

Fingerprint Recognition

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1. Introduction

Recognition of persons by means of biometric characteristics is an emerging phenomenon in modern society. It has received more and more attention during the last period due to the need for security in a wide range of applications. Among the many biometric features, the fingerprint is considered one of the most practical ones. Fingerprint recognition requires a minimal effort from the user, does not capture other information than strictly necessary for the recognition process, and provides relatively good performance. Another reason for the popularity of fingerprints is the relatively low price of fingerprint sensors, which enables easy integration into PC keyboards, smart cards and wireless hardware (Maltoni et al., 2009).

Fig. 1 presents a general framework for a general fingerprint identification system (FIS) (Ji & Yi, 2008). Fingerprint matching is the last step in Automatic Fingerprint Identification System (AFIS). Fingerprint matching techniques can be classified into three types:

- Correlation-based matching,
- Minutiae-based matching, and
- Non-Minutiae feature-based matching.

Minutiae-based matching is the most popular and widely used technique, being the basis of the fingerprint comparison.

2. Previous work and motivation

In (Bazen & Gerez, 2003), a novel minutiae matching method is presented that describes elastic distortions in fingerprints by means of a thin-plate spline model, which is estimated using a local and a global matching stage. After registration of the fingerprints according to the estimated model, the number of matching minutiae can be counted using very tight matching thresholds. For deformed fingerprints, the algorithm gives considerably higher matching scores compared to rigid matching algorithms, while only taking 100 ms on a 1 GHz P-III machine. Furthermore, it is shown that the observed deformations are different from those described by theoretical models proposed in the literature.

In (Liang & Asano, 2006), minutia polygons are used to match distorted fingerprints. A minutia polygon describes not only the minutia type and orientation but also the minutia shape. This allows the minutia polygon to be bigger than the conventional tolerance box without losing matching accuracy. In other words, a minutia polygon has a higher ability to

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Handbook of Research on Network Forensics and Analysis Techniques Shrivastava, Gulshan, Kumar, Prabhat, Gupta, B. B., Bala, Suman, Dey, Nilanjan, 2018-04-06 With the rapid advancement in technology myriad new threats have emerged in online environments The broad spectrum of these digital risks requires new and innovative methods for protection against cybercrimes The Handbook of Research on Network Forensics and Analysis Techniques is a current research publication that examines the advancements and growth of forensic research from a relatively obscure tradecraft to an important part of many investigations Featuring coverage on a broad range of topics including cryptocurrency hand based biometrics and cyberterrorism this publication is geared toward professionals computer forensics practitioners engineers researchers and academics seeking relevant research on the development of forensic tools

Innovations in Computer Science and Engineering H. S. Saini, Rishi Sayal, A. Govardhan, Rajkumar Buyya, 2022-03-25 This book features a collection of high quality peer reviewed research papers presented at the 9th International Conference on Innovations in Computer Science Engineering ICICSE 2021 held at Guru Nanak Institutions Hyderabad India on September 3 4 2021 It covers the latest research in data science and analytics cloud computing machine learning data mining big data and analytics information security and privacy wireless and sensor networks and IoT applications artificial intelligence expert systems natural language processing image processing computer vision and artificial neural networks

Multispectral Biometrics David Zhang, Zhenhua Guo, Yazhuo Gong, 2015-09-14 Describing several new biometric technologies such as high resolution fingerprint finger knuckle print multi spectral backhand 3D fingerprint tongueprint 3D ear and multi spectral iris recognition technologies this book analyzes a number of efficient feature extraction matching and fusion algorithms and how potential systems have been developed Focusing on how to develop new biometric technologies based on the requirements of applications and how to design efficient algorithms to deliver better performance the work is based on the author's research with experimental results under different challenging conditions described in the text The book offers a valuable resource for researchers professionals and postgraduate students working in the fields of computer vision pattern recognition biometrics and security applications amongst others

Autonomy of Migration? Stephan Scheel, 2019-03-20 Examining how migrants appropriate mobility in the context of biometric border controls this volume mobilises new analytics and empirics in the debates about the politics of migration and provides an analytically effective and politically significant tool for the study of contemporary migration Drawing from the tension between the EU's attempt to achieve watertight border controls by means of biometric technologies and migrants persistence to move to and live in the EU the volume pursues two interrelated objectives first it studies the encounters between migrants and the Visa Information System VIS one of the largest biometric databases in the world from the perspective of mobility in order to investigate how migrants appropriate mobility via Schengen visa within and against this biometric border regime Second it addresses criticisms of autonomy of migration in

