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ROBUST INVISIBLE QR CODE IMAGE WATERMARKING IN DWT DOMAIN

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ABSTRACT: Quick Response (QR) code is 2d code and widely used in magazine advertisement, product packet, museum, and tour tickets. It has high data capacity compare to 1d code. The invisible QR code is watermarked via popular wavelet transform algorithm in images. The results show that the proposed method is robust and tested against attacks.

KEYWORDS: QR code, watermarking, Wavelets.

I. INTRODUCTION

In this modern era mobile and wireless technology is taking over all fields of life. They are more than a communication device: they act as your PC, music player, your bank, your shopping area and more [1]. In near future the smart glasses like google glass are going to replace the current hand held devices which make to overlay the physical world with a digital layer of tags, ads, maps etc [2].

In current smart phone scenario, one of the important technology used to connect the physical world to internet or digital world using smart phone, is QR codes. They are used mainly for marketing and commerce but their applications are numerous including virtual marketing, virtual maps, QRpedia etc. We are making the QR code as invisible watermark in image using digital watermarking technology. Other alternatives proposed were marking QR code in invisible ink which is only visible with Ultraviolet [3], QR transparent stickers etc.

The main challenge in making invisible QR code is the detector part. Since the detection is expected to be done in smart phone which has slower processors, the detection must be very simple with very little processing required before passing information to QR reader. Here we implement and simulate the QR encoder and decoder in MATLAB to study the effectiveness of algorithm. This paper uses watermarking scheme in wavelet domain where multiple copies of QR code is inserted into low frequency components of host image. Since the data requires no secrecy compared to existing watermarking schemes, public watermarking technique is used [4] [5] [6].

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[Invisible Watermarking Matlab Source Code](#)

I. Jeena Jacob,Selwyn Piramuthu,Przemyslaw Falkowski-Gilski

Invisible Watermarking Matlab Source Code:

Digital Watermarking Mauro Barni,2005-08-30 This book constitutes the refereed proceedings of the 4th International Workshop on Digital Watermarking Secure Data Management IWDW 2005 held in Siena Italy in September 2005 The 31 revised full papers presented were carefully reviewed and selected from 74 submissions The papers are organized in topical sections on steganography and steganalysis fingerprinting watermarking attacks watermarking security watermarking of unconventional media channel coding and watermarking theory and applications **Integrated Technologies in Electrical, Electronics and Biotechnology Engineering** Gaurav Aggarwal,Ashutosh Tripathi,Himani Goyal Sharma,Tripti Sharma,Rishabh Dev Shukla,2025-03-31 The conference was aimed to bring researchers practicing engineers faculty members and students from across the globe to a common platform to share their research ideas that would pave way to attain solution to various real time problems Many eminent researchers from different countries participated and interacted with the young students and budding researchers from various institutions The objective of this conference was to connect with junior and senior scholars working with educational architecture of the past present or future in the area of Semiconductor Devices Electronic Circuit Design Machine Vision Signal Processing Communication Technologies and Systems Electromagnetic RF Microwave Wearable Technology Nano Technologies IC Fabrication Biotechnology Automation Robotics Electrical Machines and Adjustable Speed Drives Renewable Energy Sources Smart grids Technologies Applications Key features included keynote presentations from renowned experts paper presentations showcasing novel research interactive panel discussions and exploring practical applications of emerging technologies **Intelligent Computing Systems and Applications** Sivaji Bandyopadhyay,Valentina Emilia Balas,Saroj Kumar Biswas,Anish Kumar Saha,Dalton Meitei Thounaojam,2024-09-19 The book includes peer reviewed papers presented at the 2nd International Conference on Intelligent Computing Systems and Applications ICICSA 2023 The book discusses the most recent advances in artificial intelligence machine learning data science natural language processing computer vision image processing embedded systems robotics IoT computer networking and communications optimization security and cryptography among other topics It also discusses several application areas and modeling methodologies in many fields This book will be useful for researchers and academics working in relevant fields **Applied Signal Processing** Thierry Dutoit,Ferran Marques,2010-06-10 Applied Signal Processing A MATLAB Based Proof of Concept benefits readers by including the teaching background of experts in various applied signal processing fields and presenting them in a project oriented framework Unlike many other MATLAB based textbooks which only use MATLAB to illustrate theoretical aspects this book provides fully commented MATLAB code for working proofs of concept The MATLAB code provided on the accompanying online files is the very heart of the material In addition each chapter offers a functional introduction to the theory required to understand the code as well as a formatted presentation of the contents and outputs of the MATLAB code Each chapter exposes how digital signal

