

Thorsten P. Scheuermann

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WORK EXPERIENCE

Engine and Graphics Programmer, Valve Software (*September 2007 – present*)

- Design and implement core rendering-related technologies of Source 2 game engine, including ongoing support, optimizations, and updates to meet changing requirements
- **Material system** and scene management: Ongoing optimizations to material management (e.g. async loading, cache efficiency); evolving API and backend for features (e.g. compute shaders) and efficiency on new rendering APIs like Vulkan (e.g. taking better advantage of pre-baking static descriptor sets).
- **Shader compilation framework** and distributed shader compiler, cross-platform shader compilation
- **Texture streaming** based on estimating required texture resolution per object (mip-level streaming granularity)
- **Deferred PBR rendering pipeline** with slim G-Buffer layout (2-channel compressed albedo), GGX-prefiltered cubemap reflections, screen-space reflections, efficient water rendering, SSAO, HDR auto-exposure + tonemapping + bloom post-processing, prototyped painterly NPR post-effect
- **Lightmapping optimizations** including multithreading, ray batching, and Embree library integration for increased artist productivity (~10x speedup in multiple critical phases)
- Updates to critical internal **distributed computing framework** used for shader compilation and map lighting to prevent studio work stoppage due to internal network security hardening by IT.
- Artist and modder-facing **UI tools**: Implement features in level editor, model editor, post-processing editor and material editor
- Prototype lighting and rendering algorithms, some of them novel at the time
- Prototype gameplay and iterate based on playtest feedback
- Shipped Titles:
 - **Left 4 Dead** – shader programming, solved character readability problems identified in playtests through lighting, Xbox 360 GPU and CPU optimizations, bug fixes
 - **Left 4 Dead 2** – zombie wound shader, CPU and GPU optimization, bug fixes
 - **Portal 2** – portal rendering CPU optimization for Xbox 360 and PS3, bug fixes
 - **Dota 2** – engine feature work for Source 2 port, shader features, bug fixes, low-end CPU, GPU, and memory optimizations, texture compression for UI
 - **Team Fortress 2** – bug fixes and shader features during ongoing development
 - **Counter Strike: Global Offensive** – improved GI baking, optimizations, bug fixes, artist support for new map release
 - Engine technology I worked on is also used in **Robot Repair** VR demo and **Steam VR Home**.

Personal Project (*May 2016 – December 2016*)

- Created physics-based iPhone game (“Bust-a-Move with Physics”) to learn Unreal Engine 4
- Implemented customized spring physics, wrote a customized shader that “shrink-wraps” a sphere mesh to a signed distance field, wrote game code as a mix of C++ and Blueprints

Lead Programmer (previously SW Engineer and Senior SW Engineer), ATI/AMD, 3D Application Research Group (*April 2003 – August 2007*)

- Lead development of new cross-platform graphics engine (“Sushi 3”) and asset pipeline used for graphics demos
 - Sushi 3 supports DX10, DX9, OpenGL, OpenGL/ES, and has been used for all Radeon HD 2900 launch demos
 - Designed and implemented shader effects system – similar to D3D's FX files, but cross-platform
 - Coordinated team of three engineers working on various parts of the engine
- Designed and implemented flexible Lua-based scripting system
- Designed and implemented an extensible particle system, including GUI particle editor with real-time preview

- Added GUI system to demo engine to allow for convenient control of shader and script parameters
- Shipped demos:
 - **Radeon HD 2900 launch demo: “Whiteout”** – Particle system shading, particle and hair self-shadowing, GPU-based facial animation, HDR tone-mapping
 - **Radeon X1800 demo: “Toyshop”** (featured in the Eurographics 2006 Animation Festival and SIGGRAPH 2007 Electronic Theater) – Prototyped GPU-based water surface simulation, particles, blurry street reflections
 - **Radeon X1800 demo: “The Assassin”** (featured in the Eurographics 2006 Animation Festival) - Took over project lead responsibilities midway through project. Our team ported this demo from PC to Xbox 360 in three weeks, for use in Microsoft's Xbox 360 press briefing tour
 - **Radeon X850 demo: “Ruby: Dangerous Curves”** – Implemented dynamic cubemap reflections, optimized motion blur, shader programming, engine optimizations
 - **Radeon X800 demo: “Ruby: The Double Cross”** (featured in the SIGGRAPH 2004 Computer Animation Festival) Developed many of the shaders used in the demo, including most of the high-profile shading techniques: Depth of field rendering, Hair rendering, Gemstone rendering
 - **Radeon X800 demo: “Crowd”** (showcases rendering massive amounts of characters) – Designed and implemented technique for character shadows, added post-processing effects