order to develop it as a viable approach for border migration and critical security studies Hence the book is driven by two interrelated research questions what does the assertion of moments of autonomy of migration refer to in the context of border regimes that use biometrics to turn migrants bodies into a means of mobility control And how do migrants appropriate mobility via Schengen visa within and against biometric border regimes This book will be of great interest to scholars in border migration and critical security studies as well as researchers engaged in citizenship studies surveillance studies political theory critical IR theory and international political sociology *Surveillance in Europe* David Wright, Reinhard Kreissl, 2014-09-19 *Surveillance in Europe* is an accessible definitive and comprehensive overview of the rapidly growing multi disciplinary field of surveillance studies in Europe Written by experts in the field including leading scholars the Companion s clear and up to date style will appeal to a wide range of scholars and students in the social sciences arts and humanities This book makes the case for greater resilience in European society in the face of the growing pervasiveness of surveillance It examines surveillance in Europe from several different perspectives including the co evolution of surveillance technologies and practices the surveillance industry in Europe the instrumentality of surveillance for preventing and detecting crime and terrorism social and economic costs impacts of surveillance on civil liberties resilience in Europe s surveillance society the consequences and impacts for Europe of the Snowden revelations findings and recommendations regarding surveillance in Europe *Surveillance in Europe* s interdisciplinary approach and accessible content makes it an ideal companion to academics policy makers and civil society organisations alike as well as appealing to top level undergraduates and postgraduates **Expert Psychological Testimony for the Courts** Mark Costanzo, Daniel Krauss, Kathy Pezdek, 2020-07-24 During the past two decades the frequency and range of expert testimony by psychologists have increased dramatically Courts now routinely hear expert testimony from clinical cognitive developmental and social psychologists *Expert Psychological Testimony for the Courts* provides a comprehensive research based analysis of the content ethics and impact of expert testimony This book features leading scholars who have contributed to the scientific foundation for expert testimony and who have also served as expert witnesses The opening chapter explores issues surrounding the admissibility of expert testimony and the closing chapter explores the ethics and limits of psychological testimony Each of the intervening chapters focuses on a different area of expert testimony forensic identification police interrogations and false confessions eyewitness identification sexual harassment mitigation in capital cases the insanity defense battered women future dangerousness and child custody These chapters describe the typical content of expert testimony in a particular area evaluate the scientific foundation for testimony examine how jurors respond to expert testimony and suggest ways in which legal standards or procedures might be modified in light of psychological research This groundbreaking book should be on the shelf of every social scientist interested in the legal system and every trial attorney who is likely to retain a psychologist as an expert witness It can also serve as a text for advanced courses in psychology legal

studies criminal justice law and sociology **Systems, Signals and Image Processing** Gregor Rozinaj,Radoslav Vargic,2022-03-01 This volume constitutes selected papers presented at the 28th International Conference on Systems Signals and Image Processing IWSSIP 2021 held in Bratislava Slovakia in June 2021 Due to the COVID 19 pandemic the conference was held online The presented 14 full and 5 short papers were thoroughly reviewed and selected from the 76 submissions The papers focus on various aspects of advanced signal processing in different scientific areas including filter design Fourier and other transforms feature extraction machine learning and system adaptation to user oriented products like 5G networks IoT virtual teleport or tele surgery operations Handbook of Research on Computational Forensics, Digital Crime, and Investigation: Methods and Solutions Li, Chang-Tsun,2009-11-30 This book provides a media for advancing research and the development of theory and practice of digital crime prevention and forensics embracing a broad range of digital crime and forensics disciplines Provided by publisher **Biometrics, Crime and Security** Marcus Smith,Monique Mann,Gregor Urbas,2018-01-31 This book addresses the use of biometrics including fingerprint identification DNA identification and facial recognition in the criminal justice system balancing the need to ensure society is protected from harms such as crime and terrorism while also preserving individual rights It offers a comprehensive discussion of biometric identification that includes a consideration of basic scientific principles their historical development the perspectives of political philosophy critical security and surveillance studies but especially the relevant law policy and regulatory issues Developments in key jurisdictions where the technology has been implemented including the United Kingdom United States Europe and Australia are examined This includes case studies relating to the implementation of new technology policy legislation court judgements and where available empirical evaluations of the use of biometrics in criminal justice systems Examples from non western areas of the world are also considered Accessibly written this book will be of interest to undergraduate postgraduate and research students academic researchers as well as professionals in government security legal and private sectors Digital Image Analysis Rama Chellappa,Alexander A. Sawchuk,1985 *Emotion and Stress Recognition Related Sensors and Machine Learning Technologies* Kyandoghere Kyamakya,Fadi Al-Machot,Ahmad Haj Mosa,Hamid Bouchachia,Jean Chamberlain Chedjou,Antoine Bagula,2021-09-01 This book includes impactful chapters which present scientific concepts frameworks architectures and ideas on sensing technologies and machine learning techniques These are relevant in tackling the following challenges i the field readiness and use of intrusive sensor systems and devices for capturing biosignals including EEG sensor systems ECG sensor systems and electrodermal activity sensor systems ii the quality assessment and management of sensor data iii data preprocessing noise filtering and calibration concepts for biosignals iv the field readiness and use of nonintrusive sensor technologies including visual sensors acoustic sensors vibration sensors and piezoelectric sensors v emotion recognition using mobile phones and smartwatches vi body area sensor networks for emotion and stress studies vii the use of experimental datasets in emotion recognition including dataset

