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COPYRIGHT PROTECTION FOR IMAGE FILES WITH EXIF METADATA

Hsiang-Cheh Huang[1], Yueh-Hong Chen[2] and Shin-Chang Chen[1]

[1]Department of Electrical Engineering
National University of Kaohsiung
Kaohsiung 811, Taiwan
hchuang@nuk.edu.tw; m0965115@mail.nuk.edu.tw

[2]Department of Computer Science and Information Engineering
Far East University
Sinshih Township, Tainan County 744, Taiwan
yuehhong@gmail.com

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Abstract. *In this paper, we propose an application of robust watermarking with the aid of EXIF metadata in digital images. Application for robust watermarking is one of the major branches in digital rights management (DRM) systems. Meanwhile, implementation schemes for robust watermarking generally alter selected pixels in the spatial domain, or corresponding coefficients in the transform domain, to accomplish the embedding process. We consider not only the pixels or coefficients in the images, but we also employ the EXIF metadata associated with the original images, which serves as the role of watermark, to further protect the copyrights. Taking the manufacturer, camera model, date and time stamp, and some other information in the EXIF metadata as the watermark information, conventional watermarking techniques can be applied to ordinary pictures taken by ourselves, and watermarked images with good quality can be produced. Even when the marked image has been intentionally modified, the original EXIF with selected information can be recovered from the watermark extraction process. Simulation results present the effectiveness of such an implementation.*
Keywords: Digital rights management (DRM), EXIF, Copyright protection

1. **Introduction.** Due to the cost reduction of consumer electronics devices nowadays, most people can easily produce his or her own digital pictures by using digital cameras at any time. As a result, digital images are being accumulated rapidly, and automated tools for organizing these pictures have become a necessity for users. With the large amount of pictures produced, the EXchangeable Image File (EXIF) format is used to help record some information about the digital camera, including the date and time information, the settings of the camera, and the copyright information [1, 2, 3]. In addition to the main purpose of EXIF for helping users to organize and classify the pictures taken, we point out another direction to apply the EXIF information to the scope of digital forensics area. The concept is to serve the EXIF information, which directly corresponds to original images, as the watermark, and to conquer the tampering problem that are frequently encountered due to the ease of editing the digital files. Therefore, we focus on watermarking and its application in DRM with EXIF information in this paper.

Here we use the digital images, taken by different cameras, to represent the multimedia contents for copyright protection. It is generally agreed that for one watermarking algorithm, the watermarked image quality (or imperceptibility), the survivability after intentional attacks (or robustness), and the number of bits embedded (or capacity) are