Review of the book

*"Multimedia Watermarking Techniques and Applications"*

by Borko Furht and Darko Kirovski

CRC Press/Taylor & Francis Group, 2006

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# 1 Summary of the review

The book is a collection of 14 excellent articles on techniques of multimedia watermarking and their applications. It includes survey articles that describe the state-of-the art in multimedia watermarking techniques as well as articles that introduce new techniques that improve over the weaknesses of the existing ones and new applications of various watermarking techniques. Even though the book is intended for researchers and practitioners in the field, it includes a good range of articles with varying levels of technical details that a reader who is just starting to learn about the topic could also benefit from reading them.

# 2 Summary of the book

1. Protection of Multimedia Content in Distribution Networks by *Ahmet M. Eskicioglu and Edward Delp*

   The authors present an overview of the problem of copyrighted multimedia content protection in digital distribution networks. They introduce the user to the terminology of and issues in copyright and copyright industries. They examine technical, legal, and business solutions for multimedia security in satellite, cable, and Internet-based architectures as well as digital home networks.

2. Vulnerabilities of Multimedia Protection Schemes by *Mohamed F. Mansour and Ahmed H. Tewfik*

   The authors present some vulnerabilities in the current watermark detection algorithms when the detector is publicly available and introduce a generic attack that exploits these vulnerabilities for removing the watermark with minimum distortion. They provide analysis of the new attack

for different watermarking schemes and propose a new structure for a watermark public detector that resists the attack they introduce.

3. Survey of Watermarking Techniques and Applications by *Edin Muharemagic and Barko Furht*

   The authors first present an overview of digital watermarking and look into various watermarking techniques in spatial domain and in transform domains, watermarking with side information (informed embedding and informed coding), and multibit watermarking, They provide a very informative table that summarizes different types of watermarking systems and classifies them according to various criteria. Then they look at applications of digital watermarking including applications for copyright protection, copy protection, fingerprinting, content authentication, broadcast monitoring, and system enhancement.

4. Robust Identification of Audio Using Watermarking and Fingerprinting by *Ton Kalker and Jaap Haitsma*

   The article introduces the reader to the basic technical aspects of audio fingerprinting. It provides an overview of an audio fingerprinting technology as developed by Philips Research. It also provides an analysis of commonalities and the differences between watermarking and fingerprinting along with insights into which identification technology to use in which applications.

5. High-Capacity, Real-Time Audio Watermarking with perfect Correlation Sequence and Repeated Insertion by *Soo-Chang Pei, Yu-Feng Hsu, and Ya-Wen Lu*

   The authors first give an overview of watermarking techniques as they apply to audio watermarking. After establishing the necessary technical and mathematical background, they propose new schemes for audio watermark embedding and extraction. They also provide experimental results and a detailed analysis of the proposed schemes.

6. Multidimensional Watermark for Still Image: Parallel Embedding and Detection by *Bo Hu*

   The author starts with the basics of watermarking and goes on to introduce a multidimensional watermark scenario. They introduce a scheme for embedding multidimensional watermarks in still images and its detection. The proposed technique is discussed in detail and examined for robustness. Experimental results that show high robustness are also provided.

7. Image Watermarking Method Resistant to Geometric Distortions by *Hyungshin Kim*

   After providing some motivation in the introduction, the author presents an overview of geometric distortions and their implications in watermarking methods. The main topic of the paper is a new watermarking algorithm that uses rotation, scale, and translation (RST)-invariant feature of images. The algorithm yields a watermarking method resilient to geometric distortion. The author also provides experimental results which confirm the robustness of the scheme against certain types of geometric distortions.

8. Fragile Watermarking for Image Authentication by *Ebroul Izquierdo*

   The article starts by presenting the fundamentals of watermark-based image authentication along with main motivations for research, development, and use of this technology. The main discussion of the article is on a non-conventional technique for fragile image authentication where watermarking is achieved by linking the watermarked image with a very ill-conditioned matrix derived from a secret key and the original image. The author describes the new technique in detail and provides analysis of certain theoretical and practical aspects of its efficiency, effectiveness, and security.

