Digital Curvature Evolution Model for Image Segmentation

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Abstract

Recent works have indicated the potential of using curvature as a regularizer in image segmentation, in particular for the class of thin and elongated objects. These are ubiquitous in biomedical imaging (e.g. vascular networks), in which length regularization can sometime perform badly, as well as in texture identification. However, curvature is a second-order differential measure, and so its estimators are sensitive to noise. The straightforward extensions to Total Variation are not convex, making them a challenge to optimize. State-of-art techniques make use of a coarse approximation of curvature that limits practical applications. We argue that curvature must instead be computed using a multigrid convergent estimator, and we propose in this paper a new digital curvature flow which mimics continuous curvature flow. We illustrate its potential as a post-processing step to a variational segmentation framework.

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