

AbstractID: 6939 Title: Iterative sorting for 4D CT images based on internal anatomic motion

Purpose: To reduce the discontinuity artifacts in the current 4D CT volumes formed by the oversampling-sorting process using multi-slice CT scanners.

Method and Materials: We acquire 4D CT images using a General Electric (GE) 8-slice Lightspeed CT scanner operated in cine mode. We then iteratively sort the CT images using estimated internal motion breathing indices rather than relying on externally recorded breathing signals. In each iteration, respiratory motion is estimated by updating a motion model to best match a deformed reference volume to the moving multi-slice CT images. Based on the estimated motion, we refine the breathing indices as well as the reference volumes and then continue another iteration of the sorting process. The algorithm terminates when the most current two iterations attain the same sorted 4D CT volumes.

Results: We applied this iterative sorting method on a set of 4D CT clinical data. Our estimated breathing signals resembled the recorded external breathing signals, with subtle differences existing between individual samples. The resulting sorted volumes using the estimated internal motion-based breathing indices contained less discontinuity artifacts, comparing to those using external breathing indices.

Conclusions: The proposed iterative method establishes the temporal correspondences among the 4D CT images from the estimated internal anatomy motion, and hence improves the consistency of sorted 4D CT volumes.

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