Handbook of Multimedia Information Security: Techniques and Applications

Amit Kumar Singh • Anand Mohan
Editors

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Foreword

The book entitled *Handbook of Multimedia Information Security: Techniques and Applications* is a significant effort on the multimedia, which focuses on the emerging applications. The handbook intends to enhance the understanding of opportunities and challenges in multimedia security and processing for real-world applications at the global level.

It is a challenge for any researchers and scholars to identify the most popular topics on multimedia in any instant of time due to rapid progress on research and development. This book summarizes the recent trends in multimedia in terms of security, processing, and applications and focuses on identifying new directions for academic professionals, practicing engineers, and scientists. Given this, summarizing the vast literature in multimedia and identifying the most cutting-edge phenomena is a huge task. I hope the readers will find the book of great value in its visionary words.

I congratulate the editors for this book and look forward to seeing it in print soon.

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Saraju P. Mohanty

Preface

Recently, multimedia stands as one of the most demanding and exciting aspects of the information era, and every second, a lot of multimedia information are created and transmitted all around the world through different unsecured networks. The multimedia information distribution through open channel using information and communication technology (ICT) is an indispensable and cost-effective technique for dissemination and distribution of digital data/media files. However, the prevention of copyright violation, authenticity, confidentiality, ownership identification, and identity theft have been challenging issues due to attempts of malicious attacks or hacking of the open-channel information. Criminal offence ranging from identity theft to copyright violation and from personal information exposure to medical history disclosure is being made every day. However, research established that the authenticity of multimedia information/documents is strongly required in various emerging applications such as e-health, secure multimedia contents on social network, secured e-voting systems, automotive industries, military, digital forensic, digital cinema, education and insurance companies, driving license/passport, as well as many real-time applications. Furthermore, multimedia processing is a multi-rate computing problem and requires low-cost implementation of high-volume markets, high computation rates, and large memory bandwidth, which makes it a challenging domain for potential researchers.

Outline of the Book and Chapter Synopsis

In view of addressing the above challenges, this handbook presents the recent trends in multimedia in terms of security, processing, and applications at the global level. We have provided potential thoughts and methodology that help senior undergraduate and graduate students, researchers, programmers, and industry professionals in creating new knowledge for the future to develop efficient techniques/framework for multimedia applications.

A brief and orderly introduction to the book chapters in this handbook, organized under three major parts, is provided in the following:

Part I includes 15 interesting chapters dealing with multimedia security for emerging applications. The chapters include basic concepts of multimedia tools and applications, biological and behavioral biometrics, effective multimedia encryption and secure watermarking techniques for emerging applications, an adaptive face identification approach for android mobile devices, and multimedia using chaotic and perceptual hashing function.

Part II of the book includes 11 chapters dealing with multimedia processing for various potential applications. The chapters include a detailed survey of image processing-based automated glaucoma detection techniques and role of de-noising, recent study of dictionary learning-based image reconstruction techniques for analyzing the big medical data, brief introduction of quantum image processing and its applications, a segmentation-less efficient Alzheimer detection approach, object recognition, image enhancements and de-noising techniques for emerging applications, improved performance of image compression approach, and automated detection of eye-related diseases using digital image processing.

Part III of the book includes 11 interesting chapters dealing with multimedia applications. The chapters include the extensive survey on the role of multimedia in medicine and multimedia forensic classification, a fingerprint-based authentication system for e-health security, and analysis of recently developed deep learning techniques for emotion and activity recognition. Further, the book introduces a case study on the change of ECG according to time for user identification, role of multimedia in big data, cloud computing, the Internet of things (IoT), and blockchain environment in detail for real-life applications.

To conclude, we would like to sincerely thank all the authors for submitting their high-quality chapters to this book and the large number of potential reviewers who have participated in the review process and provided helpful comments and suggestions to the authors to improve their chapters.

We especially thank the Multimedia Systems and Applications Series Editor, *Prof. Borko Furht*, for his continuous support and great guidance.

We are also grateful to *Prof. Saraju P. Mohanty*, Department of Computer Science and Engineering University of North Texas, Denton, TX, for his inspirational foreword for the book.