9. New Trends and Challenges in Digital Watermarking Technology: Applications for Printed Materials by *Zheng Liu*

   The article introduces some new trends and challenges in the research and application of digital watermarking for printed materials. The author first provides an overview of the current digital watermarking technologies and corresponding issues. Then they discuss the watermarking techniques for two kinds printed materials, namely printed images and printed textual images which include text documents and binary images in detail. They also examine the use of mobile cameras for extracting watermarks.

10. Robust Watermark Detection from Quantized MPEG Video Data by *Dimitrios Simitopoulos, Alexia Briassouli, and Michael G. Strintzis*

    The authors present an integrated, realistic video watermarking system that incorporates a watermark embedding scheme for compressed domain video and a watermark detector for the quantized domain data of compressed video frames. They consider two types of detectors, Gaussian model (conventional model) and quantized Laplacian model(statistical detector), and provide a detailed analysis of the robustness of the two schemes under various attacks such as blurring, median filtering, cropping.

11. Image Watermarking Robust to Both Geometric Distortion and JPEG Compression by *Xiangui Kang, Jiwu Huang, and Yun Q. Shi*

    The authors first present an overview of approaches to overcome the problem of insufficient robustness of existing watermarking algorithms to geometric distortions (translation, rotation, scaling, cropping, etc. ). Then they propose a new blind image watermarking algorithm robust to both affine transformations (translation, rotation, scaling) and JPEG compression. They also provide experimental results and discuss their implications for the efficiency and effectiveness of the proposed algorithm.

12. Reversible Watermarks Using Difference Expansion by *Adnan M. Alattar*

    The author first gives an overview of reversible watermarks, then establishes the mathematical and technical background for the Generalized Reversible Integer Transform (GRIT). He describes a family of reversible watermarking algorithms based on the expansion of the difference coefficients of a GRIT of vectors of arbitrary size. He also provides test results on this new family of algorithms and discusses their efficiency and effectiveness in comparison to other algorithms in the literature.

13. Combined Indexing and Watermarking of 3-D Models Using Generalized 3-D Radon Transforms by *Petros Daras, Dimitrios Zarpalas, Dimitrios Tzovaras, Dimitrios Simitopoulos, and Michael G. Strintzis*

    The article starts with a short review of current trends in 3-D content-based search and retrieval and in 3-D model watermarking. The authors describe in detail a novel technique for 3-D model indexing and watermarking based on a generalized Radon transform. They also provide experimental results from the testing of the proposed method which show that the method satisfies properties that are highly desirable for efficient 3-D model search and retrieval and for 3-D model watermarking.

14. Digital Watermarking Framework: Applications, Parameters, and Requirements by *Ken Levy and Tony Rodriguez*

    The authors give an excellent review of a digital framework that includes digital watermark classifications, applications, important algorithm parameters, the requirements for applications in terms of these parameters, and workflow. The article is written with the goal of helping technology and solution providers design appropriate watermarking algorithms and systems and helping potential customers in understanding the applicability of technology and solutions to their markets.

# 3 What is the book like (style)?

The book is a collection of 14 articles on the subject of watermarking and its applications. As such it does not follow a continuous flow like a textbook would. It includes survey articles on techniques and issues in multimedia watermarking as well as articles that introduce new techniques which improve over existing ones and new applications of the techniques such as audio and video watermarking, fragile watermarking for image authentication, multidimensional watermarks for still images, etc. Most of the articles on new techniques and applications provide rigorous descriptions of the proposed methods and theoretical and/or experimental analysis of their feasibility, efficiency and effectiveness.

# 4 Would you recommend this book?

On the most part the articles in the book are technical and assume some mathematical background and are intended for readers who are already familiar with issues in multimedia watermarking and techniques of digital watermarking. However there are articles (such as articles 1, 3, and 14) or sections in articles where the authors provide an overview of the topic at hand without going into technical details and these articles/sections would be a very good resource for readers who are new to the field.

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