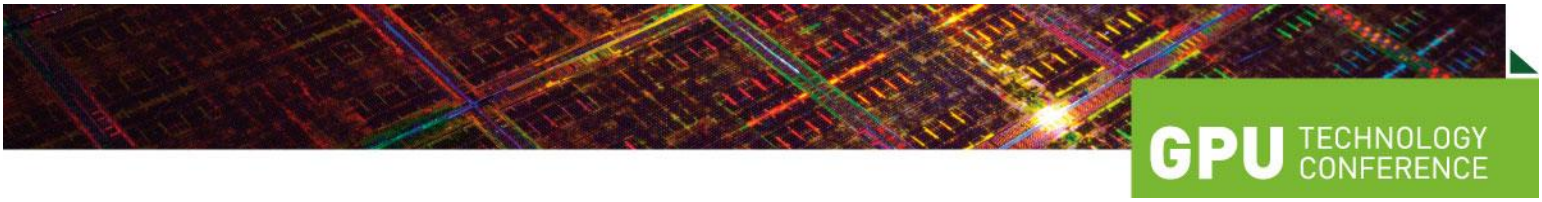


**GPU Technology Conference, May 14-17, 2012**
**McEnery Convention Center, San Jose, California**
www.gputechconf.com

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## Sessions on Medical Imaging & Visualization (subject to change)

*IMPORTANT: Visit http://www.gputechconf.com/page/sessions.html for the most up-to-date schedule.*

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**S0328 - Best Practices in GPU-Based Video Processing**
**Thomas True (NVIDIA)**
**Day:** Tuesday, 05/15 | **Time:** 2:00 pm - 2:50 pm
**Topic Areas:** Audio, Image and Video Processing; Digital Content Creation & Film; Computer Vision; Medical Imaging & Visualization
**Session Level:** Intermediate

The combination of the GPU's massively parallel compute engine with extremely high memory bandwidth and new programming paradigms such as CUDA and OpenCL have made the GPU well suited for image and video processing applications. This session will explore best practices and techniques for the development of efficient GPU-based video and image processing applications. Topics to be discussed include image segmentation and threading models for efficient parallelism, optimal memory usage strategies to reduce expensive data movement as well as multi-GPU considerations. Case studies and examples specific to video and image processing will be presented.

**S0017 - 4D Medical Image Processing with CUDA**
**Anders Eklund (Linköping University)**
**Day:** Wednesday, 05/16 | **Time:** 9:00 am - 9:50 am
**Topic Areas:** Medical Imaging & Visualization; Audio, Image and Video Processing; Neuroscience; Visualization
**Session Level:** Advanced

Learn how to do 4D image processing with CUDA, especially for medical imaging applications. In this session we will give a couple of examples of how 4D image processing can take advantage of the computational power of the GPU. We will present how to use the GPU for functional magnetic resonance imaging (fMRI) analysis and true 4D image denoising. Most of our examples use the GPU both to speed-up the analysis and to visualize the results.

**S0312 - GPU Implementation for Rapid Iterative Image Reconstruction in Nuclear Medicine**
**Jakub Pietrzak (University of Warsaw)**
**Day:** Wednesday, 05/16 | **Time:** 10:00 am - 10:25 am
**Topic Areas:** Medical Imaging & Visualization; Computational Physics; Computer Graphics
**Session Level:** Intermediate

GPU implementation can greatly accelerate iterative techniques of 3D image reconstruction in nuclear medicine imaging. Single Photon Emission Computed Tomography (SPECT) is a functional imaging modality widely used in clinical diagnosis. To obtain high quality images within reduced scanning times high sensitivity collimators need to be used and their response function modeled in the reconstruction. This is in general very computationally intensive and unfeasible with CPU and algorithm implementations. Our software is able to perform the reconstruction of patient data within clinically acceptable times using relatively low cost and widely available hardware.

**S0348 - GPUs Open New Avenues in Medical MRI**
**Chris A. Cocosco (University Medical Center Freiburg, Dept. of Radiology, Medical Physics)**
**Day:** Wednesday, 05/16 | **Time:** 10:30 am - 10:55 am
**Topic Areas:** Medical Imaging & Visualization
**Session Level:** Beginner

See how GPUs enable exciting new developments in medical Magnetic Resonance Imaging (MRI). Their computational power makes now practical new MRI techniques that can bring shorter imaging sessions, better images, and more insight into human physiology. Learn about the characteristics of the general computational approach for obtaining the final image, and how it can be implemented using an iterative conjugate gradient algorithm. The algorithm exhibits massive parallelism and fits well the GPU architecture. Learn about its CUDA implementation details and Matlab integration. See throughput measurements of Tesla GPUs compared to top of the line many-core and large RAM CPU systems.

