

TOTAL VARIATION REGULARIZATION AND EVOLUTION OF SETS - THE MAGNADOOLE APPROACH

C. PÖSCHL

In signal processing, Total Variation (TV)-regularization is a process to remove noise from a signal, without smoothing away significant jumps in the signal. *TV*-minimization is also used to remove noise from images, since it is said to preserve the edges of the image. For a deeper understanding of this regularization functional, we were interested in calculating explicit solutions for simple images.

Let $S \subset \mathbb{R}^2$ be the union of two convex sets with smooth boundary. We connect the levelsets of the minimizers u_λ of

$$(ROF) \quad \frac{1}{2} \|u - \chi_S\|_{L^2}^2 + \lambda \|u\|_{TV}$$

to the minimizers of a (simpler) set-minimization problem in order to obtain a geometrical characterization of the levelsets of u_λ . Moreover, we calculate explicit minimizers of (ROF), when S is the union of two non-intersecting circles/squares or a starshaped (nonconvex) set using simple morphological operators. Moreover we connect an area/perimeter-set-optimization problem, to the dual (ROF)-minimization problem.