A New Convex Variational Model for 3D Liver Segmentation

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We intend to submit the paper based on the method explained below to a journal. Therefore, we only provide short description of our algorithm. Full paper is on preparing and will be uploaded later.

Abstract: Due to intensity overlapping, blurred edges, large variability in shape and appearance, and complex backgrounds with clutter features, the segmentation of liver is still a challenging task. Leakage to the heart, spleen, stomach, etc is a great problem in previous method. To prevent leakage, several methods segment adjacent organs in advance or entail the user to segment several key slices every time, which call for more processing time and effort. For clinical usage, minimal human interaction and reproducibility should be considered.

Based on our previous work, we address this problem with a constrained convex variational model, which can be globally minimized and help to prevent leakage greatly. Furthermore, the proposed model integrates intensity and region appearance information properly into this convex framework. As a result, weak liver boundaries and fine structures can be stably delineated according to the information from neighborhood and nearby layers. Compared with previous methods, no prior segmentation is needed and the initialization is very easy. Few seeds without shape requirement, about three seeds, are adequate for capture fine structures. While segmenting slice by slice neglects the consecutiveness between slices, we directly segment the liver from the 3D volume data. Experimental results show that the liver can be accurately and effectively distinguished. Our system is promising for stable practical use and can be also used to segment other abdomen