

GPU Technology Conference 2010 Sessions on Medical Imaging & Visualization (subject to change)

IMPORTANT: Visit www.nvidia.com/gtc for the most up-to-date schedule and to enroll into sessions to ensure your spot in the most popular courses.

2009 - 4D Visualization and Analysis of Flow

4D flow or vector data is now common in CFD simulations as well as acquisition techniques like 4D flow MRI to study abnormal blood flow patterns. We show how by mixing compute and graphics combined with stereo we are now able to interactively analyze and visualize the resulting data to understand abnormal flow patterns. Topics include flow field rendering, computing derived quantities, merging volumetric rendering with computed geometry such as particles and surfaces, and integration 3d vision stereo.

Speaker: Shalini Venkataraman, NVIDIA

Topics: Medical Imaging & Visualization, Computational Fluid Dynamics, Stereoscopic 3D

Time: Tuesday, September, 21st, 17:00 - 17:50

2201 - A Case Study of Accelerating Matlab Based Applications using GPUs

Learn how to accelerate Matlab based applications using GPUs. We cover a popular neuro-imaging software called SPM and show how to use CUDA and Jacket to speedup computationally intensive Matlab applications.

Speaker: Aniruddha Dasgupta, Georgia Institute of Technology

Topic: Medical Imaging & Visualization

Time: Wednesday, September, 22nd, 16:00 - 16:50

2236 - A Work-Efficient GPU Algorithm for Level Set Segmentation

Explore a novel GPU level set segmentation algorithm that is both work-efficient and step-efficient. Our algorithm has $O(\log n)$ step-complexity, in contrast to previous GPU algorithms

which have $O(n)$ step-complexity. We apply our algorithm to 3D medical images and we show that in typical clinical scenarios, our algorithm reduces the total number of processed level set field elements by 16x and is 14x faster than previous GPU algorithms with no reduction in segmentation accuracy.

Speaker: Mike Roberts, Hotchkiss Brain Institute, University of Calgary, Canada

Topics: Medical Imaging & Visualization, Algorithms & Numerical Techniques, Computer Vision, Computer Graphics

Time: Thursday, September, 23rd, 09:00 - 9:50

2001 - Acceleration of the Freesurfer Suite for Neuroimaging Analysis

See how GPU technology has dramatically accelerated the Freesurfer suite of tools used by thousands of researchers for the analysis of neuroimaging data.

Speaker: Richard Edgar, Mass. General Hospital

Topics: Medical Imaging & Visualization, Imaging, Tools & Libraries

Time: Thursday, September, 23rd, 10:00 - 10:50

2235 - Advanced Medical Volume Rendering and Segmentation on the GPU

Learn how to speed up your interactive medical visualization pipeline by an order of magnitude and dramatically improve rendering quality at the same time. Leading researchers in medical imaging informatics describe recent advances in volume visualization and interactive segmentation. Emphasis is on the underlying parallel GPU algorithms and acceleration data structures.

Speakers: Mike Roberts, Hotchkiss Brain Institute, University of Calgary, Canada, Eric Penner, Hotchkiss Brain Institute, University of Calgary, Canada

Topics: Medical Imaging & Visualization, Algorithms & Numerical Techniques, Computer Vision, Computer Graphics

Time: Tuesday, September, 21st, 15:00 - 15:50

2036 - Algorithms for Automated Segmentation of Medical Imaging Studies Utilizing CUDA

Discover how GPU computing can help doctors make sense of modern imaging studies. This session is intended for a general audience as well as medical informatics specialists. The focus will be on algorithmic approaches to segmentation as it pertains to CTA (computed tomography angiography) studies. Topics covered will include specialized optimization algorithms and novel lumen tracking methodologies.

Speaker: Supratik Moulik, University of Pennsylvania

Topics: Medical Imaging & Visualization, Computer Vision

Time: Tuesday, September, 21st, 16:00 - 16:50

2021 - Efficient Volume Segmentation on the GPU

Explore a new technique in the detection of common regions in a 2D/3D data array. Connected components along the axes are linked before actual label propagation starts. The algorithm is completely gather-based, which allows for several optimizations in the CUDA C implementation. It enables real-time frame rates for the analysis of typical 2D images and interactive frame rates for the analysis of typical volume data.

