

DWT, DCT and SVD based Digital Image Watermarking

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Abstract: With the rapid development of multimedia and computer technology, images, audio, text and video can be more easily produced, processed as well as stored by digital devices in recent years. To conceal data in transmitting message for preventing the illegal copying or to protect the secret is very important. Data encryption and information hiding schemes are developed to protect the secret data. In this paper, digital image watermarking algorithm based on DWT, DCT and SVD has been proposed in which Arnold transform has been applied to watermark image in order to ensure the watermark robustness. Experimental results show the algorithm is robust to the common image process such as JPEG compression and other attacks like noise and filters.

Keywords: DCT, DWT, SVD, PSNR, MSE, NC.

I. INTRODUCTION

Since Internet is a public transmission way and it is widely applied in many applications, we can send and receive digital data, such as images, by connected networks, with the recent growth of communication technologies. At the end of the 20th century, information network technology was widely used all over the world and it was greatly convenient for resource sharing and exchange between people. However, it was followed by many serious problems. However, many new issues such as security of digital information transmission and copyright protection of digital products also emerge in the meantime. How to prevent digital products from copyright infringement, piracy and alteration without permission have become many nations' concerns needing to be resolved urgently. Data encryption methods make the secret data into meaningless bits. On the other hand, information hiding techniques hides the message into a meaningful multimedia data.

Watermarking is the process of embedding data into a multimedia element such as an image, audio or video file for the purpose of authentication. This embedded data can later be extracted from, or detected in, the multimedia for security purposes. A watermarking algorithm consists of the watermark structure, an embedding algorithm, and an extraction or detection algorithm. Watermarks can be embedded in the pixel domain or a transform domain. In multimedia

applications, embedded watermarks should be invisible, robust, and have a high capacity. In the classification of watermarking schemes, an important criterion is the type of information needed by the detector. The requirements for digital watermarks in these scenarios are different, in general. Identification of the origin of content requires the embedding of a single watermark into the content at the source of distribution. To trace illegal copies, a unique watermark is needed based on the location or identity of the recipient in the multimedia network. In both of these applications, non-blind schemes are appropriate as watermark extraction or detection needs to take place in special laboratory environment only when there is a dispute regarding the ownership of content.

II. NEED OF WATERMARKING

Watermarking methods are based on the human visual system in which it cannot be recognized due to tiny difference. In these techniques, the cover-image is used to hide the secret information and the stego-image is the cover-image with the secret data embedded inside. It hides the secret information in general files secretly first and then transmits these files through network, because they look the same as general files, they can escape from the attention of illegal interceptors easily and therefore the secret information is not easy to be attacked.

III. WORKING DOMAINS

Currently, there are two most popular digital watermarking technologies including the Methods in Time Domain and Methods in Transformation Domain. Methods in the former one can be implemented more simply, but the robustness is poorer, while methods in the latter one are more popular with their stronger anti-attack functions. The typical Transformation-Domain Methods are mostly based on the domain of Discrete Fourier Transform (DFT), Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT), etc. Recently, some researchers began to make use of Singular Value Decomposition (SVD) to embed a watermark[1]. SVD is a compression technique that can be used in a wide range of applications where data may be organized in a matrix representation. With the increasing use of SVD, the digital watermarking

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Dwt Dct And Svd Based Digital Image Watermarking:

Medical Image Watermarking Amit Kumar Singh,Basant Kumar,Ghanshyam Singh,Anand Mohan,2017-08-11 This book presents medical image watermarking techniques and algorithms for telemedicine and other emerging applications This book emphasizes on medical image watermarking to ensure the authenticity of transmitted medical information It begins with an introduction of digital watermarking important characteristics novel applications different watermarking attacks and standard benchmark tools This book also covers spatial and transform domain medical image watermarking techniques and their merits and limitations The authors have developed improved novel watermarking techniques for telemedicine applications that offer higher robustness better perceptual quality and increased embedding capacity and secure watermark The suggested methods may find potential applications in the prevention of patient identity theft and health data management issues which is a growing concern in telemedicine applications This book provides a sound platform for understanding the medical image watermarking paradigm for researchers in the field and advanced level students Industry professionals working in this field as well as other emerging applications demanding robust and secure watermarking will find this book useful as a reference Internet of Things and Connected Technologies Rajiv Misra,Nishtha

