

*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, Zürich, 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/7870>

Yun Q. Shi (Ed.)

# Transactions on Data Hiding and Multimedia Security X

 Springer

*Editor*  
Yun Q. Shi  
New Jersey Institute of Technology  
Newark, NJ  
USA

ISSN 0302-9743                      ISSN 1611-3349 (electronic)  
Lecture Notes in Computer Science  
ISBN 978-3-662-46738-1              ISBN 978-3-662-46739-8 (eBook)  
DOI 10.1007/978-3-662-46739-8

Springer Heidelberg New York Dordrecht London  
© Springer-Verlag Berlin Heidelberg 2015

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.

Printed on acid-free paper

Springer-Verlag GmbH Berlin Heidelberg is part of Springer Science+Business Media  
([www.springer.com](http://www.springer.com))

# Transactions on Data Hiding and Multimedia Security

## Tenth Issue

In this volume we present the tenth issue of the *LNCIS Transactions on Data Hiding and Multimedia Security*, which includes six papers.

The first paper presents a new method to reduce mutual information via embedding watermark in the key controlled wavelet domain. The second paper presents a perceptual image hashing algorithm based on wave atom transform, which can distinguish maliciously attacked images from content-preserving ones. In the third paper, specular reflection for short-wavelength-pass-filter detection is proposed to prevent rerecording screen images. The remaining three papers deal with steganography. While most steganographic research has been done in the field of non-real-time mediums, an algorithm that enables data hiding in G.711, the most commonly used voice codec for VoIP devices, is presented in the fourth paper. The fifth paper addresses adaptive steganography and steganalysis with fixed-size embedding, where a two-player zero-sum game between a steganographer and a steganalyst is analyzed. The sixth paper addresses permutation steganography in the File Allocation Table (FAT) file system.

We hope that this issue will be of great interest to the research community and will trigger new research in the field of data hiding and multimedia security.

Finally, we want to thank all the authors, reviewers, and editors who have devoted their valuable time to the success of this sixth issue. Special thanks go to Springer Verlag and Dr. Alfred Hofmann for their continuous support.

December 2014

Yun Q. Shi  
Hyoung-Joong Kim  
Stefan Katzenbeisser

# **LNCS Transactions on Data Hiding and Multimedia Security Editorial Board**

## **Editor-in-Chief**

Yun Q. Shi  
New Jersey Institute of Technology,  
Newark, NJ, USA  
(shi@njit.edu)

## **Vice Editors-in-Chief**

Hyoung-Joong Kim  
Korea University, Seoul, Korea  
(Khj-@korea.ac.kr)

Stefan Katzenbeisser  
Darmstadt University of Technology  
and CASED, Germany  
(Katzenbeisser@seceng.informatik.tu-  
darmstadt.de)

## **Associate Editors**

Jeffrey A. Bloom  
SiriusXM Satellite Radio, USA  
(bloom@ieee.org)

Jana Dittmann  
Otto-von-Guericke-University Magdeburg,  
Magdeburg, Germany  
(Jana.dittmann@iti.cs.uni-magdeburg.de)

Jean-Luc Dugelay  
EURECOM, Sophia, Antipolis, France  
(Jean-Luc.Dugelay@eurecom.fr)

Jiwu Huang  
Shenzhen University, Shenzhen, China  
(jwhuang@szu.edu.cn)

Mohan S. Kankanhalli  
National University of Singapore, Singapore  
(mohan@comp.nus.edu.sg)

C.C. Jay Kuo  
University of Southern California,  
Los Angeles, USA  
(cckuo@sipi.usc.edu)

Heung-Kyu Lee  
Korea Advanced Institute of Science  
and Technology, Daejeon, Korea  
(hklee@casaturn.kaist.ac.kr)

Benoit Macq  
Catholic University of Louvain, Belgium  
(macq@tele.ucl.ac.be)

Hideki Noda  
Kyushu Institute of Technology, Iizuka, Japan  
(noda@mip.ces.kyutech.ac.jp)

Jeng-Shyang Pan	National Kaohsiung University of Applied Science, Kaohsiung, Taiwan (jspan@cc.kuas.edu.tw)
Fernando Pérez-González	University of Vigo, Vigo, Spain (fperez@gts.tsc.uvigo.es)
Alessandro Piva	University of Florence, Florence, Italy (piva@lci.det.unifi.it)
Yong Man Ro	Korea Advanced Institute of Science and Technology, Daejeon, Korea (ymro@ee.kaist.ac.kr)
Ahmad-Reza Sadeghi	Darmstadt University of Technology and CASED, Germany (ahmad.sadeghi@trust.cased.de)
Kouichi Sakurai	Kyushu University, Fukuoka, Japan (sakurai@csce.kyushu-u.ac.jp)
Andreas Westfeld	University of Applied Sciences Dresden, Germany (andreas.westfeld@htw-dresden.de)
Edward K. Wong	Polytechnic School of Engineering, New York University, Brooklyn, NY, USA (ewong@nyu.edu)

### **Advisory Board Members**

Pil Joong Lee	Pohang University of Science and Technology, Pohang, Korea (pjl@postech.ac.kr)
Bede Liu	Princeton University, Princeton, NJ, USA (liu@princeton.edu)

# Contents

Strengthening Spread Spectrum Watermarking Security via Key Controlled Wavelet Filter . . . . .	1
<i>Bingbing Xia, Xianfeng Zhao, Dengguo Feng, and Mingsheng Wang</i>	
Wave Atom-Based Perceptual Image Hashing Against Content-Preserving and Content-Altering Attacks . . . . .	21
<i>Fang Liu and Lee-Ming Cheng</i>	
IR Hiding: Use of Specular Reflection for Short-Wavelength-Pass-Filter Detection to Prevent Re-recording of Screen Images . . . . .	38
<i>Isao Echizen, Takayuki Yamada, and Seiichi Gohshi</i>	
A Reliable Covert Communication Scheme Based on VoIP Steganography . . . .	55
<i>Harrison Neal and Hala ElAarag</i>	
Adaptive Steganography and Steganalysis with Fixed-Size Embedding . . . . .	69
<i>Benjamin Johnson, Pascal Schöttle, Aron Laszka, Jens Grossklags, and Rainer Böhme</i>	
Permutation Steganography in FAT Filesystems . . . . .	92
<i>John Aycock and Daniel Medeiros Nunes de Castro</i>	
<b>Author Index</b> . . . . .	107