Lecture Notes in Computer Science **10082**

Commenced Publication in 1973
Founding and Former Series Editors:
Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

Editorial Board

David Hutchison
Lancaster University, Lancaster, UK
Takeo Kanade
Carnegie Mellon University, Pittsburgh, PA, USA
Josef Kittler
University of Surrey, Guildford, UK
Jon M. Kleinberg
Cornell University, Ithaca, NY, USA
Friedemann Mattern
ETH Zurich, Zurich, Switzerland
John C. Mitchell
Stanford University, Stanford, CA, USA
Moni Naor
Weizmann Institute of Science, Rehovot, Israel
C. Pandu Rangan
Indian Institute of Technology, Madras, India
Bernhard Steffen
TU Dortmund University, Dortmund, Germany
Demetri Terzopoulos
University of California, Los Angeles, CA, USA
Doug Tygar
University of California, Berkeley, CA, USA
Gerhard Weikum
Max Planck Institute for Informatics, Saarbrücken, Germany

More information about this series at http://www.springer.com/series/7410

Yun Qing Shi · Hyoung Joong Kim
Fernando Perez-Gonzalez · Feng Liu (Eds.)

Digital Forensics and Watermarking

15th International Workshop, IWDW 2016
Beijing, China, September 17–19, 2016
Revised Selected Papers

Springer

Editors
Yun Qing Shi
New Jersey Institute of Technology
Newark, NJ
USA

Hyoung Joong Kim
Korea University
Seoul
Korea (Republic of)

Fernando Perez-Gonzalez
University of Vigo
Vigo
Spain

Feng Liu
Chinese Academy of Sciences
Beijing
China

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Computer Science
ISBN 978-3-319-53464-0 ISBN 978-3-319-53465-7 (eBook)
DOI 10.1007/978-3-319-53465-7

Library of Congress Control Number: 2017931057

LNCS Sublibrary: SL4 – Security and Cryptology

© Springer International Publishing AG 2017
This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.
The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.
The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The 15th International Workshop on Digital-Forensics and Watermarking 2016 (IWDW2016), hosted by the State Key Laboratory of Information Security, Institute of Information Engineering, Chinese Academy of Sciences, was held at Beijing Fragrant Hill Hotel, Beijing, China, during September 16–19, 2016. IWDW 2016, following the tradition of IWDW, aimed at providing a technical program covering state-of-the-art theoretical and practical developments in the field of digital watermarking, steganography and steganalysis, forensics and antiforensics, visual cryptography, and other multimedia-related security issues. Among 70 submissions from 10 different countries and areas in the world, the Technical Program Committee selected 45 papers (35 oral and 10 poster presentations) for presentation and publication, including one paper for the best student paper award, and one for the best paper award. Besides these paper presentations, the workshop featured four invited lectures: "Digital Forensics for Network Information Credibility Evaluation" presented by Professor Tieniu Tan, Vice President of the Chinese Academy of Sciences, "Future Directions of Reversible Data Hiding" presented by Professor Hyoung Joong Kim, "The Good, the Bad and the Public: Sensor-Based Device Identification Beyond Media Forensics" presented by Assistant Professor Matthias Kirchner, and "Multimedia Forensics: Source Inference from Uncertainty and Enormity" presented by Professor Chang-Tsun Li. Furthermore, there was a 1.5-hour panel discussion and rump session among all the participants; and eight industrial exhibitions demonstrated the achievements and applications of the field.

We would like to thank all of the authors, reviewers, lecturers, and participants for their valuable contributions to IWDW2016. Our sincere gratitude also goes to all the members of Technical Program Committee, International Publicity Liaisons, and our local volunteers for their careful work and great efforts made in the wonderful organization of this workshop. We appreciate the generous support from the Institute of Information Engineering, Chinese Academy of Sciences. Finally, we hope that the readers will enjoy this volume and that it will provide inspiration and opportunities for future research.