Kesswani,Muttukrishnan Rajarajan,Veeravalli Bharadwaj,Ashok Patel,2021-05-29 This book presents the recent research adoption of a variety of enabling wireless communication technologies like RFID tags BLE ZigBee etc and embedded sensor and actuator nodes and various protocols like CoAP MQTT DNS etc that has made Internet of things IoT to step out of its infancy to become smart things Now smart sensors can collaborate directly with the machine without human involvement to automate decision making or to control a task Smart technologies including green electronics green radios fuzzy neural approaches and intelligent signal processing techniques play important roles in the developments of the wearable healthcare systems In the proceedings of 5th International Conference on Internet of Things and Connected Technologies ICIoTCT 2020 brought out research works on the advances in the Internet of things IoT and connected technologies various protocols standards etc This conference aimed at providing a forum to discuss the recent advances in enabling technologies and applications for IoT *6th EAI International Conference on Big Data Innovation for Sustainable Cognitive Computing*

Anandakumar Haldorai,Arulmurugan Ramu,Sudha Mohanram,2024-05-30 This book features the proceedings of the 6th EAI International Conference on Big Data Innovation for Sustainable Cognitive Computing BDCC 2023 The papers feature detail on cognitive computing and its self learning systems that use data mining pattern recognition and natural language processing NLP to mirror the way the human brain works This international conference focuses on technologies from knowledge representation techniques and natural language processing algorithms to dynamic learning approaches Topics covered include Data Science for Cognitive Analysis Real Time Ubiquitous Data Science Platform for Privacy Preserving Data Science and Internet Based Cognitive Platform **Image and Signal Processing** Alamin Mansouri,Fathallah

Nouboud,Alain Chalifour,Driss Mammass,Jean Meunier,Abderrahim El Moataz,2016-05-06 This book constitutes the refereed proceedings of the 7th International Conference ICISP 2016 held in May June 2016 in Trois Rivières QC Canada The 40 revised full papers were carefully reviewed and selected from 83 submissions The contributions are organized in topical sections on features extraction computer vision and pattern recognition multispectral and color imaging image filtering segmentation and super resolution signal processing biomedical imaging geoscience and remote sensing watermarking authentication and coding and 3d acquisition processing and applications

Computational Vision and Robotics Ishwar K. Sethi,2015-01-03 Computer Vision and Robotics is one of the most challenging areas of 21st century Its application ranges from Agriculture to Medicine Household applications to Humanoid Deep sea application to Space application and Industry applications to Man less plant Today's technologies demand to produce intelligent machine which are enabling applications in various domains and services Robotics is one such area which encompasses number of technology in it and its application is widespread Computational vision or Machine vision is one of the most challenging tools for the robot to make it intelligent This volume covers chapters from various areas of Computational Vision such as Image and Video Coding and Analysis Image Watermarking Noise Reduction and Cancellation Block Matching and Motion Estimation Tracking of Deformable Object using Steerable Pyramid Wavelet Transformation Medical Image Fusion CT and MRI Image Fusion based on Stationary Wavelet Transform The book also covers articles from applications of soft computing techniques such as Target Searching and Tracking using Particle Swarm Optimization PSO based Functional Artificial Neural Network etc The book also covers article from the areas of Robotics such as Solar Power Robot Vehicle Multi Robot Area Exploration Intelligent Driving System based on Video Sequencing Emotion Recognition using MLP Network Identifying the Unstructured Environment

Communication, Devices, and Computing Jaydeb Bhaumik,Indrajit Chakrabarti,Bishnu Prasad De,Banibrata Bag,Surajit Mukherjee,2018-04-07 This book provides insights into the First International Conference on Communication Devices and Computing ICCDC 2017 which was held in Haldia India on November 2-3 2017 It covers new ideas applications and the experiences of research engineers scientists industrialists scholars and students from around the globe The proceedings highlight cutting edge research on communication electronic devices and computing and address diverse areas such as 5G communication spread spectrum systems wireless sensor networks signal processing for secure communication error control coding printed antennas analysis of wireless networks antenna array systems analog and digital signal processing for communication systems frequency selective surfaces radar communication and substrate integrated waveguide and microwave passive components which are key to state of the art innovations in communication technologies

