

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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Cybersecurity Unlocked Bhanu Chander,A. Ravi,A. Santhosh,2025-11-28 As cyber threats grow in sophistication and scale the demand for advanced security knowledge has never been greater This book delivers an in depth examination of critical domains in modern cybersecurity including network security advanced cryptography IoT and cloud security AI and ML in defense strategies next generation threat intelligence and zero knowledge proofs Bridging theory with practice it serves as both an academic reference and a practical guide Researchers will find cutting edge insights for further exploration students will gain a strong foundation enriched with applied perspectives and professionals will access strategies to counter real world security challenges *Biometrics in a Data Driven World* Sinjini Mitra,Mikhail Gofman,2016-12-01 Biometrics in a Data Driven World Trends Technologies and Challenges aims to inform readers about the modern applications of biometrics in the context of a data driven society to familiarize them with the rich history of biometrics and to provide them with a glimpse into the future of biometrics The first section of the book discusses the fundamentals of biometrics and provides an overview of common biometric modalities namely face fingerprints iris and voice It also discusses the history of the field and provides an overview of emerging trends and opportunities The second section of the book introduces readers to a wide range of biometric applications The next part of the book is dedicated to the discussion of case studies of biometric modalities currently used on mobile applications As smartphones and tablet computers are rapidly becoming the dominant consumer computer platforms biometrics based authentication is emerging as an integral part of protecting mobile devices against unauthorized access while enabling new and highly popular applications such as secure online payment authorization The book concludes with a discussion of future trends and opportunities in the field of biometrics which will pave the way for advancing research in the area of biometrics and for the deployment of biometric technologies in real world applications The book is designed for individuals interested in exploring the contemporary applications of biometrics from students to researchers and practitioners working in this field Both undergraduate and graduate students enrolled in college level security courses will also find this book to be an especially useful companion *Digital Image Security* Amit Kumar Singh,Stefano Berretti,Ashima Anand,Amrit Kumar Agrawal,2024-05-14 This book will highlight cutting edge research with a particular emphasis on interdisciplinary approaches novel techniques and solutions to provide digital image security for applications in diverse areas It further discusses important topics such as biometric imaging big data security and privacy in healthcare security and privacy in the internet of things and security in cloud based image processing This book Presents new ideas approaches theories and practices with a focus on digital image security and privacy solutions for real world applications Discusses security in cloud based image processing for smart city applications Provides an overview of innovative security techniques that are being developed to ensure the guaranteed authenticity of transmitted shared or stored digital images Highlights approaches such as watermarking blockchain and hashing to secure digital images in

artificial intelligence machine learning cloud computing and temper detection environments Explains important topics such as biometric imaging blockchain for digital data security and protection systems against personal identity theft It will serve as an ideal reference text for senior undergraduate graduate students academic researchers and professionals in the fields including electrical engineering electronics communications engineering and computer engineering *Advanced Image Processing Techniques and Applications* Kumar, N. Suresh,Sangaiah, Arun Kumar,Arun, M.,Anand, S.,2017-02-10 Today the scope of image processing and recognition has broadened due to the gap in scientific visualization Thus new imaging techniques have developed and it is imperative to study this progression for optimal utilization Advanced Image Processing Techniques and Applications is an essential reference publication for the latest research on digital image processing advancements Featuring expansive coverage on a broad range of topics and perspectives such as image and video steganography pattern recognition and artificial vision this publication is ideally designed for scientists professionals researchers and academicians seeking current research on solutions for new challenges in image processing The Promise of New Technologies in an Age of New Health Challenges A.J. Maeder,K. Ho,A. Marcelo,2016-11-24 There is a changed emphasis in many health services with conventional pressures such as budget and workforce constraints combined with the indirect forces of social change and strategic direction bringing about the need for more flexible approaches for the longer term By enabling different care models and delivery channels telehealth offers demonstrably effective and sustainable solutions for issues such as access to and quality of care This book presents 18 papers delivered at the 5th Global Telehealth Conference held in Auckland New Zealand in November 2016 The theme chosen for Global Telehealth 2016 is The Promise of New Technologies in an Age of New Health Challenges and the papers included here cover a wide variety of topics from theoretical and abstract contributions through to discussions of practical projects and highly specific applied contributions The book also includes two invited papers which detail recent contributions to two global issues in which telehealth plays a major role universal health coverage and personal health monitoring With papers ranging in scope from computer assisted screening technology for diabetic retinopathy to behavior change through computer games this book will be of interest to all those involved in the design and provision of healthcare services **Handbook of Research on Social and Organizational Liabilities in Information Security** Gupta, Manish,Sharman, Raj,2008-12-31 This book offers insightful articles on the most salient contemporary issues of managing social and human aspects of information security Provided by publisher **Behavioral Biometrics for Human Identification: Intelligent Applications** Wang, Liang,Geng, Xin,2009-08-31 This edited book provides researchers and practitioners a comprehensive understanding of the start of the art of behavioral biometrics techniques potential applications successful practice and available resources Provided by publisher *Handbook of Research on Intelligent Data Processing and Information Security Systems* Bilan, Stepan Mykolayovych,Al-Zoubi, Saleem Issa,2019-11-29 Intelligent technologies have emerged as imperative tools in computer

