SPARSE REPRESENTATION BASED IMAGE
DEBLURRING IN THE PRESENCE OF IMPULSE NOISE

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ABSTRACT

In this article, we introduce a new patch-based model for restoring images simultaneously corrupted by blur and impulse noise. The model involves a $\ell_0$-norm data-fidelity term, a sparse representation prior over learned dictionaries, and the total variation (TV) regularization. For salt-and-pepper noise, we use the two-phase approach, which identifies the location of noisy pixels in the first phase and restores an image via a patch-based model involving noisy pixel information. On the other hand, for random-valued impulse noise, one-phase approach is utilized. As in [6], the $\ell_0$ data-fitting term plays an influential role for removing impulse noise. Moreover, the sparse representation prior enables to preserve textures and details efficiently, whereas TV regularization locally smooths the image while keeping sharp edges. To handle nonconvex and nondifferentiable terms, we adopt a variable splitting scheme, and then the penalty method and alternating minimization algorithm are employed. This results in an efficient iterative algorithm for solving our model. Numerical results are reported to show the effectiveness of the proposed model compared with the state-of-the-art methods.

REFERENCES