AbstractID: 1135 Title: Semi-automated CT segmentation using deformable models

Purpose: The purpose of this work is to demonstrate a proof of feasibility of the application of a prototype deformable model algorithm on a commercial radiation treatment planning system to the problem of delineation of contours of anatomic structures on four-dimensional (4-D) computed tomography (CT) image data sets.
Materials and Methods: A 4-D CT image data set of a patient's thorax consisting of 3-D image data sets from 8 phases in the respiratory cycle was acquired. The contours of right and left lungs, cord, heart, and esophagus were manually delineated on the end inspiration data set. A deformable model algorithm, originally intended for deforming an atlas-based model contour to a 3-D CT image data set, was applied. The contours generated on each phase were deformed to the CT data set on the adjacent phase to generate the contours on that phase. Contour deformation was thus propagated through the 8 phases, and contours thus obtained on the end inspiration data set were compared to the original manually delineated contours.
Results and Conclusions: Contours defined by large density gradients, such as lungs, cord, and heart, were accurately reproduced, except in regions where other gradient boundaries may have confused the algorithm, such as near bronchi. The algorithm failed to contour the esophagus accurately, a soft-tissue structure completely surrounded by tissue of similar density. This technique is likely to facilitate contour delineation in 4-D CT image data sets; however, it still requires some user intervention.