AbstractID: 5885 Title: Dynamic, MultiModality Imaging: Temporal Precision and US Artifact Reduction

Purpose

Herein we describe the development of a dynamic fusion technology for ultrasound (US) and other static 3D data sets. We tested whether the high US frame rate is sufficient to accurately track objects subject to respiratory motion. In addition, we used the spatial registration functions of the system to test whether aggressive compounding of US images would be efficacious in terms of artifact reduction and boundary detection.

Materials/Methods

The system's dynamic spatial accuracy was tested using a phantom translated at a velocity of either 4 or 16 mm/s. To test inaccuracies due to video processing we offset the arm and video frame data in single frame increments. Static 3D US data sets were acquired incorporating an acoustic obstruction. Data sets were reconstructed using images from multiple angles of interrogation. Similar experiments were performed to assess the system's ability to reduce reverberation artifacts and tested on a human subject.

Results

By correcting for video processing latency, the system was able to track object motion to 0.2 and 0.5 mm for speeds of 4 and 16 mm/s, respectively. Aggressive image compounding was able to reveal objects that were otherwise obstructed from a single view. Reverberation artifacts were reduced, in addition to enhancing certain object boundaries . These results were present although less obvious in early human testing.

Conclusions

Our imaging system is spatially accurate over a range that permits interrogation of an adult abdomen from a wide range of angles. The system's ability to track respiratory motion has been demonstrated. Aggressive compounding demonstrated that obstructed test objects could be visualized by non-intelligently summing images from varying angles. Soft tissue boundaries and other US artifacts may also benefit from application of the technology.

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