Handbook Of Iris Recognition

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Mark J. Burge Mark J. Burge Fouad Sabry Nitin Kumar Mahadeo Rajesh M. Bodade Petru Radu Christian Rathgeb Richard Bonner Franjieh El Khoury Christian Rathgeb Ramadan M. Gad Sandra Rae McPherson Renu Sharma Gaganpreet Kaur Helen Zhang Elaine M. Newton Younus Javed Prateek Verma

this authoritative collection introduces the reader to the state of the art in iris recognition technology topics and features with a foreword by the father of iris recognition professor john daugman of cambridge university presents work from an international selection of preeminent researchers reflecting the uses of iris recognition in many different social contexts provides viewpoints from researchers in government industry and academia highlighting how iris recognition is both a thriving industry and an active research area surveys previous developments in the field and covers topics ranging from the low level e g physics of iris image acquisition to the high level e g alternative non daugman approaches to iris matching introduces many active and open areas of research in iris recognition including cross wavelength matching and iris template aging this book is an essential resource for anyone wishing to improve their understanding of iris recognition technology

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what is iris recognition iris recognition is an automated method of biometric identification that uses mathematical pattern recognition techniques on video images of one or both of the irises of an individual s eyes whose complex patterns are unique stable and can be seen from some distance the discriminating powers of all biometric technologies depend on the amount of entropy they are able to encode and use in matching iris recognition is exceptional in this regard enabling the avoidance of collisions even in cross comparisons across massive populations its major limitation is that image acquisition from distances greater than a meter or two or without cooperation can be very difficult however the technology is in development and iris recognition can be accomplished from even up to 10 meters away or in a live camera feed how you will benefit i insights and validations about the following topics chapter 1 iris recognition chapter 2 retinal scan chapter 3 john daugman chapter 4 biometric points chapter 5 eye vein verification chapter 6 biometric device chapter 7 private biometrics chapter 8 aadhaar chapter 9 biometrics in schools

chapter 10 aadhaar act ii answering the public top questions about iris recognition iii real world examples for the usage of iris recognition in many fields who this book is for professionals undergraduate and graduate students enthusiasts hobbyists and those who want to go beyond basic knowledge or information for any kind of iris recognition

this dissertation focuses on iris biometrics although the iris is the most accurate biometric its adoption has been relatively slow conventional iris recognition systems utilize still eye images captured in ideal environments and require highly constrained subject presentation a drop in recognition performance is observed when these constraints are removed as the quality of the data acquired is affected by heterogeneous factors for iris recognition to be widely adopted it can therefore be argued that the image capture must be facilitated and better performance should be achieved in less constrained imaging conditions the research work presented in this dissertation demonstrates how performance in iris recognition systems is improved by adopting avideo based approach the following components have been investigated in this study and presented in relevant publications 1 robust eye extraction method of eye images in face videos captured at a distance and on the move 2 selection of optimal frames in iris videos 3 iris segmentation in less constrained environments 4 an automated method for predicting inaccurate iris segmentation 5 optimization of iris codes for improved recognition the main results and novelties of this work include firstly the development of a fast and accurate method for detecting eye images in face videos secondly this work demonstrates that selection of optimal frames in nir iris videos lead to better recognition performance thirdly an accurate and robust iris segmentation model for eye images captured in uncontrolled conditions is proposed fourthly this research presents a fully automated segmentation evaluation model for detection of in correctly segmented iris images finally a new method for optimization of several iris codes into a single highly optimized iris code is introduced our results and experiments suggest that incorporation of the above methods in traditional iris recognition systems will be useful for the adoption of this technology by a larger community

the book presents three most significant areas in biometrics and pattern recognition a step by step approach for design and implementation of dual tree complex wavelet transform dtcwt plus rotated complex wavelet filters rcwf is discussed in detail in addition to the above the book provides detailed analysis of iris images and two methods of iris segmentation it also discusses simplified study of some subspace based methods and distance measures for iris recognition backed by empirical studies and statistical success verifications

iris biometrics from segmentation to template security provides critical analysis

challenges and solutions on recent iris biometric research topics including image segmentation image compression watermarking advanced comparators template protection and more open source software is also provided on a dedicated website which includes feature extraction segmentation and matching schemes applied in this book to foster scientific exchange current state of the art approaches accompanied by comprehensive experimental evaluations are presented as well this book has been designed as a secondary text book or reference for researchers and advanced level students in computer science and electrical engineering professionals working in this related field will also find this book useful as a reference

in the last few years biometric techniques have proven their ability to provide secure access to shared resources in various domains furthermore software agents and multi agent systems mas have shown their efficiency in resolving critical network problems iris biometric model for secured network access proposes a new model the iriscryptoagentsystem icas which is based on a biometric method for authentication using the iris of the eyes and an asymmetric cryptography method using rivest shamir adleman rsa in an agent based architecture it focuses on the development of new methods in biometric authentication in order to provide greater efficiency in the icas model it also covers the pretopological aspects in the development of the indexed hierarchy to classify drva iris templates the book introduces biometric systems cryptography and multi agent systems mas and explains how they can be used to solve security problems in complex systems examining the growing interest to exploit mas across a range of fields through the integration of various features of agents it also explains how the intersection of biometric systems cryptography and mas can apply to iris recognition for secure network access the book presents the various conventional methods for the localization of external and internal edges of the iris of the eye based on five simulations and details the effectiveness of each it also improves upon existing methods for the localization of the external and internal edges of the iris and for removing the intrusive effects of the eyelids

