

AbstractID: 7081 Title: Development and evaluation of an automatic contour propagation method for 4D radiotherapy

Purpose: To develop and evaluate automatic contour propagation method for 4D radiotherapy

Method and Materials: 4D CT images of one lung cancer patient and dynamic phantom images were acquired and resorted into ten respiratory phases. Demons deformable registration was performed to find the deformation field from the end-exhale fixed phase to moving phases such as the end-inhale phase. Regions of interest (ROIs) were contoured in the fixed phase with the Pinnacle³ treatment planning system. The planar parallel contours were reconstructed as the 3D binary mask image data which has zero value outside and non-zero value inside of the 3D outline of contouring. The 3D contour image data were transformed to another moving phase using the deformation field from the image registration result. On each 2D plane the binary image boundary was found to trace the closed intersection points. To assess the quality of the automatic contour propagation method, the contour for the moving phase was delineated manually. Visual inspection between the contour propagation and manual contour was performed as the qualitative evaluation. Two indices were used as the quantitative examination. One was the match index to indicate how well two contour sets match each other. The other was volume difference evaluation between two contour sets.

Results: The demons deformable registration results show good alignment for both the phantom and the patient. The match index between manual and automatic contouring ranged from 0.96 to 0.99 for the dynamic phantom and from 0.95 to 0.99 for the lung patient. The volume differences were between 0.75 and 2.97 percent for the dynamic phantom and between 1.50 and 7.32 percent for the lung patient.

Conclusions: The proposed automatic contour propagation method is simple and feasible without surface construction. It is a viable method for defining the ROIs for large amount of 4DCT data sets.