A TV based restoration model with local constraints

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Abstract

We propose a total variation based restoration model which incorporates the image acquisition model $z = h * U + n$ (where z represents the observed sampled image, U is the ideal undistorted image, h denotes the blurring kernel and n is a white Gaussian noise) as a set of local constraints. These constraints, one for each pixel of the image, express the fact that the variance of the noise can be estimated from the residuals $z - h * U$ if we use a neighborhood of each pixel. This is motivated by the fact that the usual inclusion of the image acquisition model as a single constraint expressing a bound for the variance of the noise does not give satisfactory results if we wish to simultaneously recover textured regions and obtain a good denoising of the image. We use Uzawa's algorithm to minimize the total variation subject to the proposed family of local constraints and we display some experiments using this model.