

AbstractID: 6575 Title: US remains a viable and important complementary modality for image-guided RT

Purpose:

We propose that by integrating a unique user interface, calibration protocol and tumor motion assessment strategy, that US imaging can provide a useful tool for image-guided radiation therapy. Its high temporal precision and direct tissue imaging provides a compelling advantage over systems that rely on motion surrogates. We developed a system that uses a unique spatial calibration protocol that allows it to be transported to any room possessing three-point lasers. The system also allows live overlay of a spatially registered 3DCT data set and the US image.

Methods:

Testing was performed using two anatomical phantoms and a programmable motion table. The spatial calibration was determined by touching the tip of the articulating arm to the standard three point laser positions. A GE Lightspeed scanner was used to acquire 4DCT images. High and low contrast test objects were evaluated. The peak-peak motion amplitude of the test objects was measured on the 4DCT scans using three reconstruction data sets; Max/Min pixel intensity, Average pixel intensity, and 4D movie loop. The motion of the test objects was also measured using the US system.

Results:

The three point calibration procedure yielded accurate registration to within the precision of the system (1-2 mm). Assessment of the user interface was qualitative but demonstrated that the superposition of CT and US data sets facilitated discrimination of US artifacts. The US and 4DCT movie loop methods yielded the most accurate motion results. The maximum/minimum pixel intensity reconstructions yielded consistent results but tended to under-estimate the motion by a few millimeters. The 4DCT average pixel intensity reconstruction did not perform well for the low contrast object.

Conclusions:

Integrated US and 4DCT is accurate in assessing respiratory-induced tissue motion. These modalities are complimentary, with US providing good temporal resolution and CT providing excellent geometric accuracy in most situations.

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