AbstractID: 8439 Title: Use of megavoltage fluoroscopy and cone-beam CT for on-line verification during 4D/gated delivery

Purpose: On-line real-time monitoring of tumor motion is essential for 4D/gated radiation delivery based a surrogate signal because the correlation between the surrogate signal and tumor locations on the treatment day may change from that on the simulation day. The purpose of this study is to develop tools to establish a real-time correlation between the surrogate signal and tumor motion by registering on-line megavoltage fluoroscopy (MVF) and/or cone-beam CT with the planning images.
Method and Materials: Both MVF and cone-beam CT were acquired using a flat panel detector installed on a Siemens Linac using 6MV photon beams for phantoms with moving structures and for thoracic cancer patients. A frame-grabber of 7 frames per minute was used to capture the MVF movie. The cone-beam projection images consist of 200 frames corresponding to 200 gantry angles. The acquired images were synchronized with the breathing signal from a pressure sensor (Anzai Inc.). A previously developed software, RTReg4D, was used to register acquired images with planning DRRs from 4DCT.
Results: The software can effectively and accurately register MVF images with time-sequenced DRRs. For the registration with the cone beam projection images, the software fails at some gantry angles and manual registration is needed to correct these false registrations. These registration results can establish a real-time correlation between the Anzai surrogate signals and tumor motion. This correlation would update the correlation established during the planning process for subsequent treatment delivery using either gating or 4D tracking. If gated delivery is used, the gating window may be adjusted based on the real-time correlation.
Conclusion: MV fluoroscopy and/or cone-beam CT acquired before treatment delivery can be used to establish a real-time correlation between surrogate signal and tumor location for 4D/gated treatment delivery.

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