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BIOMEDICAL ENGINEERING

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Selected links:
• Biomedical Image Processing Laboratory >>
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Research Summary

Much of my research involves minimally invasive, interventional medical imaging. In one project, cancerous tumors are tumors are treated with MR-guided RF thermal ablation. My research group is developing 3D registration, segmentation, and visualization imaging is high definition TV viewing of moving objects in the body. This quantum-limited image sequence is quite noisy, and spatio-temporal processing by the human visual system is an extremely important step in the imaging chain. Thus, we study new digital image enhancement techniques using experimental and theoretical image perception evaluations. In yet another application of imaging to treatment, we use high-resolution, 3D MR images to estimate biomechanical parameters in the fingers and wrist in order to plan tendon transfer surgery and functional neuromuscular stimulation (FNS) interventions. Digital image processing can also be applied to nanoscale images, and we are creating techniques using mathematical morphology to improve AFM images of single biomolecules.

Recent Publications

• Salvado O, Hillenbrand CM, and Wilson DL, Partial Volume Reduction by Interpolation with Reverse Diffusion, *International Journal of Biomedical Imaging*. Volume 2006, Article ID 92092, 2006.

• Fei BW, Wang HS, Muzic RF, Flask CA, Oleinick NL, Wilson DL, Duerk JL, Deformable and Rigid Registration of microPET and High-resolution MR Images for Photodynamic Therapy in Mice, *Medical Physics*, 33, 753-761, 2006.

• Salvado O, Hillenbrand CM, Zhang S, Wilson DL, Method to correct intensity inhomogeneity in MR images for atherosclerosis characterization, *IEEE Trans Med Imaging*. May;25(5):539-52, 2006.

• Meilander-Lin NJ, Cheung PJ, Wilson DL, Bellamkonda RV, Sustained in vivo gene delivery from agarose hydrogel prolongs nonviral gene expression in skin. *Tissue Eng*. 11(3-4):546-55. 2005.

• Zhang S, Suri JS, Salvado O, Chen Y, Wacker FK, Wilson DL, Duerk JL, Lewin JS, Inter- and Intra-Observer Variability Assessment of in Vivo Carotid Plaque Burden Quantification Using Multi-Contrast Dark Blood MR Images, *Stud Health Technol Inform*. 113:384-93. 2005.

• Fei B, Suri JS, Wilson DL, Three-Dimensional Volume Registration of Carotid MR Images,

Stud Health Technol Inform. 113:394-411. 2005.

- Fei B, Duerk JL, Sodee DB, Wilson DL, Semiautomatic nonrigid registration for the prostate and pelvic MR volumes, *Acad Radiol*. 12(7):815-24. 2005.

- Breen MS, Lazebnik RS, Wilson DL, Three-dimensional registration of magnetic resonance image data to histological sections with model-based evaluation. *Ann Biomed Eng*. 33 (8):1100-12. 2005.

- Breen MS, Lancaster TL, Wilson DL, Correcting spatial distortion in histological images. *Comput Med Imaging Graph*. 29(6):405-17. 2005.

- Lazebnik RS, Weinberg BD, Breen MS, Lewin JS, Wilson DL, Semiautomatic parametric model-based 3D lesion segmentation for evaluation of MR-guided radiofrequency ablation therapy, *Acad Radiol*. 12:1491-501. 2005.