

Suggested Homework

Nonlinear Multiscale Methods for Image and Signal Analysis

Exercise 1. Extend your TV-denoising code to color images with the following options

- Isotropic TV on each channel separately.
- Anisotropic TV on each channel separately.
- Penalize the gradient $(D_x u, D_y u)$ with

$$\sum_{i,j} \sqrt{\sum_k (D_x u)_{i,j,k}^2 + (D_y u)_{i,j,k}^2}$$

where the index k represents the color channels and the indices i and j correspond to the pixels.

Hint: All you need to do is to extend your projection onto the ℓ^2 ball from 2 to $2 \cdot 3 = 6$ dimensions (for usual color images with three channels).

- Penalize the gradient $(D_x u, D_y u)$ with

$$\sum_{i,j} \left(\sqrt{\sum_k (D_x u)_{i,j,k}^2} + \sqrt{\sum_k (D_y u)_{i,j,k}^2} \right)$$

where the index k represents the color channels and the indices i and j correspond to the pixels.

Hint: Do your projection onto the ℓ^2 ball along the color dimension instead of the x - y -derivative dimension.