AbstractID: 7468 Title: True 3D Contouring Via Efficient Spline Representation of Anatomy

Purpose: To make anatomy contouring more efficient by integrating contours drawn in any combination of transverse/sagittal/coronal (T/S/C) views and reconstructing the T contours from the surface defined by the drawn contours so that the user may draw/edit until the object is completed.

Method and Materials: Our program performs the surface reconstruction by thin-plate spline interpolation of points in the drawn contours. The surface is reconstructed as a variational implicit function, and runs in real-time because we abstract the most shape-informative points from the input contours. These points correspond to maxima in one of several functions of the second derivatives of the contour functions. We demonstrate contouring results for one of these methods—the scalar second derivative of the curve function.

Before abstracting the shape salient points, contours are re-computed to have consistent rotational directions, and to have origins placed consistently in the patient coordinate system. Since the contours' points are non-uniform samples of the curve, each contour is reconstructed, using all input points, by B-spline interpolation to resample the curve uniformly along the its length to compute the derivatives by finite differences.

Results: We demonstrate in the supporting document: 1) the operation of the shape abstraction algorithm, and 2) the production of contours approximating the prostate from a single S and C contours, and 3) the production of contours in 270 T sections of a spinal canal from a single S and 4 C contours.

Conclusion: We have developed a contouring program that integrates drawn contours in any combination of T/S/C views to create a coherent surface that is clipped to produce T contours at the appropriate image planes, so the user can and assess how much more drawing or editing is needed to make a satisfactory match to object boundaries visible in the image.

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