

A DIGITAL WATERMARKING SCHEME BASED ON SINGULAR VALUE DECOMPOSITION AND MICRO-GENETIC ALGORITHM

CHIH-CHIN LAI¹, HSIANG-CHEH HUANG¹ AND CHENG-CHIH TSAI²

¹Department of Electrical Engineering
National University of Kaohsiung
Kaohsiung, 81148, Taiwan
cclai@nuk.edu.tw; huang.hc@gmail.com

²Department of Computer Science and Information Engineering
National University of Tainan
Tainan, 70005, Taiwan

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ABSTRACT. *A novel robust digital image watermarking scheme based on singular value decomposition (SVD) and micro-genetic algorithm (micro-GA) is proposed in this paper. In an SVD-based watermarking scheme, the singular values of the cover image are modified to by considering multiple scaling factors to embed the watermark image. Determining the proper values of scaling factors is not an easy task. Here we view it as an optimization problem and apply the micro-GA to efficiently obtain the values. Experimental results show that the proposed approach has good performance against several attacks.*

Keywords: Watermark, Singular value decomposition, Micro-genetic algorithm

1. **Introduction.** Owing to the rapid development of Internet, users have more and more chances to use multimedia data and digital contents. Consequently, the demand for embedding securely owner identity and other personal information into multimedia becomes very urgent. The copyright protection and information hiding for digital multimedia have become important issues. To achieve these issues, watermarking technology is adopted. Watermarking [6] is the process of inserting data into a multimedia element such as an image, audio, or video file. The embedded data can later be detected or extracted from the multimedia for identifying the copyright owner.

A basic watermarking algorithm, an image for example, consists of a cover image, a watermark structure, an embedding algorithm, and an extraction or detection algorithm. Several techniques have been proposed for multimedia protection. Among the proposed methods, much interest has focused on digital images [6, 12, 13, 19]. According to the domain in which the watermark is inserted, these techniques are divided into two broad categories: spatial-domain and frequency-domain methods. Embedding the watermark into the spatial domain component of the original is the straightforward method. It has the advantages of low complexity and easy implementation. However, the spatial domain watermarking algorithms are generally fragile to image processing operations or other attacks [18]. On the other hand, the representative frequency-domain techniques embed the watermark by modulating the magnitude of coefficients in a transform domain, such as discrete cosine transform (DCT), discrete Fourier transform (DFT), and discrete wavelet transform (DWT) [2, 4, 16, 17]. Although frequency-domain methods can yield more information embedding and more robustness against many common attacks, the computational cost is higher than spatial-domain watermarking.