

BME464L Project (Fall 2013, Palmeri)

Ultrasound Probe 6-Axis Position and Pressure Monitor

Clinical Problem

Ultrasonic elasticity imaging of the prostate is becoming a popular method to diagnostically screen and characterize prostate cancer. Acoustic Radiation Force Impulse (ARFI) imaging of the prostate is one such modality that has been invented and is actively being researched here at Duke University. The prostate, however, has nonlinear mechanical properties that make its elasticity measurements dependent on the absolute pressure being applied to it by the ultrasound probe during. Additionally, 3D spatial positioning of ARFI images must be accurately known to allow the imaging plane to be properly aligned to concurrently acquired B-mode images to guide interventional procedures, and 3D MR imaging data also acquired for prostate evaluation.

Project Objective

Design a 6-axis position detection system and pressure monitoring system that can be coupled to an endorectal ultrasound probe for use in ARFI prostate imaging. Spatial registration and pressure resolution should be refined as much as possible. Transductive elements attached to the transducer must maintain a flush profile to the transducer to be used for in vivo patient imaging. Additionally, pressure and 3D position data can be sent to an Android Nexus 7 for data display and recording.

Clinical / Research Contacts

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