Vese, Luminita A.; **Osher, Stanley J.**

Modeling textures with total variation minimization and oscillating patterns in image processing. (English) Zbl 1034.49039

J. Sci. Comput. 19, No. 1-3, 553-572 (2003).

Summary: This paper is devoted to the modeling of real textured images by functional minimization and partial differential equations. Following the ideas of Yves Meyer in a total variation minimization framework of L. Rudin, S. Osher, and E. Fatemi, we decompose a given (possible textured) image f into a sum of two functions $u + v$, where $u \in \mathrm{BV}$ is a function of bounded variation (a cartoon or sketchy approximation of f), while v is a function representing the texture or noise. To model v we use the space of oscillating functions introduced by Yves Meyer, which is in some sense the dual of the BV space. The new algorithm is very simple, making use of differential equations and is easily solved in practice. Finally, we implement the method by finite differences, and we present various numerical results on real textured images, showing the obtained decomposition $u + v$, but we also show how the method can be used for texture discrimination and texture segmentation.

MSC:

49N90	Applications of optimal control and differential games
49N10	Linear-quadratic optimal control problems
68U10	Computing methodologies for image processing
94A08	Image processing (compression, reconstruction, etc.) in information and communication theory

Keywords:

functional minimization; partial differential equations; oscillating functions; functions of bounded variation; finite differences; texture modeling; image analysis

Full Text: DOI