science and information security However advanced computing practices have preceded new methods of attacks on the storage and transmission of data Developing approaches such as image processing and pattern recognition are susceptible to breaches in security Modern protection methods for these innovative techniques require additional research The Handbook of Research on Intelligent Data Processing and Information Security Systems provides emerging research exploring the theoretical and practical aspects of cyber protection and applications within computer science and telecommunications Special attention is paid to data encryption steganography image processing and recognition and it targets professionals who want to improve their knowledge in order to increase strategic capabilities and organizational effectiveness As such this book is ideal for analysts programmers computer engineers software engineers mathematicians data scientists developers IT specialists academicians researchers and students within fields of information technology information security robotics artificial intelligence image processing computer science and telecommunications

Applied Artificial Intelligence Swati V. Shinde, Varsha Bendre, D. Jude Hemanth, M.A. Balafar, 2023-09-29 This book explores the advancements and future challenges in biomedical application developments using breakthrough technologies like Artificial Intelligence AI Internet of Things IoT and Signal Processing It will also contribute to biosensors and secure systems and related research Applied Artificial Intelligence A Biomedical Perspective begins by detailing recent trends and challenges of applied artificial intelligence in biomedical systems Part I of the book presents the technological background of the book in terms of applied artificial intelligence in the biomedical domain Part II demonstrates the recent advancements in automated medical image analysis that have opened ample research opportunities in the applications of deep learning to different diseases Part III focuses on the use of cyberphysical systems that facilitates computing anywhere by using medical IoT and biosensors and the numerous applications of this technology in the healthcare domain Part IV describes the different signal processing applications in the healthcare domain It also includes the prediction of some human diseases based on the inputs in signal format Part V highlights the scope and applications of biosensors and security aspects of biomedical images The book will be beneficial to the researchers industry persons faculty and students working in biomedical applications of computer science and electronics engineering It will also be a useful resource for teaching courses like AI ML medical IoT signal processing biomedical engineering and medical image analysis

Leveraging Computer Vision to Biometric Applications Arvind Selwal, Deepika Sharma, Mukesh Mann, Sudeshna Chakraborty, Valentina E. Balas, Ouh Eng Lieh, 2024-10-07 Computer vision is an effective solution in a diverse range of real life applications With the advent of the machine and deep learning paradigms this book adopts machine and deep learning algorithms to leverage digital image processing for designing accurate biometrical applications In this aspect it presents the advancements made in computer vision to biometric applications design approach using emerging technologies It discusses the challenges of designing efficient and accurate biometric based systems which is a key issue that can be tackled via computer vision based techniques Key Features

Discusses real life applications of emerging techniques in computer vision systems Offers solutions on real time computer vision and biometrics applications to cater to the needs of current industry Presents case studies to offer ideas for developing new biometrics based products Offers problem based solutions in the field computer vision and real time biometric applications for secured human authentication Works as a ready resource for professionals and scholars working on emerging topics of computer vision for biometrics The book is for academic researchers scholars and students in Computer Science Information Technology Electronics and Electrical Engineering Mechanical Engineering management academicians researchers scientists and industry people working on computer vision and biometrics applications

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