Perceptual image watermarking consists in using knowledge of the Human Visual System (HVS) to choose the strength of the watermark according to image properties. This paper proposes a new perceptual image watermarking method that combines the advantages of both the wavelet domain and the spatial domain since a mixed-scale wavelet representation is applied. By considering the density of the dominant wavelet coefficients, our scheme is able to differentiate uniform, edge and texture areas. This allowed us to apply adapted luminance, edge or texture masking more efficiently. We selected effective Just Noticeable Difference models from the literature, i.e. luminance and edge masking developed by Chou and Li, and texture masking developed by Qi et al. We also took into account the HVS sensitivity, which varies with the orientation of the image activity. The method was tested on a large database of 50 color images, and compared with four other watermarking methods from the literature. Visual quality tests were conducted and the robustness to attacks was tested compared with four other watermarking methods from the literature. Results show that the proposed method yields a high
visual quality and our method is very robust against attacks. This last point is of great importance for real applications. The proposed method is the best trade-off between visual quality and resistance to attacks among the tested methods.

References


Index Terms
Computer Science  Image Processing

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Perceptual models, Human Visual System, digital watermarking, wavelet, lifting scheme