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Iris Texture Recognition based on Multilevel 2-D Haar Wavelet Decomposition and Hamming Distance Approach

Neda Ahmadi [a,*], Mehrbakhsh Nilashi [b]
[a] Shahid Chamran Universty of Ahvaz, Faculty of Engineering, Department of Computer Engineering, Ahvaz, Iran
[b] Faculty of Computing, Universiti Technologi Malaysia, Johor, Malaysia

*** Corresponding author email address**: n-ahmadi@mscstu.scu.ac.ir

Abstract

Security has played an essential role in human life and it has been motivated the governments of all regions in the world to make security measures tight by a higher level of safety. Although major progresses are carried out in the iris recognition domain, it will have continuous to be an open issue in the future and it will deserve additional investigation. So, as to refer these difficulties, in this paper a novel iris recognition method for feature extraction is proposed based on 2-D Haar wavelet decomposition approach. It is chosen because it causes to reduce the level of noises of the iris texture effectively. Furthermore, it accelerates the extraction process of the iris pattern and it simplifies the computing process. In order to implement this method, multilevel 2-D wavelet decomposition approach is applied on the iris images which are normalized in the pre-processing step and then, it extracts the features of these images to create a distinctive code. For finding similarity among the two iris images and carrying out the matching process, we use Hamming distance measure in order to obtain high accuracy rate in our proposed iris recognition system. Our experimental results on CASIA-Iris V3 database show the effectiveness of the proposed method in iris recognition system.

Keywords: Biometrics, Acquisition, Localization, Iris recognition, Feature extraction, 2-D Haar wavelet decomposition and matching

1. Introduction

In the new millennium, all facets of our life have been revolutionized by the advent of technology. Likewise, as reliability and uniqueness are one of the major issues for the security systems, iris recognition as one of the manifestations of technology has played a significant role in these systems. The biometric pattern give an effective, normalized and differentiating portrayal of the feature through unique physical (iris, face, DNA testing, hand profile, retinal scanning, fingerprints, palm print, etc.) and behavioural (gait measurement, signature, keystroke and voice) characteristics of each person that compared to other patterns in order to recognize the identity of each individual. Usually, there are two operational modes in biometric systems; the first mode that adds patterns to the database is called an enrolment mode and the second one is called identification mode that create a pattern for each person; then a matching process is applied and therefore, the low percentage of the two people that have the similar features are returned. The methods which are based on behavioural features are less reliable than physical ones; inasmuch as, they duplicate easily; on the contrary, physical characteristics are trustworthy methods due to the fact that they have obtained high accuracy rates in the prior existing methods and also the reliability rate in these systems are quit high; for instance, iris recognition systems obtained much attention in numerous applications such as airports security control and also they extended in commercial recognition systems (Jain et al., 2004).

Iris recognition can distinguish human identity by examining the iris texture randomly and making comparison with the ones that are in the database by utilizing the matchless information of the iris pattern. stableness of the iris pattern during human's lifespan and non-modifiability of surgery is one of the examples of iris texture; furthermore, iris recognition systems with high accuracy rate are quit well-known than the other biometric methods such as fingerprint recognition, vein recognition, face recognition and voice recognition (Daugman, 1993; Ma et al., 2003; Ahmadi and Akbarizadeh, 2016). In addition, both of verification and identification modes can be performed in iris recognition systems because there is no links between the iris patterns and human genetic structure (Muron and Pospisil, 2000).

Even though the iris texture is normally well covered interior organ, it utilized to mark the coloured section of the eye and a small round diaphragm that is located in back of the cornea and the human eye lens (Daugman, 1988; Ahmadi and Akbarizadeh, 2015). The outside part of the