Chapter 11

Anthropometric Algorithm Used for Automatic Body Dimensions and Skin Color Detection Aimed for Homeland Security Systems

ABSTRACT

Automatic body detection and identification of a person is one of the most recent research topics that has gained a lot of attention from researchers. Automated systems that will store human biometrics along with the personal information can be of significant assistance in investigations and security issues. Biometrics represents unique aspects of the body that are measurable, robust, distinctive, physical characteristic, or personal traits of an individual by which a person can be identified. Biometric surveillance systems measure and analyze human physical and behavioral characteristics for identification purposes. A method of body measurement can be used for human identification, with the means of using a static camera. Body measurement calculation based on similar triangles is proposed. The focal length of the camera is a very important aspect of the method. This process can provide the means for obtained image segmentation, measurement of the body parts of the subject, and finally, these measurements can be used for identification of the person.

1. INTRODUCTION

The measurement related to human body with an intention of understanding his or her physical variations is referred to as anthropometry. This technique is today widely used in cloth designing, (Lu, 2008), (Meunier, 2000), (Petrak, 2006), industrial designing, ergonomics, architecture and homeland security, (Abdelkader, 2010), (Bracewell, 2001), (Gittoes, 2009), (Lv, 2006), (Rao, 2006), (Stancic, 2009), (Yeadon, 1990). In these fields, statistical data about the variation and distribution of body measurements in the targeted population are used to customize and optimize the products. Several factors lead to changes in body measurements. This may include changes in lifestyles, ethnic and nutrition. For example, obesity epidemics may change the body measurement of the individuals affected thus making the anthropometric data updating necessary.

A method of body measurement can be used for human identification, with the means of using a static camera. There are certain methods that can enable obtainment of the body measurements. It

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is proposed in this chapter body measurements calculation based on similar triangles. The focal length of the camera is a very important aspect of the method. This process can provide the means how obtained image should be segmented, how the body parts of the subject can be measured and finally these measurements can be used for identification of the person.

But before starting the process some very important facts have to be assumed. The scene where the action is taking place has to be a constant one and the ground on which the subject is standing or positioning himself or herself has to be flat for the purpose of correctness of the later calculations. The cameraman has to know the distance between the person and the camera, and other information about the focal length can be obtained from the camera itself. Also, an object of a known height should be placed in the scene for the purpose of proportion calculations.

The process of the measurements of the proposed algorithm is fast and simple, and a practitioner can execute the process successfully. In recent times the introduction of the digital camera and computer has greatly reduced the physical stress of the examiner. And the most important part of this is that the lesser physical strain has resulted in lower human error in the process. The computer also validates the results automatically and compares with the estimated values from the models.

Automatic body detection and identification of a person is one of the most recent research topics that have gained a lot of attention from researchers. Automated systems that will store the human biometrics along with the personal information can be of a significant assistance in investigations and security issues.

The applications of these programs can be wide; it can be used for the purpose of monitoring criminals and terrorists, cards and supermarkets among other things. Sometimes additional measurements apart from the three basic measurements can be used to read the body measurements of the person. These developments will be immensely beneficial in the aspects of security as they will definitely improve the process of tracking the person. It should be noted out that these processes are quite complicated and time consuming as a whole.

In modern times, anthropometric studies are conducted for a variety of purposes. But the primary most demand of the anthropometrics is in the field of forensics and physical anthropology. Anthropologists, in their academic endeavors investigate the evolutionary changes in body measurements of groups of people whose forefathers lived in different environmental setups. It has been proved that human beings exhibit body measurement variations depending on the different climatic conditions of the environmental settings they dwell. For example, scientists have identified that individuals living in cold climates will tend to have greater body measurements compared to people who dwell in warm climatic conditions.

Outside academics, anthropometry study is conducted to determine the range of cloth sizes which need to be manufactured for a specific group of people. As the demand of personalized clothing is growing with every passing day these processes are used by the manufactures only to get the more accurate measurements for their customers. It lowers the price of the product and also ensures faster delivery, which saves both the efforts of the maker and the time of the buyer. Foot measurements are used in the manufacture of footwear. The above explained issues depict the importance of anthropometric studies in the modern world. Body measurements are important in manufacturing companies because they get to understand the nature of their customers thus manufacturing goods exactly to the preference of their customers.

In today’s world, there is a growing demand from consumers to purchase customized products which are needed at lower prices and delivered in time. The advanced technology has given globalization a new dimension of conducting business. The customers are able to place their orders online to suppliers who deliver the goods to their premises.