Communication and Computing Systems B.M.K. Prasad,Krishna Kant Singh,Neelam Ruhil,Karan Singh,Richard O'Kennedy,2017-02-15 This book is a collection of accepted papers that were presented at the International Conference on Communication and Computing Systems ICCCS 2016 Dronacharya College of Engineering Gurgaon September 9-11 2016

The purpose of the conference was to provide a platform for interaction between scientists from industry academia and other areas of society to discuss the current advancements in the field of communication and computing systems The papers submitted to the proceedings were peer reviewed by 2 3 expert referees This volume contains 5 main subject areas 1 Signal and Image Processing 2 Communication Computer Networks 3 Soft Computing Intelligent System Machine Vision and Artificial Neural Network 4 VLSI Embedded System 5 Software Engineering and Emerging Technologies *Soft Computing: Theories and Applications* Millie Pant, Kanad Ray, Tarun K. Sharma, Sanyog Rawat, Anirban Bandyopadhyay, 2017-11-23 This book focuses on soft computing and its applications to solve real life problems occurring in different domains ranging from medical and health care supply chain management and image processing to cryptanalysis It presents the proceedings of International Conference on Soft Computing Theories and Applications SoCTA 2016 offering significant insights into soft computing for teachers and researchers and inspiring more and more researchers to work in the field of soft computing The term soft computing represents an umbrella term for computational techniques like fuzzy logic neural networks and nature inspired algorithms In the past few decades there has been an exponential rise in the application of soft computing techniques for solving complex and intricate problems arising in different spheres of life The versatility of these techniques has made them a favorite among scientists and researchers working in diverse areas SoCTA is the first international conference being organized at Amity University Rajasthan AUR Jaipur The objective of SoCTA 2016 is to provide a common platform to researchers academicians scientists and industrialists working in the area of soft computing to share and exchange their views and ideas on the theory and application of soft computing techniques in multi disciplinary areas The aim of the conference is to bring together young and experienced researchers academicians scientists and industrialists for the exchange of knowledge SoCTA especially encourages the young researchers at the beginning of their career to participate in this conference and present their work on this platform **Techno-Societal 2016** Prashant M. Pawar, Babruvahan P. Ronge, R. Balasubramaniam, Sridevi Seshabhattachar, 2017-06-16 This volume originates from the proceedings of a multidisciplinary conference Techno Societal 2016 in Maharashtra India that brings together faculty members of various engineering colleges to solve Indian regional relevant problems under the guidance of eminent researchers from various reputed organizations The focus is on technologies that help develop and improve society in particular on issues such as the betterment of differently abled people environment impact livelihood rural employment agriculture healthcare energy transport sanitation water education This conference aims to help innovators to share their best practices or products developed to solve specific local problems which in turn may help the other researchers to take inspiration to solve problems in their region On the other hand technologies proposed by expert researchers may find applications in different regions This back and forth process for local global interaction will help in solving local problems by global approach and help in solving global problems by improving local conditions Intelligent Techniques in Signal

Processing for Multimedia Security Nilanjan Dey,V. Santhi,2016-10-18 This book proposes new algorithms to ensure secured communications and prevent unauthorized data exchange in secured multimedia systems Focusing on numerous applications algorithms and scenarios it offers an in depth analysis of data hiding technologies including watermarking cryptography encryption copy control and authentication The authors present a framework for visual data hiding technologies that resolves emerging problems of modern multimedia applications in several contexts including the medical healthcare education and wireless communication networking domains Further it introduces several intelligent security techniques with real time implementation As part of its comprehensive coverage the book discusses contemporary multimedia authentication and fingerprinting techniques while also proposing personal authentication recognition systems based on hand images surveillance system security using gait recognition face recognition under restricted constraints such as dry wet face conditions and three dimensional face identification using the approach developed here This book equips perception technology professionals with the latest technologies techniques and strategies for multimedia security systems offering a valuable resource for engineers and researchers working to develop security systems

