

DETECTION APPROACHES TO ANALYSIS EYE PATHOLOGIES: A SURVEY

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ABSTRACT

Authentication and identification purpose for we need security in all over the world today. Biometric provides a promising solutions meeting all demands. Biometrics identification exploits physiological and behavioral physiognomies to authenticate a person’s identity includes iris pattern, facial, palm print etc. Iris is suited for personal identification because of its unique biological properties. In some circumstances iris change with mature and mutilation due to injury or diseases. Impediments in iris recognition affect the structural and textural features. In this paper, we have provided a comprehensive study of various ocular diseases in particular such as exudate, cataract, glaucoma, which affect the retinal structures. Exiting methodology used to diagnosis the ocular diseases are clearly explained and it will be helpful for the iris recognition system.

Keywords—authentication ,security, diseases, iris

I. INTRODUCTION

Biometric verification is the process in which a person can be uniquely identified by evaluating one or more distinguish biological markers either physical characteristics are facial shape, finger print, hand geometry, earlobe geometry, retina and iris patterns, DNA, etc., or behavioral characteristics like voice, signature, typing rhythm, etc. As per the National Research Council, 2010, the conventional human identification systems are “inherently fallible” because they identify people within certain degrees of certainty. Iris structure is not the same throughout the life span. It may get affected structurally and textually due to many reasons.

A. Ocular Diseases analysis

The frequently happening ocular diseases with approximate percentage of diseases occurrence in the iris is shown in of Fig. 1.

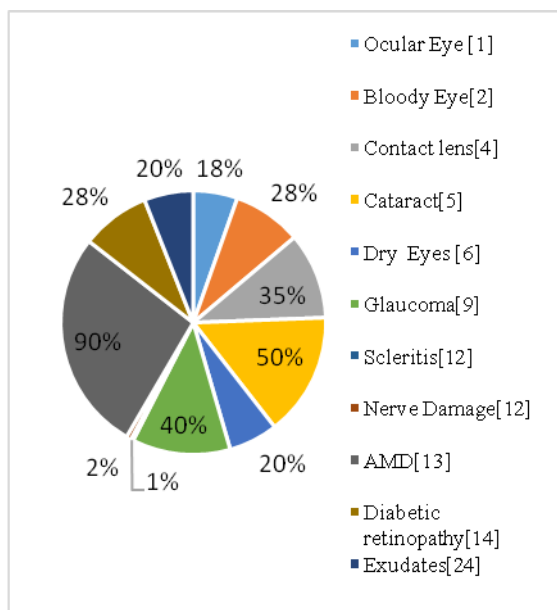


Fig. 1.Ocular diseases analysis

Important factor leading to burning eyes are heavy workload on computer and fatigue. Eye dryness, allergies, eyestrain and eye fatigue are the consequences of this disease and it is clearly exemplified [1]. Wrecked blood vessel in white part of the eye is the symptom for Bloody Eye (Sub-conjunctival Hemorrhage) is illustrated [2]. Bad hygiene and improper care of handling lenses[3] are the main causes of contact lens problems are illuminated [4]. Moisture that leaks from the eyes and dries[6], causing eyelashes to mat together is the sign of eye drainage is expounded [7]. Characteristics of eyelid twitching(eye muscle spasm)is discussed [8]. High intraocular pressure inside eye is a source of glaucoma [9] and its causes are designated [10]. Cataract, iridocyclitis and corneal haze are the causes of eye disorders is described [11]. Leakage of proteins and lipids from the bloodstream into the retina via damaged blood vessels forms exudates[15] and its physiognomies is specified [15]. Gastrointestinal diseases cause structural changes in the iris was discussed [16]. The diseases mentioned above are explained [17]. Performance depends upon several factor such as different pupil dilations, the degradation from equipment, changes in data acquisition procedure is enlightened [18]. Person with an aniridia [19] would find that they could not enroll in an iris biometric system .It is caused by a deletion on chromosome 11. Eye care professional to pay close attention to ocular changes in their diabetic patients so that they can be treated early and effectively is specified [22].

II. Review of Diseases

Due to ocular diseases iris affected due to age, medication and family history. Let us discuss major cause of diseases such as exudate, cataract and glaucoma. Exudate detection methods and merits and demerits are illustrated in section 2.1. Cataracts analysis are given in section 2.2. Glaucoma analysis is given in 2.3.

Table I. Technique followed for diagnosis exudate

Author /Citation	Technique/ Algorithm	Merits	Demerits
Gardner et al., [20]	Back Propagation Neural Network	Detection accuracy is 93.1%.	Sometimes all of the patients were detected during thres hold
Sinthanayothin et al., [21]	RRG (Recursive Region Growing) with 'Moat operator'	Sensitivity is 88.5% Specificity is 99.7%	Difficult to discriminate diabetic retinopathy
Wang et al., [22]	Major depressive disorder (MDD) classifier	Accuracy 100% achieved.	Accuracy drops a little. Specificity is 77 %.
Phillips et al., [23]	Thresholding	It reduces the cost, improves efficiency by 94.8%.	Little exudates result is poor.
Huiqi et al., [24]	Principal component Analysis(PCA) and Modified active Shape model ASM	Sensitivity is 100% Specificity is 71%.	Generalization of models could be improved when large database used.
Usher et al., [25]	RRG, adaptive intensity thresholding (AIT)	It reduces the cost, improves efficiency by 94.8%.	Still human grader may needed for Screening process
Goh et al., [26]	Minimum distance discriminant	Effective method to identify smaller exudates.	Artefacts incorrectly detected images some times.
Ege et al., [27]	Bayesian, Mahalanobis and k-Nearest Neighbour classifier	Mahalanobis best, Sensitivity of exudates is 99%.	Computational cost is high.

