

AbstractID: 7425 Title: Online region-of-interest delineation of daily head and neck images

Purpose: Online imaging modalities, such as cone beam computed tomography (CBCT) or CT on-rail provide online volumetric images. A fast, automatic and robust region-of-interest (ROI) delineation method is highly desired in image guided radiation therapy (IGRT). We have developed such a method and tested it via segmentation of head and neck (HN) fan beam CT and CBCT images.

Material and Methods: ROIs on planning CT images were manually delineated using commercial treatment planning system. A variational-based deformable image registration algorithm was implemented to register planning CT images to daily CT images. ROIs on planning CT images were automatically mapped to daily images using voxel matching information between planning and daily image datasets. The results were quantitatively and qualitatively validated by comparing to manual delineation. In order to accelerate computing speed, we paralleled the algorithm using message passing interface (MPI) on a Beowulf cluster with 16 processing elements (PE). Speed improvement was benchmarked.

Results: The discrepancies between automatically and manually delineated ROIs on fan beam images were mostly within 2mm. Automatic segmentation of CBCT images was acceptable by visual inspection. Benchmark results showed that paralleling efficiencies were above 95% and speedup factors were approximately equal to the number of PE used. With 16 PEs online delineation of HN images took about 1 minute.

Conclusion: The online ROI delineation method we have developed is robust, fast and is suitable for HN online adaptive radiation treatments.

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