Research Assistant, UNC Effective Virtual Environments Group (*Spring 2001 - April 2003*)

- Ported main research demo from SGI to PC using a 3D game engine and extended this engine to VR-specific needs
- Designed and implemented a handheld PDA interface to wirelessly control VR applications
- Assisted with set-up and operation of VR demo and running a large user study (about 200 participants) in the Emerging Technologies section at SIGGRAPH 2002

Graphics Architecture Intern, NVIDIA (*Summer 2002*)

- Evaluated options for integrating scripting capabilities into a new testing framework for graphics processors
- Integrated Lua scripting engine and ported GPU display engine tests to run in new scripting environment

Programmer, SSM Testronik GmbH (*Germany, 1996 - 2000, part-time*)

- Created new application modules for a computer-controlled material testing system and made customer-specific changes to existing code
- Ported parts the system from QNX to Linux

PUBLICATIONS

Computing Per-Pixel Object Thickness in a Single Render Pass. Oat, Scheuermann. *ShaderX6, Charles River Media.*

Efficient Histogram Generation Using Scattering on GPUs. Scheuermann, Hensley. *Symposium on Interactive 3D Graphics and Games 2007.*

Fast HDR Image-Based Lighting using Summed-Area Tables. Hensley, Scheuermann. Poster at *Symposium on Interactive 3D Graphics and Games 2007.*

Using a Commodity GPU in an Undergraduate Parallel Computing Course. Steinhurst, Scheuermann. Poster at *SIGCSE 2007.*

Dynamic Glossy Environment Reflections Using Summed-Area Tables. Hensley, Scheuermann. *ShaderX4, Charles River Media, 2005.*

Fast Summed-Area Table Generation and its Applications. Hensley, Scheuermann, Coombe, Singh, Lastra. *Proceedings of Eurographics 2005.*

A Simple Method for Rendering Gemstones. Scheuermann. *Game Programming Gems 5, Charles River Media, 2005.*

Practical Real-Time Hair Rendering and Shading. Scheuermann. *SIGGRAPH Sketch, 2004.*

Hair Rendering and Shading. Scheuermann. *ShaderX3, Charles River Media, 2004.*

Advanced Depth of Field Rendering. Scheuermann, Tatarchuk. *ShaderX3, Charles River Media, 2004.*

Simulation of Cloud Dynamics on Graphics Hardware. Harris, Baxter, Scheuermann, Lastra. *Proceedings of Graphics Hardware 2003.*

Physically-Based Visual Simulation on Graphics Hardware. Harris, Coombe, Scheuermann, Lastra. *Proceedings of Graphics Hardware 2002.*

CONFERENCE PRESENTATIONS

The Art and Technology of Whiteout. *SIGGRAPH 2007 Tech Talk*

Efficient Histogram Generation Using Scattering on GPUs. *I3D Symposium 2007*

Render to Vertex Buffer With D3D9. *SIGGRAPH 2006 Course: GPU Shading and Rendering*

Porting Between Xbox 360 and PC. *XFest 2006, Seattle*

Summed-Area Tables For Real-Time Glossy Environment Reflections. *Game Developer's Conference 2005*

Cubemap Filtering. *Game Developer's Conference 2005*

Practical Real-Time Hair Rendering and Shading. *SIGGRAPH 2004*

Advanced Depth of Field. *Game Developer's Conference 2004*

Hair Rendering and Shading. *Game Developer's Conference 2004*

EDUCATION

University of North Carolina at Chapel Hill: Ph.D. Student (Fall 2001 – Spring 2003), Exchange Student (Fall 2000 - Spring 2001)

Master's Degree in Computer Science awarded in December 2002

University of Karlsruhe, Germany: Equivalent of B.S. in Computer Science (Fall 1997 - Spring 2000)

TECHNICAL SKILLS

APIs and Applications: DX9-11, HLSL, GLSL, Vulkan, OpenGL, Qt, Unreal Engine 4, Photoshop, GIMP

Software Development: C/C++, Lua, antlr/lex/yacc, Perforce, Vtune

Platforms: Windows, iOS, Xbox 360, Mac OS X, Linux

Extensive experience with digital DSLR photography, photo development and processing in the digital darkroom. Photography work exhibited at www.thorstenscheuermann.com.

OTHER ACHIEVEMENTS

- Entered the Qtopia Worldwide Developer Contest with "*Froot*" (a Bust-a-Move clone running on a Sharp Zaurus PDA), which was voted best in the Games category and won a runner-up prize (Summer 2002)
- DaimlerChrysler Research & Technology scholarship (Spring 2000)
- Award for an outstanding Vordiplom examination from sd&m AG (Fall 1999)