

Special issue on multimedia analysis and security

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Published online: 1 September 2010
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1 Introduction

Multimedia analysis aims to provide various means to understand multimedia content automatically. Although it is still a challenging topic, various achievements have been obtained and used in practical applications, e.g., content-based image search, automatic news program segmentation, and automatic sports highlight extraction. Especially, some multimedia analysis techniques are potential for security-related applications, e.g., intelligent surveillance based on event detection, sensitive content detection/filtering based on content understanding and mining, piracy tracking based on content fingerprinting, and person identification based on biometric recognition. This field is attracting more and more researchers. However, few special issues on journals have been organized.

This special issue aims to expose the readership to the latest research results on Multimedia Analysis and Security. It includes a number of related topics, demonstrates pioneer work, investigates novel solutions and discussed the future trends in this field. This issue is composed of six papers selected from 22 submissions. Each paper is reviewed by at least two experts, with at least two rounds.

Some of the papers are recommended by 2009 International Conference on Multimedia Information NEtworking and Security (MINES 2009) (<http://liss.whu.edu.cn/mines2009/>), which aims to provide a platform for world-wide researchers and engineers to exchange the latest research results on multimedia information services, with the focuses on networking and security. This conference keeps the paper acceptance rate of 40%. The recommended best papers have at least 40% difference from the conference paper.

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2 The papers in this special issue

The first paper, “Image Similarity: From Syntax to Weak Semantics” by J. Perkio et al., investigates the measurement of image similarity, which is important for such applications as media search, copy detection, piracy tracing, etc. In this paper, the authors examined the use of simple syntactic image features (lower level and context free) combined with other multimodal features to derive a similarity measure that captures the weak semantics of an image, in order to solve the problem that the semantic (higher, contextual) level features are still difficult to obtain. The weak semantics can be seen as an intermediate step between low level image understanding and full semantic image understanding. The measure is tested for multimedia retrieval task on a tv series data, which shows how different modalities relate to each other. This paper provides valuable information to researchers in multimedia analysis.

In the second paper, “An Algorithmic Analysis of Zernike Moments in the Presence of Rotation with Crop and Loose Modes” by S. Xiang, Zernike moments’ performance against rotations is investigated. Zernike moments have some desirable properties, such as rotational invariance, noise robust and efficient representation of pattern, and are often used in pattern recognition and robust watermarking. In both theoretical and experimental ways, this paper analyzes the effect of image rotations (including crop rotation and loose rotation) on Zernike moments, and proposes the solutions to extract better Zernike moments. For example, for the crop rotation, it suggests to extract the Zernike moments by mapping the image over a disc instead of inside a circle since the outside of an image after the crop rotation will be distorted. For the loose rotation, a preprocessing step, i.e., image size normalization, will be introduced in order to eliminate the effect of image size change. Experimental results show the improved Zernike moments computing methods get some apparent advantages.

The third paper, “Content Distribution and Copyright Authentication Based on Combined Indexing and Watermarking” by S. Lian et al., proposes a media content distribution and copyright authentication system based on both media index and watermarking techniques. Before media distribution, the media content is marked (by embedding the customer information), and the robust features used both for media index and content emendation are extracted from the watermarked media and registered in a feature database. To detect whether a media content over Internet is copyright-protected or not, a watermark is extracted from the media and compared with the original one. If the watermark is not found, a robust feature is computed from the media and matched with the feature database. The matching result gives the operation parameters that are used to emend the media content. After media emendation, a watermark is extracted again and used to authenticate the copyright. Experimental results show that the combination of media index and watermark detection can improve the detection rate greatly. This paper tells an interesting research topic of detecting piracy by combining media index and watermarking.

In the fourth paper, “Watermarking Geographical Data on Spatial Topological Relations” by C. Wang et al., a watermarking algorithm is proposed to protect the copyright of geographical data. With the wide application of geographical data, the copyright protection of geographical data becomes a hot research topic. In this paper, the spatial topological relation existing between polygons is chosen as cover data, and the watermark is embedded by slightly modifying the metric measure of spatial topological relation, and some geographical objects are scaled to derive the watermarked data. To measure the distortions caused by watermark embedding, Global Main Scaling Distance is introduced. The comparative results show that the proposed algorithm has some good performances, e.g., a good robustness against geometrical attacks, simplification, interpolation, etc., and a good tradeoff between robustness and fidelity is acquired.

The fifth paper, “Parameter-Estimation and Algorithm-Selection Based United-Judgment for Image Steganalysis” by J. Lu et al., investigates steganalysis algorithms that are used to

detect whether the secret message is transmitted via the carrier (e.g., text, image, video, audio, etc.). Considering that there exist various steganalysis algorithms, this paper synthetically utilize multiple existing algorithms to construct united-judgment methods. For example, the principles are proposed to select multiple algorithms and parameters accordingly. In evaluations, both the blind and specific steganalysis are investigated. Various experiments are done, and the results show that the proposed algorithms achieve more reliable detection.

In the sixth paper, “What are suspicious VoIP delays?” by W. Mazurczyk et al., the steganalysis in VoIP networks is investigated. Since Voice over IP (VoIP) is now one of the most popular real-time services in IP networks, it is also adopted by anonymous users to transmit secret information via information hiding techniques. Considering that the modification of an RTP packet stream may lead to packet delay, reordering or intentionally lost, the information hiding in VoIP may be detectable. Motivated by this point, the paper examines real RTP traffic traces, e.g., telling what the “normal” delays in RTP packet streams look like, and what the steganographic one differs. And, thus shows the potential means to detect steganographic exchanges in VoIP. This paper mentions an interesting research topic.

Acknowledgments The guest editors wish to thank Prof. Borko Furht for providing the opportunity to edit this special issue on Multimedia Analysis and Security, and Ms. Laura A. Lander, Ms. Maria Mhanilet de Leon, and Ms. Monalisa Castaneda for providing latest publishing information and making this issue published. We would also like to thank the authors for submitting their works as well as the referees who have critically evaluated the papers within the short stipulated time. Finally, we hope the reader will share our joy and find this special issue very useful.



Shiguo Lian got his Ph.D. from Nanjing University of Science and Technology, China. He was a research assistant in City University of Hong Kong in 2004. Since July 2005, he has been a Research Scientist with France Telecom R&D (Orange Labs) Beijing. He is the author or co-author of more than 80 refereed international journal and conference papers covering topics of secure multimedia communication, intelligent multimedia services, and ubiquitous communication. He has contributed 15 book chapters and held 16 filed patents. He authored the book “Multimedia Content Encryption: Techniques and Applications” (CRC Press, 2008), and edited five books. He got the Nomination Prize of “Innovation Prize in France Telecom” and “Top 100 Doctorate Dissertation in Jiangsu Province” in 2006. He is a member of IEEE Communications & Information Security Technical Committee, IEEE Multimedia Communications Technical Committee, and IEEE Technical Committee on Nonlinear Circuits and Systems. He is on the editor board of several international journals. He is the guest editor of more than 10 international journals. He is in the organization committee or the TPC member of refereed conferences, including IEEE ICC2008/2009/2010, IEEE GLOBECOM2008/2009/2010, IEEE CCNC2009, IEEE ICCCN2009, etc. He is also the reviewer of refereed international magazines and journals.



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