

## Scientific Computing

- Publications
- Center for Biomedical Computing
- Projects
- Available Master's topics
- Intranet
- People

## CBC Workshop on Ultrasound Imaging of Cardiac Activity - March 23, 2009

**Professor Matthew O'Donnell from University of Washington , who is a leading scientist in ultrasound imaging, visited CBC and a workshop was organized to communicate cutting edge research on imaging of the heart.**

Total number of participants: 17  
 Total number of guests outside of CBC: 11  
 Number of different nationalities represented: 6  
 Total number of speakers: 1  
 Total number of talks: 2

### 11:15 Functional Assessment of Cardiac Contractility Using Ultrasound Speckle Tracking

Ultrasound strain imaging using 2D speckle tracking has been proposed to quantitatively assess changes in myocardial contractility due to ischemia. As a step toward clinical application, we have developed a well-controlled 2-D cardiac elasticity imaging technique using two coplanar and orthogonal linear probes simultaneously imaging an isolated retroperfused rabbit heart. Acute ischemia was generated by left anterior descending (LAD) artery ligation. The excitation-contraction decoupler, 2,3-butanedione monoxime (BDM), was applied at a 4mM concentration to reversibly reduce the contractility of myocardium.

Results using a single probe demonstrate that directional changes in the in-plane principal deformation axes can be used to locate the bulging area due to LAD ligation, and normal strain along the principal axes can characterize heart muscle contractility. Results using asymmetric displacement accuracy (i.e., normal single probe measurements with good axial and poor lateral estimates) were further validated using symmetric displacement accuracy (i.e., dual probe measurements using only accurate axial tracking estimates from each). However, the accuracy of 2D cardiac strain imaging using a single probe depends on the probe's orientation due to the large variance in lateral displacement estimates.

### 12:00 - 13:00 Lunch

### 13:00 Cardiac Activation Mapping Using Ultrasound Current Source Density Imaging

Intracardiac ablation procedures to correct drug-resistant arrhythmias require accurate maps of cardiac activation. Conventional methods are time-consuming and have poor spatial resolution (5- 10 mm). We have developed a potentially high resolution, minimally invasive method, Ultrasound Current Source Density Imaging (UCSDI), to map biological currents. UCSDI is based on the acousto-electric (AE) effect, a modulation of the electric resistivity by acoustic pressure. If a current passes through the focal region of an ultrasound transducer, a voltage modulated at the ultrasonic frequencies can be measured with a pair of electrodes located distant to the focal zone. By sweeping the focal zone, UCSDI can map a distributed current field.

UCSDI has several potential advantages as a technique for mapping cardiac activation currents: high spatial resolution determined by the typically sub-mm focal characteristics of the ultrasound beam, short mapping time using electronically steered ultrasonic beams, and automatic registration with B-mode ultrasound images without sophisticated mathematical algorithms. As an initial test, UCSDI was used to detect and map biological currents in an isolated rabbit heart.

Both UCSDI and normal low frequency electrocardiograms (ECG) were measured simultaneously by tungsten electrodes embedded in the left ventricle. Measured UCSDI maps showed temporal and spatial patterns consistent with a spreading activation wave and timing consistent with normal ECG signals.

### About the speaker

Professor Matthew O'Donnell is dean of engineering at University of Washington and holds 50 patents and has authored or co-authored more than 200 publications. He is associate editor of the journal *Ultrasonic Imaging*, is a permanent member of the National Institutes of Health Imaging Study Section, a fellow of both IEEE and AIMBE, and a member of Sigma Xi, and the American Physical Society.

Please visit: [www.engr.washington.edu/about/dean/index.html](http://www.engr.washington.edu/about/dean/index.html) for more information about Professor O'Donnell

<b>What</b>	▪ Seminar
<b>When</b>	Mar 23, 2009 from 11:00 AM to 02:00 PM
<b>Where</b>	Storstua @ Simula
<b>Contact Name</b>	Sverre Holm
<b>Attendees</b>	Robert Artebrand Andreas Austeng Ann Blomberg Jean-Francois Gelly Roy Hansen Geir V. Haugen Iben Holfart Sverre Holm Atle Jensen

	Kjell Kristoffersen Pan Li Glenn Lines Marius Lysaker Molly Maleckar Matthew O'Donnel Anders R. Sørnes Kirsten ten Tusscher
<b>Add event to calendar</b>	 vCal  iCal