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New Trends in Intelligent Information and Database Systems Dariusz Barbuscha,Ngoc Thanh Nguyen,John Batubara,2015-03-22 Intelligent information and database systems are two closely related subfields of modern computer science which have been known for over thirty years They focus on the integration of artificial intelligence and classic database technologies to create the class of next generation information systems The book focuses on new trends in intelligent information and database systems and discusses topics addressed to the foundations and principles of data information and knowledge models methodologies for intelligent information and database systems analysis design and implementation their validation maintenance and evolution They cover a broad spectrum of research topics discussed both from the practical and theoretical points of view such as intelligent information retrieval natural language processing

semantic web social networks machine learning knowledge discovery data mining uncertainty management and reasoning under uncertainty intelligent optimization techniques in information systems security in databases systems and multimedia data analysis Intelligent information systems and their applications in business medicine and industry database systems applications and intelligent internet systems are also presented and discussed in the book The book consists of 38 chapters based on original works presented during the 7th Asian Conference on Intelligent Information and Database Systems ACIIDS 2015 held on 23-25 March 2015 in Bali Indonesia The book is divided into six parts related to Advanced Machine Learning and Data Mining Intelligent Computational Methods in Information Systems Semantic Web Social Networks and Recommendation Systems Cloud Computing and Intelligent Internet Systems Knowledge and Language Processing and Intelligent Information and Database Systems Applications

Biometric Recognition Jianjiang Feng, Junping Zhang, Manhua Liu, Yuchun Fang, 2021-09-09 The LNCS volume 12878 constitutes the proceedings of the 15th Chinese Conference on Biometric Recognition held in Shanghai China in September 2021 The 53 papers presented in this book were carefully reviewed and selected from 72 submissions The papers cover a wide range of topics such as multi-modal biometrics and emerging biometrics hand biometrics facial biometrics and speech biometrics

Handbook of Research on Computational Intelligence for Engineering, Science, and Business Bhattacharyya, Siddhartha, Dutta, Paramartha, 2012-11-30 Using the same strategy for the needs of image processing and pattern recognition scientists and researchers have turned to computational intelligence for better research throughputs and end results applied towards engineering science business and financial applications Handbook of Research on Computational Intelligence for Engineering Science and Business discusses the computation intelligence approaches initiatives and applications in the engineering science and business fields This reference aims to highlight computational intelligence as no longer limited to computing related disciplines and can be applied to any effort which handles complex and meaningful information

Biometric Solutions David D. Zhang, 2012-12-06 Biometric Solutions for Authentication in an E World provides a collection of sixteen chapters containing tutorial articles and new material in a unified manner This includes the basic concepts theories and characteristic features of integrating formulating different facets of biometric solutions for authentication with recent developments and significant applications in an E world This book provides the reader with a basic concept of biometrics an in-depth discussion exploring biometric technologies in various applications in an E world It also includes a detailed description of typical biometric based security systems and up-to-date coverage of how these issues are developed Experts from all over the world demonstrate the various ways this integration can be made to efficiently design methodologies algorithms architectures and implementations for biometric based applications in an E world

Applied Mechanics Reviews, 1987

Biometric Recognition Zhenan Sun, Gongping Yang, Jie Zhou, Yunhong Wang, Yilong Yin, 2013-11-05 This book constitutes the refereed proceedings of the 8th Chinese Conference on Biometric Recognition CCBR 2013 held in Jinan China

in November 2013 The 57 revised full papers presented were carefully reviewed and selected from among 100 submissions The papers address the problems in face fingerprint palm print vein biometrics iris and ocular biometrics behavioral biometrics and other related topics and contribute new ideas to research and development of reliable and practical solutions for biometric authentication

Biometric Recognition Jie Zhou, Yunhong Wang, Zhenan Sun, Zhenhong Jia, Jianjiang Feng, Shiguang Shan, Kurban Ubul, Zenhua Guo, 2018-08-08 The LNCS volume 10996 constitutes the proceedings of the 13th Chinese Conference on Biometric Recognition held in Urumchi China in August 2018 The 79 regular papers presented in this book were carefully reviewed and selected from 112 submissions The papers cover a wide range of topics such as Biometrics Speech recognition Activity recognition and understanding Online handwriting recognition System forensics Multi factor authentication Graphical and visual passwords

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