

## Watermarking Signature for Still Images

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**Abstract.** This paper presents a watermarking method using signatures for still images. An image authentication approach is requested to guarantee reliability of conveyed image data. To protect copyright, watermarking with digital signature is required. The watermarking method is a tool for ownership identification or content honesty information. The conventional watermarking methods are not directly applicable. To alleviate this issue, we propose a new watermarking method which uses signature and Sobel mask. We apply Sobel mask to classify image into two regions: edge and smooth regions. Pre-generated diagonal and anti-diagonal shape patterns are applied to generate specific signature for watermarking. Performance assessment is conducted in simulation results section. Watermarking signatures are embedded in the test images, and three metrics were applied to assess the performance.

**Keywords:** Watermarking, signature, color image, authentication, pattern

### 1 Introduction

Watermarking is generally used to protect image contents [1]. The watermarking is a favorable act which is able to defend the patent of image data through transmitting [2,3]. Thus, copyright protection is one of reasonable expectations of watermarking applications [4]. In addition, digital watermarking is a tool of hiding a message concerning to a signal within an image [5,6]. The goal of watermarking is to add and hide specific information, so as the contents owner may retrieve it from transmitted image when it is necessary.

In this paper, we propose a new watermarking method which efficiently hides watermarking information in lower bit plane. We apply Sobel mask to obtain edge image of signature. The diagonal and anti-diagonal patterns are drawn in edge and non-edge (smooth) regions. Section 2 presents a proposed technique. Experimental results are provided in Section 3. Performance assessment on watermarked images with embedded signatures is displayed in this section. Conclusion remarks are provided in Section 4.

## 2 Proposed method

The proposed watermarking method consists of three stages (Fig. 1). The watermarking generation stage is explained. Bit plane decomposition stage separates 24 bit image into 3 color and 8 bit planes. The bit plane of a digital image is a set of bits corresponding to a provided bit position in each of the binary numbers implying the image. Among each bit plane, we substitute watermarking signal with  $c_0$  ( $0^{\text{th}}$  bit plane). Watermarking image stage sends image data to transmitter or CODEC.

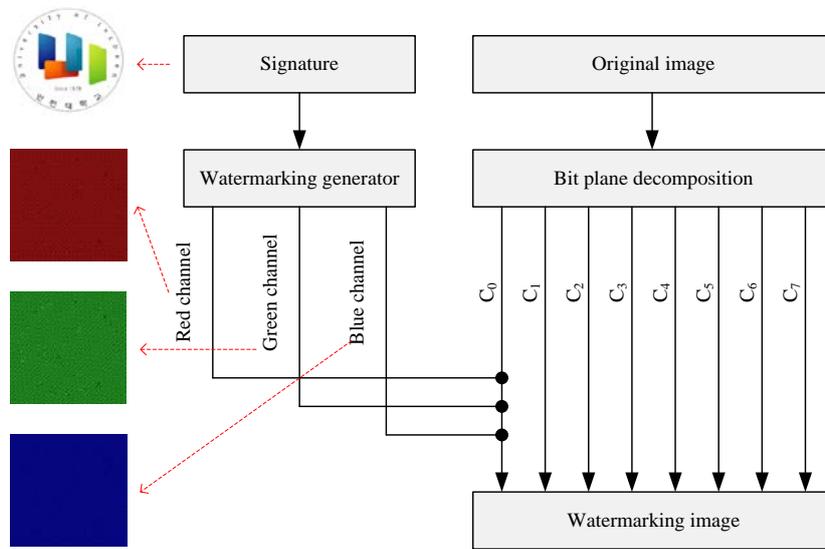


Fig. 1. Flowchart of the proposed method.

## 3 Experimental Results

The test is conducted on seven McM images (#1, #2, #3, #7, #8, #17, and #18). The size of all images is width×height =500×500. Figure 2 shows 18 images of McM dataset.



**Fig. 2.** Test images: McM dataset.

## 4 Conclusions

Ownership verification is an important which is to assure reliability of transferred image data. In this paper, we presented a new watermarking approach that utilizes Sobel mask based signature. The Sobel was used to classify given image into two areas: edge and non-edge areas. We have two patterns for watermarking symbol, and each pattern is given to corresponding area. Objective and subjective performance evaluation is carried out in experimental results.

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