

# Watermarking Via B-spline Expansion & Natural Preserving Transforms

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## Abstract

In this paper, two approaches are proposed for digital image watermarking. In the first approach, we rely on embedding all the watermarking information in the approximation coefficients of the host's image wavelet decomposition. This is achieved by combining a weighted least squares Bspline coefficient expansion of the watermarking image, to the host's approximation coefficients. In order to make the size of Bspline expansion less or equal to the size of the host's approximation matrix, the watermarking image has to be decimated. The second approach relies on applying natural preserving transforms NPT, in a symmetrical manner to the host's image. In this case, the logo or the secret key replaces some of the host's image bottom lines. After applying NPT, the original host image bottom lines, replace the watermarked ones to make the host image looks natural. A novel fast least squares algorithm is proposed for watermark extraction. Illustrative examples are given, to show the effectiveness of these methods. These results show that the proposed Bspline data hiding technique is robust to compression, as well as the abilities of watermark extraction of any NPT watermarked images.

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