

Periocular Biometrics for Iris Recognition: A Review

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Abstract: Periocular refers to the facial region in the vicinity of the eye, including eyelids, lashes and eyebrows. While face and irises have been extensively studied, the periocular region has emerged as a promising trait for unconstrained biometrics, following demands for increased robustness of face or iris systems. With surprisingly high discrimination ability, this region can be easily obtained with existing setups for face and iris, and the requirement of user cooperation can be relaxed, thus facilitating the interaction with biometric systems. It is also available over a wide range of distances even when the iris texture cannot be reliably obtained (low resolution) or under partial face occlusion (close distances). Here, we review the state of the art in periocular biometrics research. A number of aspects are described, including: i) existing databases, ii) algorithms for periocular detection and/or segmentation, iii) features employed for recognition, iv) identification of the most discriminative regions of the periocular area, v) comparison with iris and face modalities, and vi) soft-biometrics (gender/ethnicity classification). This work is expected to provide an insight of the most relevant issues in periocular biometrics, giving a comprehensive coverage of the existing literature and current state of the art. Moreover, we will use different feature extraction techniques such as LBP, PCA, and ICA for pre-processing of periocular biometrics. Comparative Analysis with other competent technologies is also the essential part of this research work.

Keywords: Acquisition, Biometric System, Periocular, iris recognition, iris, databases etc.

1. Introduction

Aims:

Identification and authentication of any human will be becoming very important in present time. In the surrounding where electronics devices will more commonly used and there is a need for accurate and secured authentication. Old techniques such as passwords, ID cards, are not accurate and secure. Thus, there shall be increasing to implements for automatic authentication process.

Biometric System:

The word "biometrics" comes from the Greek words "bio" and "metric," meaning "life computation" The unparalleled of a personally, physiological and behavioral, characteristics is the basis for the science of biometrics. Typical physiological features measured include an individual's fingerprints, face, retina, iris, DNA and hand geometry.

Periocular:

The term "periocular" comes from the prefix, "peri-", meaning "around or about", and the genesis word, "ocular", meaning "of a relating to the eye". In biometrics, the term has been applied to both a small region including the eye, eyelids, and lashes.

Acquisition:

Researchers have explored multiple kinds of acquisition techniques in iris recognition. The facial region in the immediate vicinity of the eye. Acquisition of the periocular biometric is anticipated to require less subject cooperation while permitting a larger depth of field compared to traditional ocular biometric. Traits (retina, iris, conjunctiva, periocular.)

2. Objective

In this research work following of aspect will be investigated and implemented:

- The effectiveness of incorporating the eyebrows,
- An use of side information (left or right) in matching,
- The manual versus automatic segmentation schemes,
- The local versus global feature extraction schemes,
- The fluidization of face and periocular biometrics,
- An use of the periocular biometric in partially occluded face image
- An effect of pose variation and occlusion,
- An effect of masking the iris and eye region,
- Development of novel technique for periocular recognition,
- Comparative Analysis.

Periocular Biometric systems are applied for the unique identification of an individual by evaluating one or more distinguishing biological traits. Authentication plays a major role as a first line of defense against intruders. The number of systems that have been compromised is ever increasing and biometric verification is any means by which a person can be uniquely identified by evaluating one or more distinguishing biological traits. Periocular biometric recognition is based on the appearance of the region around the eye. The performance of iris recognition is affected if iris is captured at a distance, also affected for subjects who are blind or have cataracts and the performance of face recognition is affected by lighting changes, hair of the person, the age and if the person wear glasses. Periocular recognition [1] is useful in applications where it is difficult to implement the iris and the face biometrics. Acquisition of the Periocular biometrics has require to large number of user cooperation. In the existing work, After capturing the

periocular region, feature extraction method is done using Local binary pattern (LBP), Histograms of Oriented Gradients (HOGs) and Scale Invariant Feature Transform (SIFT). The human and the machine performance are analyzed based on these algorithms and this not a complete automated system. In this manual intervention is required for the recognition of the features that is obtained using those algorithms.



Figure 1: Original Left and Right Periocular Images

(A) J.R.Lyle et al (2010) proposed soft biometric classification using periocular region features in [5]. The focus is on gender and ethnicity classification of individuals using periocular images. The core is to focus whether periocular images carry enough information to reliably obtain similar soft biometric information to that obtained from face images. This paper describes a soft biometric classification approach using appearance based periocular features. The soft biometric information thus obtained can be effectively used for improving the performance of existing periocular based recognition approaches.

