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Estimation of atmospheric PSF parameters for hyperspectral imaging. (English)

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Summary: We present an iterative approach to solve separable nonlinear least squares problems arising in the estimation of wavelength-dependent point spread function parameters for hyperspectral imaging. A variable projection Gauss-Newton method is used to solve the nonlinear least squares problem. An analysis shows that the Jacobian can be potentially very ill conditioned. To deal with this ill conditioning, we use a combination of subset selection and other regularization techniques. Experimental results related to hyperspectral point spread function parameter identification and star spectrum reconstruction illustrate the effectiveness of the resulting numerical scheme.

MSC:
94A08 Image processing (compression, reconstruction, etc.) in information and communication theory
65F20 Numerical solutions to overdetermined systems, pseudoinverses
65K10 Numerical optimization and variational techniques

Keywords: hyperspectral imaging; PSF estimation; regularization

Software:
KELLEY; UTV; Matlab

Full Text: DOI

References:
[14] Pargal S Hyperspectral subspace identification and endmember extraction by integration of spatial-spectral information 2011