

Person identification technique using human iris recognition

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Abstract

The biometric person authentication technique based on the pattern of the human iris is well suited to be applied to any access control system requiring a high level of security. This paper examines a new iris recognition system that implements (i) gradient decomposed Hough transform / integro-differential operators combination for iris localization and (ii) the “analytic image” concept (2D Hilbert transform) to extract pertinent information from iris texture. All these image-processing algorithms have been validated on noised real iris images database. The proposed innovative technique is computationally effective as well as reliable in terms of recognition rates.

1. Introduction

1.1 Overview

Today, biometric recognition is a common and reliable way to authenticate the identity of a living person based on physiological or behavioral characteristics. A physiological characteristic is relatively stable physical characteristics, such as fingerprint, iris pattern, facial feature, hand silhouette, etc. This kind of measurement is basically unchanging and unalterable without significant duress. A behavioral characteristic is more a reflection of an individual’s psychological makeup as signature, speech pattern, or how one types at a keyboard. The degree of intra-personal variation in a physical characteristic is smaller than a behavioral characteristic. For examples, a signature is influenced by both controllable actions and less psychological factors, and speech pattern is influenced by current emotional state, whereas fingerprint template is independent. Nevertheless all physiology-based biometrics don’t offer satisfactory recognition rates (false acceptance and/or false reject rates, respectively referenced as FAR and FRR). The automated personal identity authentication systems based on iris recognition are reputed to be the most reliable among all biometric methods: we consider that

the probability of finding two people with identical iris pattern is almost zero [1]. That’s why iris recognition technology is becoming an important biometric solution for people identification in access control as networked access to computer application [2].

Compared to fingerprint, iris is protected from the external environment behind the cornea and the eyelid. No subject to deleterious effects of aging, the small-scale radial features of the iris remain stable and fixed from about one year of age throughout life.

1.2 Outline

This paper is divided into five main parts. The *Section 1* introduces what is the position of iris technology in personal authentication. In the *Section 2*, we sum up the state of the art in the domain of iris recognition. The more widely known iris recognition system developed by *J.Daugman* [4] is taken as reference for comparison. The *Section 3* presents in details our approach, and discusses the different issues we chose. The *Section 4* provides test results and illustration of typical iris signature. At last a conclusion is done in *Section 5*, which tasks about the next considerations for the improvement of the proposed solution.

2. Background

The French ophthalmologist *Alphonse Bertillon* seems to be the first to propose the use of iris pattern (color) as a basis for personal identification [3]. In 1981, after reading many scientific reports describing the iris great variation, *Flom* and San Francisco ophthalmologist *Aran Safir* suggested also using the iris as the basis for a biometric. In 1987, they began collaborating with computer scientist *John Daugman* of *Cambridge University* in England to develop iris identification software who published his first promising results in 1992 [4]. Later on a little similar works have been investigated, such as *R.Wildes’* [5], *W.Boles’* [6] and *R.Sanchez-Reillo’s* [7] systems, which differ both in the iris features representation (iris signature) and pattern matching algorithms. *R.Wildes’* solution includes (i) a *Hough*

