AbstractID: 1416 Title: Wavelets-based local tomography for dose reduction of MV/kV CT in image guided radiation therapy

In image guided radiation therapy, multiple fraction imaging can result in giving excessive dose to the patient, which is particularly pronounced when MVCT is used. One possible way of reducing the dose is to image only a part of the region of interest (e.g., tumor, critical structures). However, when truncated data is used, methods of local tomography have to be employed. Wavelet-based multi-resolution local tomography (WMLT) was used in our work. The method was tested on the simulation of the Shepp-Logan phantom and verified on the experimental synchronous kV/MV CT bench top using the Rando phantom. Excellent correlation between the locally and globally reconstructed images has been observed. Results show that in order to image a 5% area of an object with less than 1% error, less than 25% of the dose is required compared to the global reconstruction, which is close to the theoretical limit. When the requirement of the image quality can be relaxed for daily monitoring, further reduction in the imaging dose is observed up to 90%. At the same average low dose level, the WMLT exhibits much better image quality at the local region-of-interest. We also show that the method can be extended to any non-circular shaped or multiple region-of-interests by a combination of several circular reconstruction areas.

This work is partially supported by a grunt from NIH (P01 CA088960).