AbstractID: 13581 Title: Reconstructing Surface Models from Contours: A Simple Two-Step Algorithm

Purpose: To reconstruct surface models from delineations on CT images, a simple two-step algorithm is implemented.

Method and Materials: Stacks of contours with CT images are extracted from DICOM files which are exported from the treatment planning system. The surface reconstruction algorithm contains two steps. The first step is to segment the CT images according to delineations via determining volumetric pixels inside or outside the contours via a simple scan line algorithm. The second step is to classify the six facets of each volumetric pixel of regions of interest, which is on or inside the contours, into inner facets and outer facets via determining a facet shared by two volumetric pixels or not. All the outer facets represent the boundary of delineated regions of interest on the CT images. The surface model is then generated from all the outer facets.

Results: In comparison to other surface reconstruction algorithms, such as “Marching Cubes”, the surface reconstruction algorithm we describe here can be used to generate ‘interpolating’ surfaces other than ‘approximate’ surfaces. The surface model can also be opened or closed if outer facets depending on whether the first and last layers of a CT image are included or not. A lung case and a prostate case were tested. The largest surface model is the body surface model from the lung case which has roughly 400K triangular facets. For targets, the surface models have approximately 2K triangular facets and 20K triangular facets for the lung and prostate PTVs, respectively.

Conclusions: We have implemented a simple method to reconstruct surfaces from contours. All surface models can be efficiently operated on a low-end desktop computer. The algorithm is efficient and accurate, and can be used to generate surface models for applications such as IGRT and dose-surface histogram analysis.

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