
SIGGRAPH2006
Advanced Real-Time Rendering
in 3D Graphics and Games
Course 26
SIGGRAPH 2006
Boston, MA

Convergence of Games and Research

- Explosion of innovative algorithms in the interactive domain
  - Advances in real-time graphics research
  - Ever increasing power of mainstream GPUs
- Games are quickly catching up to research in complexity
  - Tremendous visual quality improvements
  - Novel algorithms driven by game developers push researchers

Advances in real-time graphics research and the increasing power of mainstream GPUs has generated an explosion of innovative algorithms suitable for rendering complex virtual worlds at interactive rates. This course will focus on the interchange of ideas from game development and graphics research, demonstrating converging algorithms enabling unprecedented visual quality in real-time.

The amazing power of the latest GPUs has spurred a real osmosis of ideas between the game developers and state-of-the-art graphics research. This course will present innovative real-time algorithms from award-winning game engines and ground-breaking 3D rendering that are pushing the visual boundaries and interactive experience of complex virtual worlds.

State-of-the-Art Real-Time Rendering

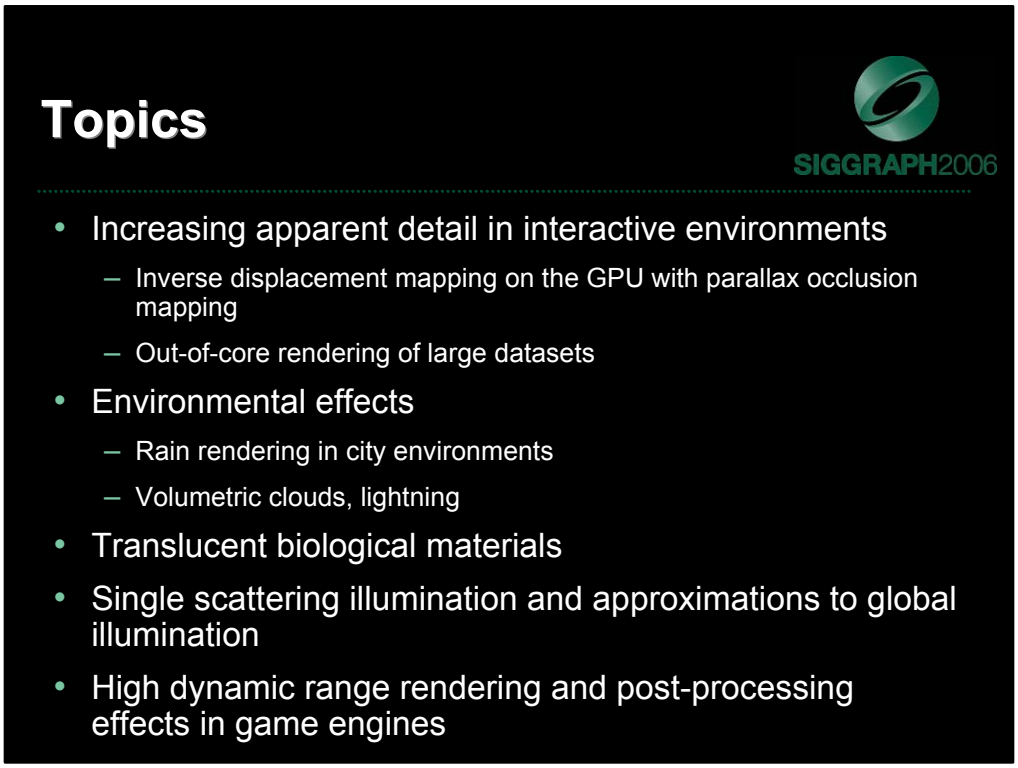
- Focus on interactive research algorithms
- Algorithms implemented in several award-winning games

- General, optimized methods
- Applicable in a variety of applications
  - Game rendering
  - Scientific visualizations
  - Offline and cinematic rendering

This course will include state-of-the-art real-time rendering research as well as algorithms implemented in several award-winning games and will focus on general, optimized methods applicable in variety of applications including scientific visualization, offline and cinematic rendering, and game rendering.

Challenges

- Interactivity and massive worlds require high detail
  - Complexity grows with each year
- Algorithms must be flexible to be easily adopted on variety of hardware models
- Many unsolved research problems
  - Dynamic global illumination
  - Detail representation



Examples of practical real-time solutions to complex rendering problems. Some of the topics covered will include interactive inverse displacement mapping on the GPU with parallax occlusion mapping; out-of-core rendering of large datasets; efficient foliage rendering in large virtual worlds; high dynamic range rendering integration and post-processing effects in game engines; single scattering illumination and global illumination approximation; realistic rain rendering, among others.

Lecturers

- Natalya Tatarchuk, ATI Research, Inc.,
- Christopher Oat, ATI Research, Inc.,
- Pedro Sander, ATI Research, Inc. / University of Hong Kong
- Jason Mitchell, Valve,
- Alex Evans, Independent Game Developer,
- Carsten Wenzel, Crytek

Course Schedule – Morning

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8^{30}am	Introduction (Tatarchuk)	
8^{45}am	Out-of-Core Rendering of Large Meshes with Progressive Buffers (Sander)	
9^{30}am	Animated Skybox Rendering and Lighting Techniques (Sander)	
9^{45}am	Rendering Gooey Materials with Multiple Layers (Oat)	
10^{15} - 10^{30} am	*Break*	

-8:30 am – Introduction (15 minutes)

-8:45 am - Out-of-Core Rendering of Large Meshes with Progressive Buffers (Sander) (45 minutes)

-9:30 am - Animated Skybox Rendering and Lighting Techniques (Sander) (15 minutes)

-9:45 am - Rendering Gooey Materials with Multiple Layers (Oat) (30 minutes)

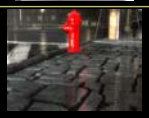
-10:15 am – Break

-10::30 am - Fast Approximations for Global Illumination on Dynamic Scenes (Evans) (45 minutes)

-11:15 am - Parallax Occlusion Mapping for Detailed Surface Rendering (Tatarchuk) (60 minutes)

-12:15 pm – Lunch

Course Schedule – Morning

10^{30} am	Fast Approximations for Global Illumination on Dynamic Scenes (Evans)	
11^{15} am	Parallax Occlusion Mapping for Detailed Surface Rendering (Tatarchuk)	
12^{15}pm–1^{30} pm	*Lunch*	

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-12:15 pm – Lunch

Course Schedule - Afternoon

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1:30 pm	Shading in Valve's Source Engine (Mitchell)	
2:15 pm	Artist-Directable Real-Time Rain Rendering in City Environments (Tatarchuk)	
3:30 pm-3:45 pm	*Break*	
3:45 pm	Ambient Aperture Lighting (Oat)	
4:30 pm	Real-Time Atmospheric Effects in Games (Wenzel)	
5:15 pm	*Discussion and Q & A (All)*	

-1:30 pm - Shading in Valve's Source Engine (Mitchell) (45 minutes)

-2:15 pm - Artist-Directable Real-Time Rain Rendering in City Environments (Tatarchuk) (75 minutes)

-3:30 pm – 3:45pm Break

-3:45 pm - Ambient Aperture Lighting (Oat) (45 minutes)

-4:30 pm - Real-time Atmospheric Effects in Games (Wenzel) (45 minutes)

-5:15 pm - Discussion and Q & A (All)