this book covers iris and periocular recognition a prominent field in biometrics recognition and identity science in the areas of security computing and communications research and technologies selected topics cover a wide spectrum of current research focusing on periocular recognition to augment the biometric performance of the iris in unconstrained environments paving the way for multi spectral biometric recognition on mobile devices divided into three parts this text covers the most recent research and future directions as well as security related topics

biometric systems recognize individuals based on their physical or behavioral traits viz face iris and voice iris the colored annular region around the pupil is one of the most

popular biometric traits due to its uniqueness accuracy and stability however its widespread usage raises security concerns against various adversarial attacks another challenge is to match iris images with other compatible biometric modalities i e face to increase the scope of human identification therefore the focus of this thesis is two fold firstly enhance the security of the iris recognition system by detecting adversarial attacks and secondly accentuate its performance in iris face matching to enhance the security of the iris biometric system we work over two types of adversarial attacks presentation and morph attacks a presentation attack pa occurs when an adversary presents a fake or altered biometric sample plastic eye cosmetic contact lens etc to a biometric system to obfuscate their own identity or impersonate another identity we propose three deep learning based iris pa detection frameworks corresponding to three different imaging modalities namely nir spectrum visible spectrum and optical coherence tomography oct imaging inputting a nir image visible spectrum video and cross sectional oct image respectively the techniques perform effectively to detect known iris pas as well as generalize well across unseen attacks unseen sensors and multiple datasets we also presented the explainability and interpretability of the results from the techniques our other focuses are robustness analysis and continuous update retraining of the trained iris pa detection models another burgeoning security threat to biometric systems is morph attacks a morph attack entails the generation of an image morphed image that embodies multiple different identities typically a biometric image is associated with a single identity in this work we first demonstrate the vulnerability of iris recognition techniques to morph attacks and then develop techniques to detect the morphed iris images the second focus of the thesis is to improve the performance of a cross modal system where iris images are matched against face images cross modality matching involves various challenges such as cross spectral cross resolution cross pose and cross temporal to address these challenges we extract common features present in both images using a multi channel convolutional network and also generate synthetic data to augment insufficient training data using a dual variational autoencoder framework the two focus areas of this thesis improve the acceptance and widespread usage of the iris biometric system

in the present work many methods are combined to build a reliable and fast method for feature extraction in iris recognition system reliable techniques for iris image enhancement and circle detection are used these techniques can then be used to facilitate the further study of the statistics of iris also a program coding with matlab going through all the stages of the iris recognition is built it is helpful to understand the procedures of iris recognition and demonstrate the key issues of iris recognition the hamming distance has been employed for classification of iris templates and two templates have been found to match if a test of statistical independence failed the

system performed with perfect recognition and resulted in false accepts and false reject rates of 0 01 and 0 61 respectively the accuracy of the system is found to be 99 38 therefore iris recognition is reliable and accurate biometric technology

the department of homeland security is deploying the transportation worker identification credential twic to u s ports to help ensure only authorized individuals having undergone background checks have access to secure areas congress mandated the twic have a biometric authenticator dhs chose fingerprints this thesis argues iris scanning is a better choice because of the nature of the maritime environment and because iris scanning is a more accurate biometric this thesis also argues there are social factors affecting a biometric enabled identification card which must be considered for the program to be successful to investigate the issue of biometrics and the twic this thesis performed a field study of an iris scanner a survey of biometric attitudes and interviews with members of the pma and the ilwu the iris study operated the scanner in an identification mode experiencing no false acceptances and few false rejects however it found the scanner sensitive to sun position with respect to the subject the pilot study of attitudes found subjects supportive of biometrics in scenarios currently requiring positive identification but opposing them when it would create new requirements for identification both pilot studies were impacted by an inability to provide an incentive to study subjects

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the iris recognition system utilizes image processing and computer vision in order to identify human beings most effective algorithms are employed to gather suitable patterns from an iris image then mathematical analysis is carried out for collecting required features using efficient image enhancement techniques and feature extraction methodologies the extracted features through six different schemes are compared exhaustively for matching with the iris images of individuals already stored in the database the low cost of development of the proposed iris recognition system encourages its application in majority of the organizations and establishments the experimental work presented in this book provides detailed and critical analysis using three experiments various components of the developed system operate accurately and give an excellent performance in terms of iris recognition accuracy

iris recognition is regarded as the most reliable and accurate biometric identification system available iris recognition system captures an image of an individual s eye the iris in the image is then segmented and normalized for feature extraction process the

performance of iris recognition systems highly depends on segmentation segmentation is used to locate the correct iris region in an eye and it should be done accurately and correctly to remove the eyelids eyelashes reflection and pupil noises present in iris region in our book we are comparing two segmentation methods namely daughman s algorithm and hough transform iris images are selected from the casia database then the iris and pupil boundary are detected from rest of the eye image removing the noises the segmented iris region was normalized to eliminate dimensional inconsistencies between iris regions by using daugman s rubber sheet model a comparative analysis is made of the two methods to find out the better method

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