October 2016

Yun Qing Shi
Hyoung Joong Kim
Fernando Perez-Gonzalez
Feng Liu

Organization

General Chair

Dongdai Lin	Institute of Information Engineering, Chinese Academy of Sciences, China

Technical Program Chairs

Yun Qing Shi	New Jersey Institute of Technology, USA
Hyoung Joong Kim	Korea University, South Korea
Fernando Perez-Gonzalez	University of Vigo, Spain

Technical Program Committee

Lee-Ming Cheng	City University of Hong Kong, SAR China
Claude Delpha	University of Paris-Sud XI, France
Jana Dittmann	University of Magdeburg, Germany
Isao Echizen	National Institute of Informatics, Japan
Guang Hua	Nanyang Technology University, Singapore
Fangjun Huang	Sun Yet-sen University, China
Xinghao Jiang	Shanghai Jiao-Tong University, China
Xiangui Kang	Sun Yat-sen University, China
Mohan S. Kankanhalli	NUS, Singapore
Anja Keskinarkaus	University of Oulu, Finland
Minoru Kuribayashi	Okayama University, Japan
Chang-Tsun Li	University of Warwick, UK
Shenghong Li	Shanghai Jiaotong University, China
Feng Liu	Chinese Academy of Sciences, China
Zheming Lu	University of Zhejiang, China
Bing Ma	Shandong University of Political Science and Law, China
Jiang Qun Ni	Sun Yat-sen University, China
Michiharu Niimi	Kyushu Institute of Technology, Japan
Akira Nishimura	Tokyo University of Information Science, Japan
Alessandro Piva	University of Florence, Italy
Yong-Man Ro	KAIST, South Korea
Vasiliy Sachnev	Catholic University, South Korea
Pascal Schöttle	University of Münster, Germany
Andreas Westfeld	HTW Dresden, Germany
Xiaotian Wu	Sun Yat-sen University, China
Dawen Xu	Ningbo University of Technology, China

Diqun Yan	Ningbo University, China
Ching-Nung Yang	National Dong Hwa University, Taiwan
Rui Yang	Sun Yet-sen University, China
Xinpeng Zhang	Shanghai University, China
Xianfeng Zhao	Chinese Academy of Sciences, China
Rongrong Ni	Beijing Jiao Tung University, China
Guopu Zhu	Chinese Academy of Sciences, China

International Publicity Liaisons

America

Ton Kalker	Huawei, USA
Min Wu	University of Maryland, USA

Europe

Anthony T.S. Ho	University of Surrey, UK
Stefan Katzenbeisser	TUD, Germany

Asia

Heung-Kyu Lee	KAIST, South Korea
Yao Zhao	Beijing Jiao Tung University, China

Industrial Liaisons

Jing Dong	Institute of Automation, CAS, China

Organizing Committee

Chairs

Feng Liu	Institute of Information Engineering, CAS, China
Xianfeng Zhao	Institute of Information Engineering, CAS, China
Linna Zhou	University of International Relations, China

Members

Jing Dong	Institute of Automation, CAS, China
Gang Shen	Institute of Information Engineering, CAS, China
Qian Zhao	Institute of Information Engineering, CAS, China
Dingyu Yan	Institute of Information Engineering, CAS, China
Wen Wang	Institute of Information Engineering, CAS, China
Yawei Ren	Institute of Information Engineering, CAS, China
Yun Cao	Institute of Information Engineering, CAS, China
Peipei Wang	Institute of Information Engineering, CAS, China

Yanfei Tong	Institute of Information Engineering, CAS, China
Qingxiao Guan	Institute of Information Engineering, CAS, China

Sponsors

Contents

Digital Forensics

A Multi-purpose Image Counter-anti-forensic Method Using Convolutional Neural Networks 3
Jingjing Yu, Yifeng Zhan, Jianhua Yang, and Xiangui Kang

Detection of Video-Based Face Spoofing Using LBP and Multiscale DCT . . . 16
Ye Tian and Shijun Xiang