Speakers: Allan Rasmusson, University of Aarhus (NVIDIA intern), Gernot Ziegler, NVIDIA

Topics: Algorithms & Numerical Techniques, Computer Vision, Imaging, Medical Imaging & Visualization

Time: Wednesday, September, 22nd, 17:00 - 17:50

4010 - Emerging Companies: CEO on Stage featuring Natural Motion, Optitex, and Useful Progress

See the hottest new technologies from startups that could transform computing.

In a lively and fast-paced exchange, the “Emerging Companies Summit - CEO on Stage” sessions will feature CEOs from three startups who will have 8 minutes to introduce their companies and 8 minutes to interact with a panel of industry analysts, investors and technology leaders.

This CEO on Stage session will feature Natural Motion, Optitex, and Useful Progress - covering the fields of computer graphics, physics simulation, and medical imaging.

Panelists will include Bill Tai (CRV), Paul Weiskopf (Adobe), and Tim Bajarin (Creative Strategies).

Speakers: Bill Tai, Charles River Ventures, Yoram Burg, OptiTex USA Inc., Sylvain Ordureau, UsefulProgress, Paul Weiskopf, Adobe, Tim Bajarin, Creative Strategies

Topics: General Interest, Medical Imaging & Visualization, Physics Simulation, Computer Graphics

Time: Thursday, September, 23rd, 15:00 - 15:50

2020 - GPU-Accelerated Data Expansion for the Marching Cubes Algorithm

Learn how to accelerate marching cubes on the GPU by taking advantage of the GPU's high memory bandwidth and fast on-chip shared memory in a data expansion algorithm that can extract the complete iso-surface mesh from (dynamic) volume data without requiring any data transfers back to the CPU.

Speakers: Gernot Ziegler, NVIDIA, Chris Dyken, SINTEF

Topics: Algorithms & Numerical Techniques, Imaging, Medical Imaging & Visualization

Time: Wednesday, September, 22nd, 16:00 - 16:50

2282 - GPU-Enabled Biomedical Imaging

The purpose of this presentation is to describe several novel biomedical imaging applications which make extensive use of GPUs. In CT iterative reconstructions, for example, high performance computing is allowing us to see details and structures we previously were not able to discern.

Speaker: Homer Pien, MGH / HMS

Topics: Medical Imaging & Visualization, High Performance Computing, Imaging, Life Sciences

Time: Wednesday, September, 22nd, 17:00 - 17:50

2096 - High-Speed CT Reconstruction in Medical Diagnosis & Industrial NDT Applications

We present the software platform CERA developed by Siemens, which utilizes (multiple) graphics processing units (GPUs) in order to deliver high-speed CT reconstructions, and describe its implementation challenges using CUDA and OpenCL. We further show how GPU acceleration

enables the utilization of reconstruction approaches which provide highly improved reconstruction quality in NDT applications.

Speaker: Holger Scherl, Siemens AG

Topics: Medical Imaging & Visualization, Imaging

Time: Tuesday, September, 21st, 11:00 - 11:50

2139 - Interactive Histology of Large-Scale Biomedical Image Stacks

Get the latest information on leveraging GPU computing to process and visualize large-scale biomedical image stacks. We will discuss both display-aware processing and GPU-accelerated texture compression for histology applications on the GPU.

Speakers: Won-Ki Jeong, Harvard University, Jens Schneider, King Abdullah University of Science and Technology

Topics: Medical Imaging & Visualization, Imaging, Life Sciences

Time: Wednesday, September, 22nd, 14:00 - 14:50

2144 - Large-Scale Visualization Using A GPU Cluster

Learn how to visualize extremely large-scale scientific data using GPGPU techniques on a GPU-accelerated visualization cluster. Recent advances in general-purpose GPU (GPGPU) computing provide a promising solution to compute-intensive scientific visualization. However, the largest scientific simulations produce datasets that are orders of magnitude larger than the memory available on current GPUs. Many distributed GPUs must be used in parallel. We present Longhorn, currently the world's largest GPU-enhanced cluster dedicated for visualization and data analysis, and describe the distributed memory architecture and GPGPU techniques to interactively visualize massive datasets using distributed GPUs on Longhorn.