We would also like to thank the publishers at Springer, in particular *Susan Lagerstrom-Fife*, Senior Publishing Editor/CS Springer, for their helpful guidance and encouragement during the creation of this book.

We are sincerely thankful to all authors, editors, and publishers whose works have been cited directly/indirectly in this book.

We believe that our book will be helpful to the senior undergraduate and graduate students, researchers, industry professionals, healthcare professionals, and providers working in the area demanding state-of-the-art solutions for multimedia applications.

Patna, India — Amit Kumar Singh
Varanasi, India — Anand Mohan

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The second author gratefully acknowledges the authorities of *Indian Institute of Technology (BHU), Varanasi, India,* for their kind support to come up with this book.

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About the Editors

Amit Kumar Singh received his bachelor's degree in computer science and engineering from the Institute of Engineering and Technology, VBS Purvanchal University, Jaunpur, India, in 2005; M.Tech. degree in computer science and engineering from Jaypee University of Information Technology, Waknaghat, India, in 2010; and Ph.D. degree in computer engineering from the National Institute of Technology, Kurukshetra, India, in 2015. He was with the Computer Science and Engineering Department, Jaypee University of Information Technology, from 2008 to 2018. He is currently an Assistant Professor with the Computer Science and Engineering Department, National Institute of Technology (an Institute of National Importance), Patna, India. He has authored over 70 peer-reviewed journals, conference publications, and book chapters and 2 books entitled *Medical Image Watermarking: Techniques and Applications*, in 2017, and *Animal Biometrics: Techniques and Applications*, in 2018 (Springer International Publishing). He has also edited the book *Security in Smart Cities: Models, Applications, and Challenges* (Springer International Publishing, 2019), the Proceedings of 4th IEEE International Conference on Parallel, Distributed and Grid Computing in 2016, and the Proceedings of 4th International Conference on Image Information Processing in 2017. He currently serves on the Editorial Board of two peer-reviewed international journals, namely, the *IEEE Access* and *Multimedia Tools and Applications* (Springer). He has edited various international journal special issues as a Guest Editor, such as *IEEE Consumer Electronics Magazine*, *IEEE Access*, *Multimedia Tools and Applications* (Springer), *International Journal of Information Management* (Elsevier), *Journal of Ambient Intelligence and Humanized Computing* (Springer), *Multimedia Systems* (Springer), *International Journal of Information and Computer Security* (Inderscience), *International Journal of Grid and Utility Computing* (Inderscience), and *Journal of Intelligent Systems* (Walter de Gruyter GmbH & Co. KG, Germany). His research interests include data hiding, biometrics, and cryptography.

Anand Mohan has nearly 42 years rich experience of teaching, research, administration, and managing higher educational institutions. He began his career in December 1975 as R&D Engineer of Murphy India Ltd., Thane, Maharashtra, and

subsequently joined as Faculty in April 1979 at Electronics Engineering, Institute of Technology, now IIT (BHU), where he is currently working as Institute Professor. He has provided national-level leadership to the defense-related R&D activities as Chairman, Armament Sensors & Electronics (ASE) Panel under ARMREB, DRDO, Ministry of Defence, Government of India. As part of a doctoral research, he has developed a potential technology for application in "Neutron Detection Reader" system for defense applications. Prof. Mohan has active research collaboration with Louisiana State University, USA; Curtin University, Malaysia; Kathmandu University, Nepal; and Central Electronics Engineering Research Institute (CEERI), Pilani, Rajasthan. He has made notable academic and research contributions in the field of Electronics Engineering at IIT (BHU) by creating a dedicated research group of eminent academicians and researchers from the country and abroad. He has established state-of-the-art research facilities and conducted high-quality research in the areas of fault-tolerant/survivable system design, steganography, and embedded system design. His current areas of research interest are intelligent instrumentation, fault-tolerant design, robust watermarking algorithms, and information security. He has authored 145 research papers published in reputed international/national journals and conference proceedings. He has supervised 11 Ph.D. theses and made 4 chapter contributions in books. His coauthored book, *Medical Image Watermarking: Techniques and Applications*, has been published by Springer. Academic and research contributions of Prof. Mohan are internationally/nationally acknowledged.