

A NOVEL MULTIPLE SEMI-BLIND ENHANCED ISB WATERMARKING ALGORITHM USING WATERMARK BIT-PATTERN HISTOGRAM FOR COPYRIGHT PROTECTION

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ABSTRACT. *Digital watermarking process must be fast enough especially for real-time applications like digital cameras. This research focuses on spatial-domain watermarking techniques for digital image owner identification in order to design a robust and low computation approach which can withstand against different levels of reset removal attack which have been less considered by other researchers. This paper presents original innovative schemes based on multiple watermarks in which two different watermarks embed concurrently into the intermediate significant bits of the host image pixels. The main watermark is the original information about the owner of the digital image property. With the intention of preserving the imperceptibility, we propose embedding this watermark within a lower ISB bit-plane of the host image pixels. The second embedding watermark (sub-watermark) which includes statistical information about the main watermark bit stream has the key role in our proposed scheme. This watermark which used much less pixels of the host image compared with the main watermark generates based on the main watermark bit stream using binary bit-patterns. By counting these bit-patterns, a bit-pattern histogram could be drawn in the time of extracting process. By comparing this bit-pattern histogram with the original bit-pattern histogram, the owner of the host image can be identified. This is the proposed double check mechanism which approximately identifies the ownership of the image property. With the purpose of increasing the robustness of our approach, we proposed the sub-watermark embedding within a higher ISB bit-plane of the host image pixels. This double check mechanism is more useful when the main watermark replaces by a fake watermark or is totally destroyed by a strong attack. Experimental investigations on the proposed schemes revealed that, in order to make a balanced trade-off between the imperceptibility and the robustness, two different bit-planes including 5th and 2nd can be used concurrently to embed the watermark and the sub-watermark respectively in separate pixels of the host image. The proposed schemes seem to replace the advantages of the spectral-domain with those of the spatial-domain approaches but with lower computational complexity.*

Keywords: Spatial domain watermarking, ISB, Robustness, Imperceptibility, Copyright protection, Real time

1. **Introduction.** Nowadays, illicit digital distribution of the multimedia properties is a major concern for their providers. For this problem, watermarking and steganography can be key solutions. Watermarking and steganography come from the same origin; however, they are different in practice. The main target in steganography is to use a