Source Cell-Phone Identification Using Spectral Features of Device Self-noise 29
Chao Jin, Rangding Wang, Diqun Yan, Biaoli Tao, Yanan Chen, and Anshan Pei

Speech Authentication and Recovery Scheme in Encrypted Domain 46
Qing Qian, Hongxia Wang, Sani M. Abdullahi, Huan Wang, and Canghong Shi

Detecting Double H.264 Compression Based on Analyzing Prediction Residual Distribution 61
S. Chen, T.F. Sun, X.H. Jiang, P.S. He, S.L. Wang, and Y.Q. Shi

Identification of Electronic Disguised Voices in the Noisy Environment. 75
Wencheng Cao, Hongxia Wang, Hong Zhao, Qing Qian, and Sani M. Abdullahi

Using Benford's Law Divergence and Neural Networks for Classification and Source Identification of Biometric Images 88
Aamo Iorliam, Anthony T.S. Ho, Adrian Waller, and Xi Zhao

Source Camera Identification Based on Guided Image Estimation and Block Weighted Average 106
Le-Bing Zhang, Fei Peng, and Min Long

Recapture Image Forensics Based on Laplacian Convolutional Neural Networks 119
Pengpeng Yang, Rongrong Ni, and Yao Zhao

Concealing Fingerprint-Biometric Data into Audio Signals for Identify Authentication 129
Sani M. Abdullahi, Hongxia Wang, Qing Qian, and Wencheng Cao

A Novel Robust Image Forensics Algorithm Based on L1-Norm Estimation 145
Xin He, Qingxiao Guan, Yanfei Tong, Xianfeng Zhao, and Haibo Yu

Detection of Copy-Move Forgery in Flat Region Based on Feature Enhancement. 159
Weiwei Zhang, Zhenghong Yang, Shaozhang Niu, and Junbin Wang

A Local Derivative Pattern Based Image Forensic Framework for Seam Carving Detection 172
Jingyu Ye and Yun-Qing Shi

Visual Cryptography

Privacy Monitor 187
Teng Guo, Feng Liu, Wen Wang, and BingTao Yu

Information Security Display Technology with Multi-view Effect 198
Wen Wang, Feng Liu, Teng Guo, Yawei Ren, and Gang Shen

Random Grids-Based Threshold Visual Secret Sharing with Improved Visual Quality 209
Xuehu Yan, Yuliang Lu, Lintao Liu, and Song Wan

Halftone Visual Cryptography with Complementary Cover Images 223
Gang Shen, Feng Liu, Zhengxin Fu, Bin Yu, and Wen Wang

Collusive Attacks to Partition Authentication Visual Cryptography Scheme 238
Yawei Ren, Feng Liu, and Wen Wang

On the Robustness of Visual Cryptographic Schemes 251
Sabyasachi Dutta, Partha Sarathi Roy, Avishek Adhikari, and Kouichi Sakurai

Reversible Data Hiding

Optimal Distortion Estimation for Prediction Error Expansion Based Reversible Watermarking 265
Aniket Roy and Rajat Subhra Chakraborty

Blind 3D Mesh Watermarking Based on Sphere-Shape Template 280
Hak-Yeol Choi, Jeongho Son, Han-Ul Jang, and Heung-Kyu Lee

Fragile Watermarking Based Proofs of Retrievability for Archival Cloud Data. 296
Xin Tang, Yining Qi, and Yongfeng Huang

Multiple Watermarking Using Multilevel Quantization Index Modulation 312
Bingwen Feng, Jian Weng, Wei Lu, and Bei Pei

Increasing Secret Data Hiding Capacity in QR Code Using 3 × 3 Subcells. . . 327
Wisdarmanto Erlangga and Ari Moesriami Barmawi

Databases Traceability by Means of Watermarking with Optimized Detection 343
Javier Franco-Contreras and Gouenou Coatrieux

