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Color Image Morphology Using an Adaptive Saturation-Based Technique

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Abstract: An adaptive algorithm that implements a saturation-based ordering (for color image morphology) is introduced. The adaptation is achieved using a tradeoff parameter in the form of a nonlinear function of the local saturation. To evaluate the performance of the proposed algorithm, a designed psychophysical experiment is used to derive a metric denoted as the average value for the psychophysical evaluation in percent (APE%). Results of implementing the proposed APE show that an APE 53 to 96% can be achieved for basic morphological operators, i.e., dilation, erosion, opening, and closing. APE value depends on the size and shape of the structuring element as well as on the image details. The proposed algorithm has also been extended to other morphological operators, such as image smoothing (noise suppression), top hat, gradient, and Laplacian operators. In the case of a smoothing operation, an average peak signal-to-noise ratio (PSNR) 31 to 37 dB is achieved at various structuring elements and applied noise variances, while good results are achieved with the proposed top-hat operators.