AbstractID: 8118 Title: Spinal canal segmentation with well-balanced speed and accuracy combination for radiation treatment planning

Purpose: This study proposes a fast automatic spinal canal segmentation algorithm which is clinically acceptable in terms of speed and accuracy. **Method and Materials:** The proposed algorithm employs gray-level thresholding, morphological operations, and distance-transform based interpolation in the CT slice direction. The method consists of two phases: 2D extraction and 3D extraction phases. In the 2D extraction phase, smoothing and multilevel thresholding based on CT values are performed for each ROI (Region Of Interest) on all the CT images. Next, erosion followed by dilation of the extracted blobs is applied to eliminate speckle-shaped and thin line-shaped blobs. Subsequently, island blobs having areas less than a predetermined threshold level are removed. After that, the compactness that characterizes a disk-shaped blob is calculated for blobs in each ROI image and the disk-shaped blob having the maximum compactness is identified because a contour of spinal canal in axial plane is close to a ring. In the subsequent 3D extraction phase, false regions are removed by evaluating position variations of the centers of gravity of the identified blobs in the slice direction. For improperly extracted ROI images that have no reasonable blobs, interpolation in the slice direction is performed by referring to the properly extracted blobs in the adjacent slice images on both sides. **Results:** The false blobs in 2D extraction phase are replaced to reasonable ones in 3D extraction phase and smoother shape is clearly observed in 3D views of segmented spinal canal. The calculation time was approximately six seconds for 126 slices in lung SRT (Stereotactic radiotherapy) datasets. **Conclusion:** We proposed a fast automatic spinal canal segmentation approach. Verification results have showed that the proposed method is well-balanced speed and accuracy combination, which expectedly results in significant acceleration of radiation treatment planning with reduced oncologist's workload.