A New Card Authentication Scheme Based on Image Watermarking and Encryption 358
Xinxin Peng, Jianfeng Lu, Li Li, Chin-Chen Chang, and Qili Zhou

Copyright Protection for 3D Printing by Embedding Information Inside 3D-Printed Objects 370
Kazutake Uehira, Masahiro Suzuki, Piyarat Silapasuphakornwong, Hideyuki Torii, and Youichi Takashima

Watermarking with Fixed Decoder for Aesthetic 2D Barcode 379
Minoru Kuribayashi, Ee-Chien Chang, and Nobuo Funabiki

Two-Dimensional Histogram Modification for Reversible Data Hiding in Partially Encrypted H.264/AVC Videos 393
Dawen Xu, Yani Zhu, Rangding Wang, Jianjing Fu, and Kai Chen

Second Order Perdicting-Error Sorting for Reversible Data Hiding 407
Jiajia Xu, Hang Zhou, Weiming Zhang, Ruiqi Jiang, Guoli Ma, and Nenghai Yu

Reversible Data Hiding for Texture Videos and Depth Maps Coding with Quality Scalability 421
Yuanzhi Yao, Weiming Zhang, and Nenghai Yu

Reversible Data Hiding in Encrypted AMBTC Compressed Images. 436
Xuejing Niu, Zhaoxia Yin, Xinpeng Zhang, Jin Tang, and Bin Luo

Reversible 3D Image Data Hiding with Quality Enhancement. 446
Wengai Liu, Rongrong Ni, and Yao Zhao

An Adaptive Reversible Data Hiding Scheme for JPEG Images 456
Jiaxin Yin, Rui Wang, Yuanfang Guo, and Feng Liu

Separable Multiple Bits Reversible Data Hiding in Encrypted Domain. 470
Yan Ke, Minqing Zhang, and Jia Liu

Steganography and Steganalysis

Distortion Function for Spatial Image Steganography Based on the Polarity of Embedding Change 487
Zichi Wang, Jinpeng Lv, Qingde Wei, and Xinpeng Zhang

Embedding Strategy for Batch Adaptive Steganography 494
Zengzhen Zhao, Qingxiao Guan, Xianfeng Zhao, Haibo Yu, and Changjun Liu

Adaptive Steganography Using 2D Gabor Filters and Ensemble Classifiers . . . 506
Yuan Bian, Guangming Tang, Shuo Wang, Zhanzhan Gao, and Shiyuan Chen

An Adaptive Video Steganography Based on Intra-prediction Mode and Cost Assignment 518
Lingyu Zhang and Xianfeng Zhao

Segmentation Based Steganalysis of Spatial Images Using Local Linear Transform 533
Ran Wang, Xijian Ping, Shaozhang Niu, and Tao Zhang

Reliable Pooled Steganalysis Using Fine-Grained Parameter Estimation and Hypothesis Testing 550
Wei Huang and Xianfeng Zhao

Deep Learning on Spatial Rich Model for Steganalysis 564
Xiaoyu Xu, Yifeng Sun, Guangming Tang, Shiyuan Chen, and Jian Zhao

A High Embedding Capacity Data Hiding Scheme Based upon Permutation Vectors 578
Chin-Chen Chang, Jen-Chun Chang, Yun-Hong Chou, and Hsin-Lung Wu

Data Hiding in H.264/AVC Video Files Using the Coded Block Pattern 588
Hong Zhang, Yun Cao, Xianfeng Zhao, Haibo Yu, and Changjun Liu

A Study of the Two-Way Effects of Cover Source Mismatch and Texture Complexity in Steganalysis 601
Donghui Hu, Zhongjin Ma, Yuqi Fan, and Lina Wang

Erratum to: Speech Authentication and Recovery Scheme in Encrypted Domain E1
Qing Qian, Hongxia Wang, Sani M. Abdullahi, Huan Wang, and Canghong Shi

Author Index 617