Energy minimization problem in image processing

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Abstract: We recover an unknown image from a noisy blurred image f. We solve this problem by minimizing a regularized functional and find solutions of the form $u + v$, where u is cartoon modeled in a space of bounded variation and v is texture in a homogeneous Sobolev space of negative differentiability. With this model, unlike many other PDE models, we can not only recover a clean unknown image but also decompose the image into cartoon and texture parts capturing more details in natural images. We will also prove that there is a minimizer of this problem satisfying highly nonlinear Euler-Lagrange equations of the energy functional that we minimize and investigate the characteristics of the minimizers. We implement this model using gradient descent and finite difference scheme to see how good the recovered images will be.

This is a joint work with my adviser Luminita A. Vese and will be submitted for a paper.