

AbstractID: 6897 Title: Combining Magnetic-Resonance Spectroscopy and Ultrasound Spectral Parameters to improve Tissue-Type Imaging of Prostate Cancer

Purpose: To improve prostate-cancer imaging by making use of independent prostate tissue properties sensed by multiple imaging modalities such as the choline-to-citrate ratio detected by magnetic-resonance (MR) spectroscopy in conjunction with parameters of ultrasound (US) echo-signal spectra and clinical variables.

Method and Materials: Ultrasonic (US) radio-frequency (RF) echo-signal data, and clinical variables including prostate-specific antigen (PSA), were acquired during biopsy examinations. A neural-network classifier was trained using spectral parameters computed from the RF data. Biopsy-core histology was used as the gold standard. Classifier performance was assessed using ROC analysis. A look-up table that returned cancer-likelihood scores for spectral parameter and PSA combinations was used to generate tissue-type images (TTIs). 3-D renderings of the prostate were generated from transverse MR and US scans to determine feasibility of combining the two imaging modalities. The MR 3-D volume was warped in 3-D using the US volume as a reference to compensate for the distortions introduced by the larger endorectal probe used in MR imaging.

Results: The ROC-curve area for US neural-network-based classification was 0.84 compared to the ROC-curve area of 0.64 for B-mode based classification. Cancerous regions that were not visible in conventional US images were revealed in the TTIs. Co-registration of 3-D prostate phantom US and MR images after warping was successful.

Conclusions: TTIs based on neural-network classification of US and clinical parameters show promise for improving the detection of prostate cancer. Warping 3-D renderings of the prostate to compensate for the deformations introduced by different probes appears to be feasible. Consequently, we will be able to produce accurately co-registered 3-D data derived from US and MR to improve methods for visualizing prostate-cancer foci. Success in combining the two imaging modalities will be valuable for depicting cancerous regions in the prostate for biopsy and treatment planning and treatment monitoring.