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Ear Biometrics

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Synonym

Ear Recognition

Introduction

Biometrics identification methods have proved to be very efficient, more natural and easy for users than traditional methods of human identification. Biometrics methods truly identify humans, not keys and cards they possess or passwords they should remember. The future of biometrics leads to systems based on image analysis as the data acquisition is very simple and requires only cameras, scanners or sensors. More importantly, such methods could be **passive**, which means that the subject does not have to take active part in the whole process or, in fact, would not even know that the process of identification takes place. There are many possible data sources for human identification systems, but the physiological biometrics has many advantages over methods based on human behavior. The most interesting human anatomical parts for passive, physiological biometrics systems are face and ear.

There are many advantages of using the ear as a source of data for human identification. Firstly, the ear has a very rich structure of characteristic ear parts.

life while face changes more significantly with any other part of human body [1, 2]. Face changes due to cosmetics, facial hair and hair color. Secondly, human faces change due to emotions and stress. Thirdly, human faces change due to different states of mind like sadness, happiness or surprise. In contrast, ear features are fixed and not changeable by emotions. The ear is not symmetric and the left and right ears are not the same. Due to facial and medical studies, from the age of 4 ears change proportionally, which is the problem of ear biometrics in computer vision systems [1].

Furthermore, the ear is a human sensor, therefore it is usually visible to enable good hearing. In the process of acquisition, in contrast to face identification systems, ear images cannot be disturbed by beard or make-up. However, occlusion by hair or glasses is possible.

It is also important that ear biometrics is more accepted by users in possible access control applications and government security such as airport programs. According to users, ear biometrics is less stressful than fingerprinting. Moreover, users are more comfortable with ear biometrics than face images enrolment (people tend to care less about how they look on photographs) [3]. Furthermore, in ear biometrics systems there is no need to touch any part of the body and therefore there are no problems with hygiene.

It is worth mentioning that ear images are more secure than face images, mainly because it is difficult to associate ear image with a given person (in fact, most of users are not able to recognize their own ear image). Therefore, ear image databases have to be as much secured as face databases, since the risk of attacks is much lower.

On the other hand, ear biometrics is not a