

AbstractID: 3574 Title: Volumetric cone beam reconstruction engines for 4D image guidance

Purpose: Limited angle tomography (LAT) may be used to rapidly reconstruct longitudinal slice images from cone beam datasets. These images are useful for image guidance in radiotherapy applications. By sampling a limited angular range (AR) imaging time is reduced, particularly in prospectively gated studies. We compare the LAT performance, as a function of AR, of the standard FDK algorithm and the simultaneous algebraic reconstruction technique (SART). We propose an imaging protocol to minimize dose and imaging time, while providing image guidance. **Method and Materials:** We employ LAT reconstruction (LATview) to produce high contrast images of a target tumor in the presence of large amounts of overlying and underlying anatomy. The performance of the SART and FDK s compared for ARs of 15-60 degrees. **Results:** We demonstrate using a 4D clinical thorax dataset that a lung tumor may be well delineated from within the ribcage along longitudinal planes utilizing as few as 8 projections over 15 degrees of arc using FDK. Assuming an average patient respiration rate of 0.3Hz, gated imaging is completed within 24 seconds. This constitutes an 8-fold reduction in imaging time when compared to a full AR tomographic acquisition involving 60 projections over 200 degrees. **Conclusion:** LATview offers significant speed advantages over full angular sampling for 4D studies. It is also more versatile than techniques of digital tomosynthesis as it is able to simultaneously generate multiple image planes of the target volume. Both FDK and SART appear useful for image guidance. Although the SART images subjectively provide more detail, this detail may reduce the tumor-background contrast (TBC). As a result, TBC is higher for FDK for the lowest AR (15 degree) acquisitions, while SART performs better in terms of TBC for ranges of more than 30 degrees. **Conflict of Interest:** Supported by Siemens Medical Solutions USA, Inc.