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The L_0-regularized discrete variational level set method for image segmentation

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Abstract

In this paper, we present a new variant of level set methods and then propose a ternary variational level set model involving L_0 gradient regularizer and L_0 function regularizer in discrete framework, following the Chan-Vese model for image segmentation. Different from the existing level set methods, we use the 0.5-level set of a ternary function whose values are within $\{0, 0.5, 1\}$ to implicitly represent the interfaces between subregions and use L_0 counting operator to discretely measure the length of interfaces and the area of foreground subregions. The proposed model can be regarded as a discrete form of the Chan-Vese model. Based on the half-quadratic splitting method, we design an alternating minimization algorithm to solve our model efficiently. Experimental results show the proposed method has good performance for segmentation of images with severe noise, outliers or low contrast.

Keywords: image segmentation; level set; variational model; L_0-based regularizer.

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