Gate to Computer Science and Research Vol. 5

Embodying Intelligence in Multimedia Data Hiding

Edited by Chang Wook Ahn, Musrrat Ali, Millie Pant

Science Gate Publishing

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Preface

The digital information revolution has brought about profound changes in our society and our life. The tremendous advances in signal processing and signal transmission techniques have made it possible for consumers worldwide to acquire, duplicate, share, and enjoy the multimedia data. Internet and wireless networks offer ubiquitous channels to deliver and to exchange multimedia information for such purposes. All these advances in multimedia coding and communication technologies over the past decade have raised the concerns that how to make sure that the content is used for its intended purpose by its intended recipients. The core issue then becomes the development of secure management of content usage and delivery across communication networks. Multimedia data hiding is the promising technology for multimedia data protection and rights management. Data hiding is the art and science for embedding data into multimedia data such as audio, video, or image to build a covert channel for secret communication, for the purpose of verifying the integrity, for the copyright protection, or for other purpose. Data hiding particularly includes watermarking and steganography, cryptography that encrypts the data instead of hiding it, does not come under this category. Both the data hiding technologies embed the information in the cover media in order to send this information imperceptibly. However, in steganography, the communication is carried out between two parties. As a result, steganography is mainly concerned with concealing the existence of the communication and protecting the embedded data against any modifications that may happen during the transmission. Thus, steganography has limited robustness with the maximum capacity. On the other hand, watermarking schemes are used when the cover media is available to parties who know the existence of the hidden information and may try to destroy it. Hence, the main concerns of multimedia data hiding are robustness, imperceptibility, and the hiding of maximum number of bits (capacity). These features are conflicting with each other, so it is a very difficult task to satisfy all the requirements at the same time. Some of the researchers tried to find out the solution of this problem utilizing the artificial intelligence approaches. Therefore, the focus of this book is to provide a critical review, applications and advances of intelligent multimedia data

hiding schemes. The book is organized into six chapters.

The first chapter titled *"Data Hiding Schemes: A Survey"* written by the editors attempts a survey of the research in the field of multimedia data hiding. This chapter provides a detailed review of the basic concepts of multimedia data hiding and a survey of its major variants developed so far. The chapter classifies the data hiding schemes based on several aspects of data hiding comprising artificial intelligence. Furthermore, the chapter also provides the recommendations and research directions for further research.

The second chapter titled *"Ownership and Tamper Detection of Relational Data: Framework, Techniques and Security Analysis"* written by Vidhi Khanduja, Shampa Chakraverty and O.P. Verma is a review of watermarking schemes for relational database.

The third chapter titled *"Intelligent Watermarking Scheme Employing the Concepts of Block Based Singular Value Decomposition and Firefly Algorithm"* written by editors proposes a novel image watermarking scheme by redistributing the image and applying some normalization operators. Cover image is segmented into non-overlapping blocks and singular value decomposition (SVD) is applied to each block to get the largest singular value. The firefly algorithm (FA), an intelligent optimization technique, is applied to obtain the quantization step (QS) optimally to improve the fidelity and the perceptual quality of the watermarked image. Empirical analysis of the results has demonstrated the efficiency of the proposed scheme.

The chapter four titled *"Hardware Implementation of Image and Video Watermarking for Ownership Verification"* written by Amit Joshi, Monica Bapna, Aniruddh Malpani, Ashwini Kumar Goyal and Manisha Meena proposes a novel hardware implementation of watermarking for images that is further extended for videos. Two different schemes have been proposed in different frequency domains (i.e., DWT and DCT). The comparative analysis of the proposed schemes with the other methods has shown that the proposed schemes have given better or comparable performance.

The chapter five titled *"Security Verification Systems for Digital Media"* written by Jianping Chen proposes two Secure Electronic Document (SED) schemes for legal document issuing organizations. In this chapter, an overview of the methodologies is provided as well.

The last chapter of the book, titled *"Using Genetic Algorithm and Wisdom of Artificial Crowds to Find Hidden Data in DNA"* written by Marc B. Beck, Ahmed H. Desoky, Eric C. Roucka, Patrick S. McClure and Roman V. Yampolskiy presents a software toolkit using a combination of Genetic Algorithm and Wisdom of Artificial Crowds to decode a message written in DNA symbols. Through comparison with the other algorithms, it is shown that the proposed approach has delivered significantly more accurate results than the others.

In conclusion, we consider that this book would be a useful insight and a good source for the readers who are interested in the application of artificial intelligence in multimedia data hiding. The editors would like to thank all the authors for their contributing chapters, without whom this book would have been just wishful thinking. Finally, the editors would also like to thank Maria Katefidou and Science Gate Pub-

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