AbstractID: 7132 Title: Fusion-Aligned Reprojection: A Method to Compensate for Limited-Data Radiotherapy Images

In order to account for patient anatomy changes, it is particularly helpful for a radiotherapy system to feature on-board imaging. However, many such systems suffer from limited-data, typically limited field-of-view (LFOV) due to hardware limitations or the desire to reduce patient dose. Such LFOV images can have severe bowl artifacts that affect their utility. Moreover, the lack of peripheral data means that dose calculations using the fraction images do not properly account for attenuation and scatter.

The method of fusion-aligned reprojection (FAR) largely resolves these issues. It is possible to use certain automatic fusion techniques to align the incomplete-data image with a reference image, where the reference image was acquired on a scanner with a broader FOV. Once the images are aligned, it is possible to reproject the planning image into a sinogram, and use that sinogram data to estimate the missing data from the fraction image sinograms. An improved FAR treatment image can then be reconstructed.

The benefit of the FAR images is that they closely approximate the complete-data images that ideally would have been collected. Anatomy changes within the LFOV scan region are detected, and un-obscured by bowl artifacts. Beyond the LFOV scan region, the patient is imaged sufficiently well to make dose reconstruction possible.

Ultimately, FAR improves one's ability to monitor patient changes during image-guided radiotherapy, for LFOV and other limited-data cases. The image improvements are useful both to visualizing changes in the patient's anatomy, and calculating the dose delivered to the patient in the treatment position.