

Chapter 37

3D Image Acquisition and Analysis of Range Face Images for Registration and Recognition

Suranjan Ganguly
Jadavpur University, India

Debotosh Bhattacharjee
Jadavpur University, India

Mita Nasipuri
Jadavpur University, India

ABSTRACT

Although, automatic face recognition has been studied for more than four decades; there are still some challenging issues due to different variations in face images. There are mainly two categories of face recognition based on acquisition procedure. One technology that deals with video based face recognition and another approach where different sensors are used for acquisition purpose of different stationary face images, for instance: optical image, infra-red image and 3D image. In this context, researchers have focused only on 3D face images. 3D face images convey a series of advantages over 2D i.e. video frame, optical as well as infra-red face images. In this chapter, a detailed study of acquisition, visualization, detail about 3D images, analyzing it with some fundamental image processing techniques and application in the field of biometric through face registration and recognition are discussed. This chapter also gives a brief idea of the state of the art about the research methodologies of 3D face recognition and its applications.

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INTRODUCTION

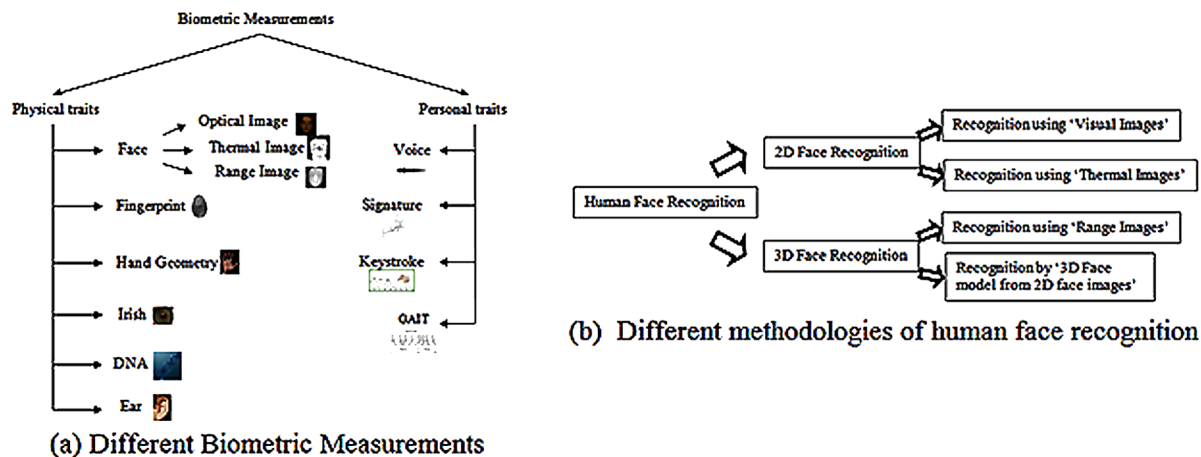
In our busy schedule of daily life, everyone is very much worried about his or her security. At present, there are different surveillance systems for this reason. It is hooked up from ATM to authentication and also attendance system. The classical approaches like, username and password or even better security system such as, punch card with PIN code are limited to human memorization capabilities and can be stolen, forgot or even it can be duplicated easily, or sometime it may also be corrupted. To overthrow these major issues for security purpose, an alternative approach for authentication system is introduced i.e. 'Biometric' based authentication system. It is basically reliant to the intelligence of a computer to compute a series of operation for automatically identification purpose. The context of Biometric is 'life measurement' (Seal et al., 2014). Biometric based system uses two different kinds of characteristics. Depending on the characteristic, biometric measurements are broadly grouped into two sections namely: physical and personal qualities. It is illustrated in Figure 1.

Furthermore, individually, face recognition (FR) domain can further be grouped into two sub-domains such as 2D face recognition and 3D face recognition. It is briefly described in Figure 1(b). Again, 2D FR can be performed using a visual image, as well as infrared image. Other than range face images, 3D face model from 2D images is another approach for 3D face based FR.

The aim of this chapter is to include detail structural information about 3D image technology, its detailing and successful application for biometric measurement especially by 'Range Face Images'. A comparative study on results of recent works on range face image registration and recognition on well-known databases are also reported here.

There are different challenges where computational intelligence fails to correctly recognize the probe range image with gallery face images. But with the advancement of technology, 3D face images can be used to overcome some of these problems. It is captured by 3D scanners. Though there are several biometric measurements, but due to the unique characteristic with non-contacting and non-counterfeit properties, face base authentication system is highly praised over others. In Figure 2, the importance of face image in a different paradigm is highlighted.

Figure 1. Human face: a biometric measurement



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