

ElasticMap: Interactive Image Segmentation Using a Few Seed-Points

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ABSTRACT

Elastic Body Splines (EBS) belonging to the family of 3D splines were recently introduced to capture tissue deformations within a physical model-based approach for non-rigid biomedical image registration. EBS model the displacement of points in a 3D homogeneous isotropic elastic body subject to forces. We propose a novel extension of using elastic body splines for interactive learning-based figure-ground segmentation. The task of interactive image segmentation, with user provided foreground-background labeled seeds or samples, is formulated as learning a spatially dependent interpolating pixel classification function that is then used to assign labels for all unlabeled pixels in the image. The spline function we chose to model the semi-supervised pixel classifier is the EBS which can use sparse point-scribble input from the user and has a closed form solution. Experimental results demonstrate the applicability of the EBS approach for image segmentation. The EBS method for interactive foreground segmentation uses on an average just four to six labeled pixels as input from the user. Using such sparsely labeled information the proposed EBS method produces very accurate results with an average accuracy consistently exceeding 95 percent on three different benchmark datasets and outperforms eleven other popular interactive image segmentation methods.