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An objective measure for perceived noise.

Signal Process. 49, No.3, 187-206 (1996).

Summary: An algorithm for estimating the standard deviation (SD) of additive white noise on the basis of the local gradient energy in uniform regions of the image is presented. The performance of this algorithm is compared with that of an algorithm based on the local gradient amplitude and it is shown that the latter method gives less consistent estimates. The algorithm based on gradient energy is subsequently extended to include the estimation of the SD and correlation length (CL) of non-white noise. The perception of noise in images has been studied in psychophysical experiments. The perceived noise (or noisiness) of an image is found to be independent of the probability density function (PDF) of the noise. The local luminance of uniform regions is not a significant factor either. The most influential parameters are the noise SD and CL. On the basis of these findings an objective measure of the noisiness of an image, called noise index, is proposed. In the case of white noise, the noise index is based on the noise SD. In the case of non-white noise, it is based on the SD of the white noise through the filtering of which the non-white noise has been obtained. Both of these SDs can be estimated on the basis of the noisy image. The proposed objective measure of noisiness is shown to correlate well with perceived noisiness.

Keywords: Noise estimation; Noisiness; Image quality; Visual perception
doi:10.1016/0165-1684(96)00016-3