Speakers: Byungil Jeong, TACC / UT-Austin, Paul Navratil, Texas Advanced Computing Center

Topics: Medical Imaging & Visualization, High Performance Computing

Time: Wednesday, September, 22nd, 16:00 - 16:50

2211 - Modern Architecture for Massively Parallel Medical Tomographic Image Reconstruction on a GPU Cluster

Learn how to combine GPU and Cluster Programming with a real-world example. Many aspects of medical tomographic image reconstruction are embarrassingly parallel, but require massive compute power. We distribute the load onto a cluster of multi-GPU equipped nodes using Message Passing Interface (MPI) and CUDA. The Thrust library allows for a modern object-oriented approach.

Speakers: Sven Prevrhal, Philips, Jingyu Cui, Stanford University

Topics: Medical Imaging & Visualization, Algorithms & Numerical Techniques, High Performance Computing, Tools & Libraries

Time: Wednesday, September, 22nd, 15:00 - 15:50

2094 - Nearly Instantaneous Reconstruction for MRIs

GE's Autocalibrating Reconstruction for Cartesian Imaging (ARC) is a computationally intensive, widely used algorithm in MRI Reconstruction using Parallel Imaging. We demonstrate that an optimized CUDA implementation of ARC on a GPU can enable nearly instantaneous reconstruction and speedups of up to 10x over an optimized dual socket QuadCore CPU implementation. We will discuss challenges both with computational intensity and data read/write efficiency. We will also compare the Fermi C2050 with the C1060.

Speaker: Babu Narayanan, GE Global Research

Topics: Medical Imaging & Visualization, High Performance Computing

Time: Tuesday, September, 21st, 14:00 - 14:50

2248 - Parallel Processing on GPUs at the University of Utah

The University of Utah is a CUDA Center of Excellence. We have been doing both basic and applied research using CUDA. In this session, we plan to give 3-4 talks on ongoing research. Most of the work that we will be presenting has been peer reviewed at top conferences.

Speakers: Claudio Silva, University of Utah, Huy Vo, University of Utah

Topics: High Performance Computing, Life Sciences, Medical Imaging & Visualization, Tools & Libraries

Time: Wednesday, September, 22nd, 14:00 - 14:50

2169 - Real-time Volumetric Medical Ultrasound Applications for GPU Computing

Real-time volumetric medical ultrasound requires computationally intensive rapid processing of data for visualization of acquired acoustic data. Clinical applications of GPU-based technologies in obstetrics and cardiology will be discussed.

Speaker: Roe Lazebnik, Siemens Healthcare

Topics: Medical Imaging & Visualization, Imaging, Stereoscopic 3D, Computer Graphics

Time: Wednesday, September, 22nd, 10:00 - 10:50

2134 - Ultra High Resolution Displays and Interactive Eyepoint Using CUDA

We'll go over the challenges we have overcome in building 100 million pixel seamless displays. One customer requirement involves interactive changes of the eyepoint as a person moves, relative to the screen, yet the distortions computed are quite non-linear. We discuss our use of a GPU to implement this procedure.

Speaker: Rajeev Surati, Scalable Display Technologies

Topics: Computer Graphics, High Performance Computing, Medical Imaging & Visualization

Time: Wednesday, September, 22nd, 10:00 - 10:50

2146 - Virtual Surgery

Come see how 3D Vision technology is used in Virtual Surgery Training for Medical Education. BioDigital Systems in conjunction with University of California San Francisco (UCSF), has developed a dental injection simulator to teach students of dentistry the mechanics of nerve block injection. 3D Vision Technology has added a new dimension of realism by providing users with a unique immersive experience.

Speaker: Aaron Olikier, BioDigital

Topics: Medical Imaging & Visualization, Stereoscopic 3D

Time: Wednesday, September, 22nd, 11:00 - 11:50