Liver Segmentation with Constrained Convex Variational Model

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Abstract

Our results of liver segmentation were produced by the method proposed in [1]. This paper proposes a novel convex variational model for 3-D liver segmentation in CT scan volumes, which presents a variety of challenges including ambiguous edges, tissue adhesion and intensity overlapping between organs/tissues. To stably delineate weak liver boundaries and fine structures, both gradient and local context based edge detectors are utilized. While edge based segmentation is instable and easy to be misled, an intensity weight is proposed to suppress irrelevant strong edges and enhance the liver detection. Regional appearance constraint is also integrated. Given the intricate anatomical structures of the abdomen, user knowledge is incorporated through a convex box constraint, which can greatly avoid over-segmentation. Other than segmentation of adjacent tissues beforehand as previous works, few seeds without shape restriction, about three seeds, are adequate for accurate segmentation. Moreover, an accelerated primal-dual algorithm is proposed to efficiently and globally optimize the model. We validate the model on MICCAI liver dataset, producing a sound score of 80.5.

References


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