AN INTEGRATED WATERMARKING TECHNIQUE WITH TAMPER DETECTION AND RECOVERY

Shinfeng D. Lin and Yu-Hsun Huang

Department of Computer Science and Information Engineering
National Dong Hwa University
Hualien, Taiwan
david@mail.ndhu.edu.tw

Abstract. *In this paper, we propose a novel scheme which combines robust watermarking and tamper recovery. Our proposed technique not only embeds the watermark for image authentication, but also has the ability of tamper detection and recovery. It is the first integrated watermarking scheme with robust watermarking and tamper recovery in the literatures. For robust watermarking, we use the hash function and an XOR operation to obtain an authentic sequence. Then this sequence is embedded into one of the sub-blocks in an image. For tamper detection and recovery, we first extract the LL3 coefficients of the block-wise DWT. The coefficients are hidden into the middle frequency of another sub-block in the image. This scheme protects copyright and recovers the tampered region without using the host image. Experimental results demonstrate that our proposed scheme is an effective technique to verify the ownership and recover the tampered region.*
Keywords: Tamper detection and recovery, Ownership, Robust watermarking

1. **Introduction.** The advent of the Internet and the advancement of digital technologies have enabled numerous applications in the areas of multimedia communications. It is known some hazards exist on delivering the digital media on public network. One can imperceptibly copy or tamper the media and lead to large unauthorized distribution. Therefore, the security of digital data has been a great concern. In addition, because the editing and processing technologies of modern digital media allow high quality forgery to be made at a low cost, tamper detection and recovery is increasingly essential to secure digital applications.

A solution for claiming the ownership is to use the electronic stamps or so-called watermarks [1]. Robust watermarking technique embeds a watermark into an image. The watermark can then be extracted from the watermarked image to verify the ownership. To protect the ownership, several robust watermarking schemes [2-4] have been proposed for the past decade. These approaches extract the recognizable watermark after malicious attacks, but they can not recover the tampered region. As described in [5], tamper detection schemes can be applied to detect modifications of those images that are sensitive to any changes. Or, one can apply semi-fragile watermarking, as mentioned in [6,7], to detect only the malicious destructions of the images while tolerating the necessary manipulations such as compression. Our concern is, nevertheless, to locate the tampered region for recovery. Recently, much attention has been paid to the robust watermarking researches in the literatures. However, tamper detection and recovery has received little attention. The related works of watermarking scheme and tamper recovery are introduced in the following.