

SHAPE RECONSTRUCTION FROM VOLUMETRIC IMAGES

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ABSTRACT

This thesis presents the research algorithms and techniques applied to three volumetric image problems (1) high quality mesh reconstruction from distance field volumetric data, (2) distance field surface approximation from gray scale images applied to 2-D and 3-D images, and (3) the extension of (2) to diffusion tensor magnetic resonance imaging (DT-MRI).

A proposed method for the extraction of high quality meshes from volumetric distance field data is given. The proposed method uses local gradient and curvature information to incrementally cover the objects surface by growing tangentially to the volume gradient.

An algorithm for structure inference of MRI brain data from 2-D and 3-D grayscale images is presented. Given a seed point initialization in a 2-D grayscale image, a PDE is proposed to evolve an explicit model based on the interior statistics of the previously identified region.

The algorithm is adapted to volumetric diffusion tensor MRI to extract the thalamus and thalamus nuclei structure. A modification of the mean shift algorithm is used to accomplish the segmentation of these more subtle structures.