**S0105 - Hardware Acceleration for Vessel Visualization Tasks**
**Christoph Kubisch (NVIDIA)**
**Day:** Wednesday, 05/16 | **Time:** 2:30 pm - 2:55 pm
**Topic Areas:** Medical Imaging & Visualization; Computer Graphics
**Session Level:** Beginner

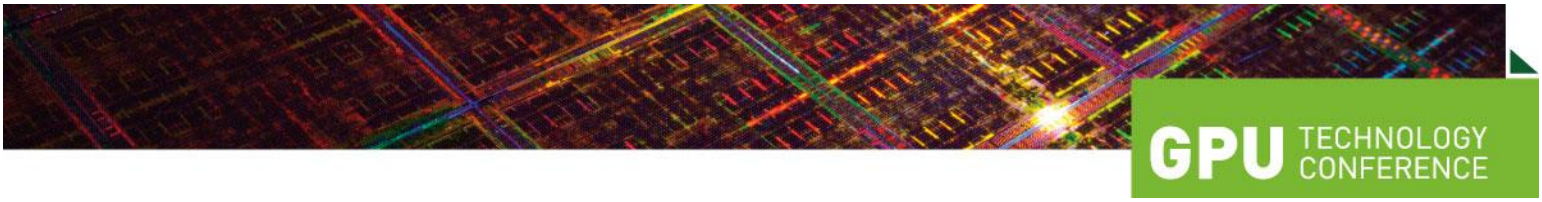
To analyze datasets visually, systems with fast feedback loops on user interaction are beneficial. In this session rendering and preprocessing techniques for medical volume data will be presented using OpenGL and CUDA. In the context of the coronary artery disease the analysis of individual vessel branches is important. We show how local transfer function application and generation by means of histogramm analysis can help navigating and finding details in the datasets. Furthermore, domain-specific acceleration and illustration techniques for volume rendering are also applied to datasets from brain aneurysms.

**S0141 - GPU-Accelerated Optical Coherence Tomography Imaging**
**Kang Zhang (GE Global Research)**
**Day:** Wednesday, 05/16 | **Time:** 3:30 pm - 3:55 pm
**Topic Areas:** Medical Imaging & Visualization
**Session Level:** Beginner

We developed a series of GPU-based technologies to accelerate the imaging reconstruction and visualization for optical coherence tomography (OCT). Several GPU-based algorithms such as non-uniform fast Fourier transform, numerical dispersion compensation, simultaneous phase modulation and multi-GPU implementation were developed to achieve improved impulse response, better SNR, doubled imaging range and higher system stability. The GPU-accelerated 4D-OCT system was validated by imaging both in vivo and ex vivo biological tissues. This technology overcomes the imaging reconstruction and visualization bottlenecks that widely exist in current ultrahigh speed OCT systems and opens the way to interventional OCT imaging for applications in guided microsurgery.

**S0303 - GPU Acceleration for Threshold Based Region Growth Algorithms**
**Supratik Moulik (University of Pennsylvania), Jason Walsh (University of Pennsylvania 3D lab)**
**Day:** Thursday, 05/17 | **Time:** 9:00 am - 9:50 am
**Topic Areas:** Medical Imaging & Visualization; Bioinformatics
**Session Level:** Beginner

Come learn how the massively parallel computing power of modern GPUs help to create faster and more accurate volume rendered images for the medical imaging community. Attendees of this session will gain insight into how




GPUs can accelerate region growth algorithms and how these algorithms can be optimized for the latest generation of NVIDIA hardware. Topics covered will include fundamental of region growth, GPU implementations, and practical examples of vessel tracking algorithms based on GPU accelerated algorithms.

**S0382 - Hybrid System Architectures for High-Speed Processing in Optical Coherence Tomography**
**Brian Applegate (Texas A&M University Department of Biomedical Engineering)**
**Day:** Thursday, 05/17 | **Time:** 10:00 am - 10:25 am
**Topic Areas:** Medical Imaging & Visualization; Life Sciences; Application Design & Porting Techniques; Development Tools & Libraries
**Session Level:** Intermediate

Several factors are spurring the development of hardware and software to accomplish high-speed processing for Optical Coherence Tomography (OCT), e.g. ultrahigh speed (>1 MHz) volumetric imaging and clinical applications (e.g. intravascular imaging). The computation power of GPUs ensures that it will be an essential part of the solution. We are exploring the development of a hybrid system in which the computational burden is shared between GPUs and other processors. This will make it possible to extract crucial diagnostic information in real or near real time. Technical challenges and recent progress will be discussed.