B. Cataract Analysis

In 1998 world health report published that 43% of global blindness was caused by cataracts and it is extended up to 47.8% [31]. Proteins inside the lens of aged populace are prone to tie and turn into stiffer to form cloudy spots (cataracts) is discussed [32]. More than 50% of all Americans at the age of 65 or above suffer from age-related cataracts in U.S. [33]. Figure

A. Exudates Analysis

Exudate is symptoms of diseases leading to blindness such as diabetic retinopathy and wet macular degeneration. Table I highlights the features of exudate detection techniques with merits and demerits. Exudate [17] is formed by the leakage of proteins and lipids from the bloodstream into the retina via damaged blood vessels [28]. Iris pattern is the most unfair of facial biometrics. Age, disease and medication are the important factors that affects the textual features in retina [29]. Eye pathology on iris recognition scrutinizes that the exudate could cause iris recognition systems to fail. Failure rates of local and non-local exudates are denoted as 20.3% and 13.8% respectively [30]. 2 shows the percentage of structural changes occur due to cataract formation [39].

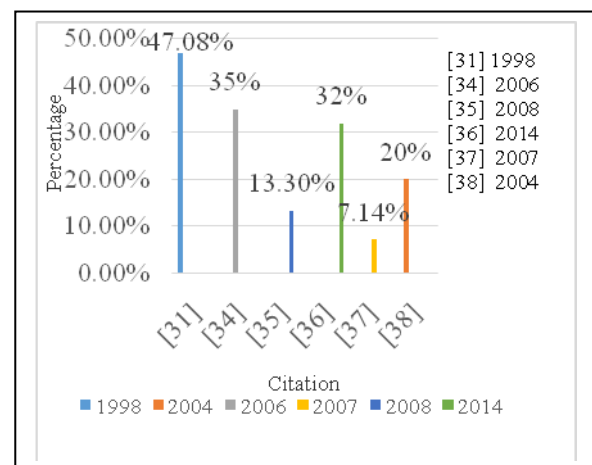


Fig. 2. Percentage of iris changes due to cataract

C. Glaucoma

Glaucoma is an optic nerve disease resulting in the loss of vision. The survey of computer aided diagnosis of ocular diseases is discussed [40]. Macular degeneration due to diabetics is explained in [41]. Segmentation methods used for glaucoma are listed in Table II.

Table II. Segmentation Methods followed for diagnosis glaucoma

Author Citation	Segmentation methods	Localization Method	Merits	Demerits
Walter et al., [42]	Optic Disk detection Centre localization	Brightest Region Identification	Straight forward approach	Fails to localize brightest area
Osareh et al., [43]		Template Matching	It is more efficient due to highest pixel intensity.	Not able to Differentiate artifacts across retina.
Hoover et al., [44]		Pointing vasculature structure	Efficient in term of computational time.	It avoids miss-localization of the optic disk
Kose et al., [45]	Optic Disk Extraction	Morphological Approaches /Thresholding	It improves the accuracy by 90%.	CDR is not factor for large size ONH patients
Kande et al., [46]		Contour Modeling	Template is not needed.	Error during testing occur.
Kim et al., [47]		Shape Approximation Modeling	Reduces the blood vessel occlusion.	Accuracy is poor, due to less number of factors trained.
Nayak et al., [48]	Optic cup Extraction	Morphological Approaches	90% of accuracy achieved.	Segmentation accuracy is less.
Wong [49]		Gradient flow Approaches	84% overlapping score.	Not visible in contrast color image.
Tan [50]	Peripapillary Atrophy (PPA) Detection	Localization	Accuracy is 92%.	Reliability scorer < 0.85
Muramatsu et al., [51]		Extraction	It improves the accuracy by 73%.	Increased disc size, does not indicate glaucoma precisely.
Lee et al., [52]	Retinal Nerve Fibre Layer Defect	OCT/SLP (Scanning Laser Polarimetry)	71% of accuracy achieved.	Only preliminary work are done.

III. Conclusion

Inevitable properties of biometric used to increase as identity of the security system. Biometric is essential for personalities and humanity. Iris recognition is prospective to be at the vanguard of this development and has already been amalgamated in to numerous solicitations. This study show that the compounding aspect of prospective eye pathologies such as exudate, cataract and glaucoma in the population as a whole. Disease characteristics are analyzed for diagnosis. The above such diseases cannot be cured entirely. Diagnosis at the prior stage can help clinicians to treat it consequently and to inhibit the patient prominent to blindness. Further research is required in to impending glitches for eye pathology might cause for the key biometric technology.

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