Exploring Security in Software Architecture and Design Felderer, Michael,Scandariato, Riccardo,2019-01-25 Cyber attacks continue to rise as more individuals rely on storing personal information on networks Even though these networks are continuously checked and secured cybercriminals find new strategies to break through these protections Thus advanced security systems rather than simple security patches need to be designed and developed Exploring Security in Software Architecture and Design is an essential reference source that discusses the development of security aware software systems that are built into every phase of the software architecture Featuring research on topics such as migration techniques service based software and building security this book is ideally designed for computer and software engineers ICT specialists researchers academicians and field experts

Intelligent Wavelet Based Techniques for Advanced Multimedia Applications Rajiv Singh,Swati Nigam,Amit Kumar Singh,Mohamed Elhoseny,2020-02-27 This book contains high quality research articles and reviews that promote research and reflect the most recent advances in intelligent wavelet based techniques for advanced multimedia applications as well as other emerging areas In recent time wavelet transforms have become useful in many signal image and video processing applications especially for multimedia security and surveillance A few applications of wavelets in security and surveillance are watermarking fusion steganography object detection tracking motion recognition and intention recognition etc Wavelets are well capable of analyzing signal image and video at different resolution levels popularly known as multiresolution analysis The multiresolution analysis is advantageous in multimedia security and surveillance applications It provides flexibility in selection of different resolution levels that leads to better accuracy Furthermore recently sparse representation has become an advancement to analyze wavelet coefficients It is observed that wavelet transforms possess the invariance property which makes them suitable for many vision applications This book provides a concise overview of the

current state of the art and disseminates some of the novel and exciting ideas and techniques In addition it is also helpful for the senior undergraduate and graduate students researcher academicians IT professional and providers citizens customers as well as policy makers working in this area as well as other emerging applications demanding state of the art wavelet based multimedia applications

Blockchain for Information Security and Privacy Udai Pratap Rao,Piyush Kumar Shukla,Chandan Trivedi,Sweta Gupta,Zelalem Sintayehu Shibeshi,2021-11-30 Distributed and peer to peer P2P applications are increasing daily and cyberattacks are constantly adopting new mechanisms to threaten the security and privacy of users in these Internet of Things IoT environments Blockchain a decentralized cryptographic based technology is a promising element for IoT security in manufacturing finance healthcare supply chain identity management e governance defence education banking and trading Blockchain has the potential to secure IoT through repetition changeless capacity and encryption Blockchain for Information Security and Privacy provides essential knowledge of blockchain usage in the mainstream areas of security trust and privacy in decentralized domains This book is a source of technical information regarding blockchain oriented software and applications It provides tools to researchers and developers in both computing and software engineering to develop solutions and automated systems that can promote security trust and privacy in cyberspace

FEATURES Applying blockchain based secured data management in confidential cyberdefense applications Securing online voting systems using blockchain Safeguarding electronic healthcare record EHR management using blockchain Impacting security and privacy in digital identity management Using blockchain based security and privacy for smart contracts By providing an overview of blockchain technology application domains in IoT e g vehicle web power web cloud internet and edge computing this book features side by side comparisons of modern methods toward secure and privacy preserving blockchain technology It also examines safety objectives efficiency limitations computational complexity and communication overhead of various applications using blockchain This book also addresses the combination of blockchain and industrial IoT It explores novel various levels of information sharing systems

Innovation in Medicine and Healthcare Yen-Wei Chen,Satoshi Tanaka,Robert J. Howlett,Lakhmi C. Jain,2025-03-06 This book presents the proceedings of the KES International Conferences on Innovation in Medicine and Healthcare KES InMed 24 held in Madeira Portugal on June 19 21 2024 Covering a number of key areas including digital IT architecture in healthcare advanced ICT for medicine and healthcare biomedical engineering trends research and technologies and healthcare support systems this book is a valuable resource for researchers managers industrialists and anyone wishing to gain an overview of the latest research in these fields

Digital Image Watermarking Surekha Borra,Rohit Thanki,Nilanjan Dey,2018-12-07 The Book presents an overview of newly developed watermarking techniques in various independent and hybrid domains Covers the basics of digital watermarking its types domain in which it is implemented and the application of machine learning algorithms onto digital watermarking Reviews hardware implementation of watermarking Discusses optimization problems and solutions in watermarking with a

special focus on bio inspired algorithms Includes a case study along with its MATLAB code and simulation results

