

## A ROI-BASED SEMI-FRAGILE WATERMARKING FOR IMAGE TAMPER DETECTION AND RECOVERY

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**ABSTRACT.** *A ROI-based semi-fragile watermarking technique for image tamper detection and recovery is proposed. In the proposed method, the image is divided into ROI and ROB regions first. The authentication watermark is constructed based on the ROI content and embedded back to the ROI region. Recovery information is obtained from ROI and embedded to the ROB region. If the ROI region is tampered, the tampered areas can be recovered from the information embedded in ROB. The unique features of our proposed method are it is robust to both the mild modification, such as JPEG compression, and malicious attacks, such as collusion attack and counterfeiting attack. Experimental results show that our algorithm is superior to the compared technique.*

**Keywords:** Tamper detection, Tamper recovery, Semi-fragile

**1. Introduction.** The rapid growth of Internet technologies and wide availability of image processing tools make that the acquisition, transmission and modification of digital media become a simple task. Validity of digital content is the main concern in content authentication and copyright protection. The studies of content protection can be roughly divided into two categories: digital signature and digital watermark. Digital signature may be produced by encrypting the image content or features with a private key. A signature-based authentication scheme can be aware of the modification of the image, but it cannot locate the tampered regions of the image. By comparison, a digital watermark-based scheme has more advantages, which cannot only detect the modification but also localize the manipulated regions. Moreover, the tampered regions of the image can be recovered without the original image in some methods.

Traditional imperceptible watermarking techniques can be classified as fragile watermarking, robust watermarking and semi-fragile watermarking. The watermark of fragile watermarking can be easily altered or destroyed by any sort of image operation such as compression, blurring, sharpening, scaling, rotation, cropping and various malicious manipulations. It is usually used for verifying the integrity of the received images. Robust watermarking is designed to resist various attacks which are attempting to destroy the watermark in the image. The main purpose of robust watermarking is for ownership authentication or copyright protection. Semi-fragile watermarking can locate modified regions in an image and extract the remaining watermark from the undamaged regions. So, a semi-fragile watermarking is capable of authenticating an image even if some manipulations are applied to the image.

In recent years, several image content verification and authentication watermarking techniques have been proposed for protecting the integrity of image. Among them, watermarking for image authentication [1-8] is used for protecting image content and ownership.