Portfolio of Image-Guidance and Organ Localization Technologies from the Lab of Professor Michael Miga

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Technology description

Summary
The focus of Dr. Miga’ s laboratory is on the development of new paradigms in detection, diagnosis, characterization, and treatment of disease through the integration of computational models into research and clinical practice.

Technologies

Image-Guided Radio Frequency Ablation
This technology is a method and apparatus for use during the collection and processing of physical space data during image-guided surgery. The innovation provides a complete system for performing tissue ablations that includes a spatial probe, an ablation tool, and a computer processor. Using this technology, the surgeon is able to view the location of the ablation tool in the patient’ s medical images as well as the ablation zone of the instrument and the particular portion of the tissue to be ablated.

Advanced Method for Data Corrections in Organ Deformation
A group of Vanderbilt University researchers have developed a solution that will correct for the mis-registration of image data in image-guided surgery. The solution uses software to correct for any mis-registration that is caused by the presence of intraoperative deformations. This invention helps to improve the performance and capabilities of image-guided surgery.

Image-Guidance System for Breast Cancer Surgery
This technology is an image-guidance system that aims to reduce the revision rate for breast conserving surgeries through the use of intraoperative tumor location. The platform integrates MRI imaging, optical tracking, tracked ultrasound, and patient specific biomechanical models to provide a superior tumor localization end result.

Improving Accuracy in Image-Guided Neurosurgery
This innovation is a method to overcome intra-operative brain shifts experienced during neurosurgery using computer modeling in tandem with image-guided surgery. Previous methods of image-guided surgery proved to have limitations on accuracy, which is overcome by this new method.

Laser Range Scanning for Cortical Surface Registration & Deformation Tracking
This technology aligns a patient in an image-guided surgery system (registration) without the use of fiducial markers on the cranium exterior. The system utilizes laser range scanning technology, the

features on the cortical surface and the corresponding natural features derived from the patient’ s preoperative MR-data. In addition, the technology is amenable to measuring deformation (brain shift) in order to compensate for intra-operative registration error.

Compression Correction for Ultrasound Imaging

Vanderbilt researchers have developed a system that corrects for compressional effects in ultrasound data during soft tissue imaging. The system uses tracking and digitization information to detect the pose of the ultrasound probe during imaging, and then couples this information with a biomechanical model of the tissue to correct compressional effects during intraoperative imaging.

Trackerless Image-Guidance Using a Surgical Microscope

This technology is a new image-guided, tracker-less surgical microscope system to be used in soft tissue surgeries. The current method is to use a surgical microscope along with an image-guided system. This new design eliminates the need for a separate image-guidance system; the entire guidance environment can be realized within the microscope environment.

Institution

Vanderbilt University

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com