processing is applied for solving a real engineering problem used in a consumer product The chapters are organized with a description of the problem in its applicative context and a functional review of the theory related to its solution appearing first Equations are only used for a precise description of the problem and its final solutions Then a step by step MATLAB based proof of concept with full code graphs and comments follows The solutions are simple enough for readers with general signal processing background to understand and they use state of the art signal processing principles Applied Signal Processing A MATLAB Based Proof of Concept is an ideal companion for most signal processing course books It can be used for preparing student labs and projects **Digital Watermarking** ,2005 **Data Intelligence and Cognitive Informatics** I. Jeena Jacob,Selwyn Piramuthu,Przemyslaw Falkowski-Gilski,2024-01-06 The book is a collection of peer reviewed best selected research papers presented at the International Conference on Data Intelligence and Cognitive Informatics ICDICI 2023 organized by SCAD College of Engineering and Technology Tirunelveli India during June 27 28 2023 This book discusses new cognitive informatics tools algorithms and methods that mimic the mechanisms of the human brain which lead to an impending revolution in understating a large amount of data generated by various smart applications The book includes novel work in data intelligence domain which combines with the increasing efforts of artificial intelligence machine learning deep learning and cognitive science to study and develop a deeper understanding of the information processing systems   Multidisciplinary Approach to Modern Digital Steganography Pramanik, Sabyasachi,Ghonge, Mangesh Manikrao,Ravi, Renjith V.,Cengiz, Korhan,2021-06-04 Steganography is the art of secret writing The purpose of steganography is to hide the presence of a message from the intruder by using state of the art methods algorithms architectures models and methodologies in the domains of cloud internet of things IoT and the Android platform Though security controls in cloud computing IoT and Android platforms are not much different than security controls in an IT environment they might still present different types of risks to an organization than the classic IT solutions Therefore a detailed discussion is needed in case there is a breach in security It is important to review the security aspects of cloud IoT and Android platforms related to steganography to determine how this new technology is being utilized and improved continuously to protect information digitally The benefits and challenges along with the current and potential developments for the future are important keystones in this critical area of security research Multidisciplinary Approach to Modern Digital Steganography reviews the security aspects of cloud IoT and Android platforms related to steganography and addresses emerging security concerns new algorithms and case studies in the field Furthermore the book presents a new approach to secure data storage on cloud infrastructure and IoT along with including discussions on optimization models and security controls that could be implemented Other important topics include data transmission deep learning techniques machine learning and both image and text stenography This book is essential for forensic engineers forensic analysts cybersecurity analysts cyber forensic examiners security engineers cybersecurity network analysts cyber network defense analysts and

digital forensic examiners along with practitioners researchers academicians and students interested in the latest techniques and state of the art methods in digital steganography   Cryptographic and Information Security Approaches for Images and Videos S. Ramakrishnan,2018-12-07 This book presents essential principles technical information and expert insights on multimedia security technology Illustrating the need for improved content security as the Internet and digital multimedia applications rapidly evolve it presents a wealth of everyday protection application examples in fields including Giving readers an in depth introduction to different aspects of information security mechanisms and methods it also serves as an instructional tool on the fundamental theoretical framework required for the development of advanced techniques

Advances in Optical Science and Engineering Indrani Bhattacharya,Satyajit Chakrabarti,Haricharan Singh Reehal,Vasudevan Lakshminarayanan,2017-09-21 The Proceedings of 3rd International Conference on Opto Electronics and Applied Optics OPTRONIX 2016 is an effort to promote and present the research works by scientists and researchers including students in India and abroad in the area of Green Photonics and other related areas as well as to raise awareness about the recent trends of research and development in the area of the related fields The book has been organized in such a way that it will be easier for the readers to go through and find out the topic of their interests The first part includes the Keynote addresses by Rajesh Gupta Department of Energy Science and Engineering Indian Institute of Technology Bombay P T Ajith Kumar President and Leading Scientist Light Logics Holography and Optics Crescent Hill Trivandrum Kerala and K K Ghosh Institute of Engineering Motoharu Fujigaki University of Fukuii Japan Takeo Sasaki Tokyo University of Science Japan Kehar Singh Former Professor Indian Institute of Technology Delhi India Rajpal S Sirohi Tezpur University India Ajoy Kumar Chakraborty Institute of Engineering Lakshminarayan Hazra Emeritus Professor Calcutta University India S K Bhadra Emeritus Scientist Indian Institute of Chemical Biology India Partha Roy Chaudhuri Department of Physics Indian Institute of Technology Kharagpur India Navin Nishchal Indian Institute of Technology Patna India Tarun Kumar Gangopadhyay CSIR Central Glass and Ceramic Research Institute India Samudra Roy Department of Physics Indian Institute of Technology Kharagpur India Kamakhya Ghatak University of Engineering Fibre and Integrated Optics Lasers Interferometry Optical Communication and Networks Optical and Digital Data and Image Processing Opto Electronic Devices Terahertz Technology Nano Photonics Bio Photonics Bio Medical Optics Lasers Quantum Optics and Information Technology E M Radiation Theory and Antenna Cryptography Quantum and Non Linear Optics Opto Electronic Devices Non Linear Waveguides Micro Electronics and VLSI Interdisciplinary   Index to Theses with Abstracts Accepted for Higher Degrees by the Universities of Great Britain and Ireland and the Council for National Academic Awards ,2008 Theses on any subject submitted by the academic libraries in the UK and Ireland   **Digital Watermarking Using MATLAB** Pooya Monshizadeh Naini,2011 Digital Watermarking Using MATLAB   **An Invisible Watermarking Based Framework for Authenticating Biometric Images** Payal Garg,2023-12-20 It is now routine practice to make large picture archives hosted on publicly accessible