(B) D.L.Woodard et al (2010) described periocular region appearance cues for biometric identification in [6]. The low-level features extracted from the periocular region can be effectively used for identification. The chief novelty in this work lies in our use of only the level-two periocular features based on skin texture and color information to perform identification corresponding author only.

To this effect, mask the eye in the periocular region thus removing the iris and various level-one features. Although removal of the eye from a periocular region image may seem like a heavy loss of discriminating information, it could be potentially advantageous as the level-one features are highly sensitive to the opening and closing of the eyes and may end up influencing the texture features adversely).

3. Expected Impact on Academics/Industry

In spite of the tremendous progress made in ocular biometrics, there are significant provocation encountered by these systems:

(1) The iris is a moving object with a small surface area that is located within the independently transfer eyeball. The eyeball itself is located within another moving object—the head. Therefore, convey localizing the iris in eye images obtained at a distance in unconstrained environments can be difficult [11]. Furthermore, since the iris is generally imaged in the near-infrared (NIR) portion (700–900 nm) of the electromagnetic (EM) spectrum, proper invisible lighting is required to illuminate it prior to image accession.

(2) The size of an iris is very small contrast to that of a face. Face images get with low decision sensors or large standoff distances offer very little or no data; about iris texture.

(3) Even under ideal shape characterized by appreciative lighting conditions and an optimal deadlock distance, if the subject blinks or closes his eye, the iris data cannot be reliably get.

(4) Retinal vasculature cannot be effortless, imaged unless the subject is collective. In addition, the imaging device has to be in close presence to the eye.

(5) While conjunctiva vasculature can be imaged at a distance, the curvature of the sclera, the secular likeness. In the image, and the fineness of the vascular patterns can surprise the feature extraction and similar modules of the biometric system [12].

The performance of periocular recognition could be further enhanced by incorporating the information related to the eye shape. The applications of biometrics will be divided into the following three main bodies.

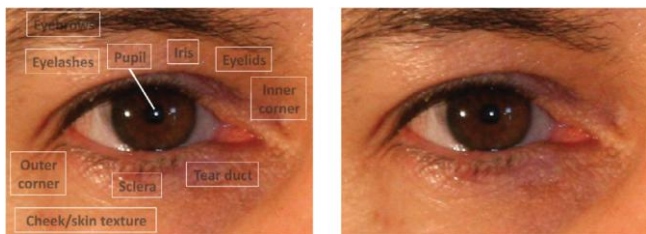
Commercial: applications such as computer network sign in, electronic data security, E-commerce, Network access, ATM, credit card, bodily access control, cellular phone, PDA, medical records database, and distance learning.

Government: applications such as national ID card, correctional, solution, driver's license, social security, welfare disbursement, border control, and passport control.

Forensic: applications such as corpse distinguish, criminal investigation, terrorist identification, parenthood resolution, and missing children.

4. Major Inputs (Infrastructure) Requirement

- Face data set- FDS is a *database* of static images of human *faces*.
- Region Extraction- The extraction of regions from multiple images simultaneously with their correspondences.
- Local binary patterns- A type of visual descriptor used for classification in computer vision, and particular case of the Texture Spectrum model.
- Periocular recognition- Periocular recognition has gained attention recently due to demands of increased robustness of face or periocular in less controlled of scenarios.
- Scale-invariant feature transform- An algorithm is computer vision to detect and describe to local features in images.
- Academic Service: Computer Science & engineering, Department Faculty of Engineering & Technology, Rama University, Rama Kanpur, Rama City, G.T. Road, Mandhana, Kanpur (U .P.) 208 017 Software Requirement: Matlab-R2015a



Global versus Local Matcher

Most image matching schemes can be categorized as being global or local based on whether the features are extracted from the entire image (or a region of interest) or from a set of local regions. Representative global image features include those based on color, shape, and texture [18]. Global features are typically represented as a fixed length vector, and the matching process simply compares these fixed length vectors, which is very time efficient. On the other hand, a local feature-based approach first detects a set of key points and encodes each of the key points using the surrounding pixel values, resulting in a local key point descriptor [19], [20]. Then, the number of matching key points between two images is used as the match score. Since the number of key points varies depending on the input image, two sets of key points from two different images.

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