Western
Biomedical Imaging
Research Centre

SEMINAR SERIES
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Tuesday, December 4th, 2018; 4:30 - 5:30 pm

Fisher Conference Room
2nd Floor - Robarts Research Institute

Pizza will be served

Dr. Matthieu Chabanas, PhD

Associate Professor, Grenoble Alpes University, France Visiting Scholar, Vanderbilt University, Nashville, TN, USA

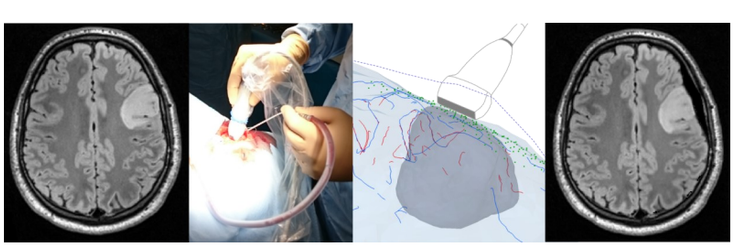
Title: Biomechanical model-based registration for image-guided surgery: applications to brain-shift compensation and thoracoscopic surgery.

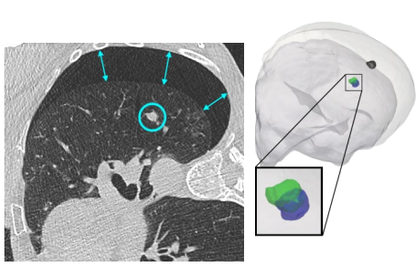
Abstract: In recent years, the importance of computer simulation of deformable organs has increased considerably for surgical planning, guidance or training. In this presentation, two biomechanical models of the brain and lung will be presented for registration with intra-operative images.

The first application concerns brain-shift compensation during tumor resection in neurosurgery.

A patient-specific model of the brain is first built from pre-operative MR images, including blood vessels around the tumor. Sliding contacts are allowed between brain tissues and the dura matter, tentorium and cerebral falx. This model is used to iteratively register the pre-operative vascular tree to the intra-operative one, extracted from navigated Doppler Ultrasound images.

Qualitative and quantitative results on 5 retrospective cases have shown that, on average, 67% of the brain-shift can be corrected.





The second application is Video Assisted Thoracoscopic Surgery (VATS).

During VATS, large deformations of the lung occur due to a pneumothorax, created when air penetrates in the chest case through surgical ports.

Once the lung is deflated, intra-operative localization of small, deep of low-density nodules is extremely challenging. A biphasic model of the lung is thus proposed, to simulate the lung deflation and deformation.

This model is used to register preoperative CT images with an intra-operative CBCT image, acquired at the beginning of the procedure. A first evaluation of this preliminary lung model will be presented.

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