internet servers making the photos accessible over the Internet has also allowed malicious actors to change forgery photos available on the web or replacing them with supplied images Both of these scenarios are possible now Additionally as a result of the proliferation of sophisticated image editing software in recent years many people now have access to the tools necessary to modify the contents of digital images with relative ease producing results that are eerily similar to those produced by professionals working in the conventional photographic medium To address these issues it has become necessary to create methods that can safeguard digital pictures against attacks that are harmful in nature Invisible watermarking is used for data concealment copyright protection and picture verification Several different approaches for invisible watermarking have been documented This research will concentrate mostly on the methods of undetectable watermarking that may be used for picture authentication The Trustworthy Digital Camera included a watermarking system or not public key encryption technology had been used to modify a digital photograph Schendel also led a conversation on manipulating the least significant bit to encode digital signatures on a photo which you can read more about in the previous sentence LSB During the course of the project many methods were designed to embed binary bits at addresses that were produced at random Each pixel s LSB was modified to match the bit that corresponded to it in the string It is quite unusual for invisible watermarking techniques information inscribed on the LSB of picture pixel values to generate visual artefacts in the image When an image is modified the least significant bit LSB almost always shifts which makes it possible for the verification process to identify the update It is not difficult to Create a system that updates picture content without modifying LSBs This can be done to the point where the entire image can be changed without changing the LSB LSB tampering is vulnerable to malicious attacks When this occurs verification does not pick up modifications which is dependent on the LSB The verification process of some existing techniques for invisible watermarking is limited by the fact that these techniques cannot determine the specific regions of an image that have been altered Instead they can only indicate if an image has been altered This is merely one of these methods drawbacks Using this information more effective safety measures could be created In the image verification process the portions of the image that have been altered can be determined and localized with the help of the suggested watermarking approach and removing watermarks If the verified key is unknown a change to one region s pixel values will certainly cause watermark pixels to differ artefacts in the extracted watermark image This type of Verification doesn t require an original unwatermarked source image and it is efficient because the technique for watermark extraction only requires a small number of operations For a Verifiable invisible watermarking it must be nearly Interloper can t tell if a picture is watermarked whether the information is embedded or not and that the interloper is unable to edit or reapply the watermark In order to evade verification In other words an interloper must not be able to Identify watermarked images Therefore within the framework of this particular technique the embedded watermark may be identified throughout its detection by only LSB analysis which are pixel distributions produced following the watermarking procedure

DWT Based Robust Invisible Watermarking Altaf Mulani,P. B. Mane,2016-12-27 **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 *INVISIBLE WATERMARKING IN JPEG IMAGES* LEE YOW ZHONG (TP024915),2014 Audio Watermark Yiqing Lin,Waleed H. Abdulla,2014-09-22 This book illustrates the commonly used and novel approaches of audio watermarking for copyrights protection The author examines the theoretical and practical step by step guide to the topic of data hiding in audio signal such as music speech broadcast The book covers new techniques developed by the authors are fully explained and MATLAB programs for audio watermarking and audio quality assessments and also discusses methods for objectively predicting the perceptual quality of the watermarked audio signals Explains the theoretical basics of the commonly used audio watermarking techniques Discusses the methods used to objectively and subjectively assess the quality of the audio signals Provides a comprehensive well tested MATLAB programs that can be used efficiently to watermark any audio media *The Effects of Invisible Watermarking on Satellite Image Classification* Yunlong Yang,2001 *Resolving Rightful Ownerships with Invisible Watermarking Techniques: Limitations, Attacks, and Implications* International Business Machines Corporation. Research Division,Scott Craver,Nasir Memon,Boon-Lock Yeo,Minerva M. Yeung,1997 Abstract Digital watermarks have been proposed in recent literature as a means for copyright protection of multimedia data In this paper we address the capability of invisible watermarking schemes to resolve copyright ownerships We show that in certain applications rightful ownerships cannot be resolved by current watermarking schemes alone Specifically we attack existing techniques by providing counterfeit watermarking schemes that can be performed on a watermarked image to allow multiple claims of rightful ownerships In the absence of standardization and specific requirements imposed on watermarking procedures anyone can claim ownership of any watermarked image In order to protect against the counterfeiting techniques that we develop we examine the properties necessary for resolving ownership via invisible watermarking We introduce and study invertibility and quasi invertibility of invisible watermarking techniques We propose non invertible watermarking schemes and subsequently give examples of techniques that we believe to be non quasi invertible and hence invulnerable against more sophisticated attacks proposed in the paper The attacks and results presented in the paper and the remedies proposed further imply that we have to carefully re evaluate the current approaches and techniques in invisible watermarking of digital images based on application domains and re think the promises applications and implications of such digital means of copyright protection

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web sep 28 2023   sea turtles are amongst some of the world s oldest reptiles that are still alive today sadly they are

becoming an endangered species due to climate change pollution and poaching but many conservation projects are being set up globally to help these beautiful creatures of the sea survive

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