Cyberspace Safety and Security Jaideep Vaidya,Xiao Zhang,Jin Li,2020-01-03 The two volumes LNCS 11982 and 11983 constitute the proceedings of the 11th International Symposium on Cyberspace Safety and Security CSS 2019 held in Guangzhou China in December 2019 The 61 full papers and 40 short papers presented were carefully reviewed and selected from 235 submissions The papers cover a broad range of topics in the field of cyberspace safety and security such as authentication access control availability integrity privacy confidentiality dependability and sustainability issues of cyberspace They are organized in the following topical sections network security system security information security privacy preservation machine learning and security cyberspace safety big data and security and cloud and security

Symmetry-Adapted Machine Learning for Information Security James (Jong Hyuk) Park,2020-12-15 Symmetry adapted machine learning has shown encouraging ability to mitigate the security risks in information and communication technology ICT systems It is a subset of artificial intelligence AI that relies on the principles of processing future events by learning past events or historical data The autonomous nature of symmetry adapted machine learning supports effective data processing and analysis for security detection in ICT systems without the interference of human authorities Many industries are developing machine learning adapted solutions to support security for smart hardware distributed computing and the cloud In our Special Issue book we focus on the deployment of symmetry adapted machine learning for information security in various application areas This security approach can support effective methods to handle the dynamic nature of security attacks by extraction and analysis of data to identify hidden patterns of data The main topics of this Issue include malware classification an intrusion detection system image watermarking color image watermarking battlefield target aggregation behavior recognition model IP camera Internet of Things IoT security service function chain indoor positioning system and crypto analysis

Recent Trends in Information and Communication Technology Faisal Saeed,Nadhmi Gazem,Srikanta Patnaik,Ali Saleh Saed Balaid,Fathey Mohammed,2017-05-24 This book presents 94 papers from the 2nd International Conference of Reliable Information and Communication Technology 2017 IRICT 2017 held in Johor Malaysia on April 23 24 2017 Focusing on the latest ICT innovations for data engineering the book presents several hot research topics including advances in big data analysis techniques and applications mobile networks applications and usability reliable communication systems advances in computer vision artificial intelligence and soft computing reliable health informatics and cloud computing environments e learning acceptance models recent trends in knowledge management and software engineering security issues in the cyber world as well as society and information technology

Emerging Technologies for Computing, Communication and Smart Cities Pradeep Kumar Singh,Maheshkumar H. Kolekar,Sudeep

Tanwar,Sławomir T. Wierzchoń,Raj K. Bhatnagar,2022-04-21 This book presents best selected papers presented at the Second International Conference on Emerging Technologies for Computing Communication and Smart Cities ETCCS 2021

held on 21-22 August 2021 at BFCET Punjab India. IEI India members supported externally. It is co-organized by Southern Federal University, Russia; University of Jan Wykowski, UJW Polkowice, Poland; SD College of Engineering Technology, Muzaffarnagar, India, as an academic partner; and CSI India for technical support. The book includes current research works in the areas of network and computing technologies, wireless networks, and Internet of Things (IoT), futuristic computing technologies, communication technologies, security, and privacy.

International Advanced Researches & Engineering Congress 2017 Proceeding Book Recep HALICIOGLU, Hediye KIRLI AKIN, Yusuf FEDAI, 2017-12-29. INTERNATIONAL WORKSHOPS at IAREC 17. This book includes English main and Turkish languages. International Workshop on Mechanical Engineering, International Workshop on Mechatronics Engineering, International Workshop on Energy Systems Engineering, International Workshop on Automotive Engineering and Aerospace Engineering, International Workshop on Material Engineering, International Workshop on Manufacturing Engineering, International Workshop on Physics Engineering, International Workshop on Electrical and Electronics Engineering, International Workshop on Computer Engineering and Software Engineering, International Workshop on Chemical Engineering, International Workshop on Textile Engineering, International Workshop on Architecture, International Workshop on Civil Engineering, International Workshop on Geomatics Engineering, International Workshop on Industrial Engineering, International Workshop on Food Engineering, International Workshop on Aquaculture Engineering, International Workshop on Agriculture Engineering, International Workshop on Mathematics Engineering, International Workshop on Bioengineering Engineering, International Workshop on Biomedical Engineering, International Workshop on Genetic Engineering, International Workshop on Environmental Engineering, International Workshop on Other Engineering Science.

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