it is complicated to implement due to all different situation that a human face can be found. The most popular approaches to face recognition are based on either the location or shape of facial attributes such as eyes, eyebrows, nose, lips and chin. For best work of facial recognition system in practice, it should automatically

- Detect whether face is available in the acquired image.
- Locate the face if there is only one face and,
- Recognize the face.

Face recognition is a process does not require active co-operation of a person so without instructing the person can recognize the person, so face recognition is much more advantageous compared to the other biometrics. Face recognition has a high identification or recognition rate of greater than 90 percent for huge face databases with well-controlled pose and illumination conditions.

1.3 Face Recognition

Face recognition is one of the most common methods used for identifying or verifying a person due to its non-intrusive nature, as acquiring face images can be done at a distance. Recognizing faces and facial expressions is becoming very important in many practical applications, such as in border control and