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Nonlinear diffusion filtering methods locally adapted to data features

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The contribution deals with nonlinear diffusion filtering methods on a planar surface. These methods represent an extension of the simple linear diffusion filtering by the nonlinear diffusivity coefficient. This coefficient represents a function which depends on data features such as gradient and local or global extrema of data. In the case of the regularized surface Perona-Malik model, method mostly used in image processing, the diffusivity coefficient represents the edge detector function. If we use the nonlinear diffusion filtering influenced by the Laplace operator, local extrema detector function affects the diffusion process. We use a finite-volume method to approximate numerically the nonlinear parabolic partial differential equation on uniform rectangle grid and finite difference method to approximate gradients and Laplacians. Numerical experiments present nonlinear diffusion filtering of artificial data and real measurements in upcoming filtering software with real-time filtered data visualization widget. Real measurements represent GOCE satellite observations, satellite-only MDT data, and high-resolution altimetry-derived gravity data. They aim to point out the main advantage of the nonlinear diffusion models which, on the contrary to linear models, preserve important structures of processed data.