Cutting Edge Tools and Techniques for Real-Time Rendering with NVIDIA GameWorks

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What is NVIDIA GameWorks?

NVIDIA GameWorks™ represents NVIDIA's investment in real-time graphics and simulation for games.

Over 300 engineers work on a combination of development tools, sample code and advanced libraries enabling developers to create the best performing games ever.

We provide these along with support through our web portal and developer forums.

NVIDIA GameWorks is part of the NVIDIA SDK and Developer Program
GameWorks in Games

- GameWorks technology is used in hundreds of games including some of the most critically acclaimed games
GameWorks is Everywhere

• PhysX, our cross platform physics solution is already integrated into:
  • Unity3D (Yes, it's used in Pokémon Go)
  • Unreal Engine (3&4)
  • StingRay

• PhysX is open and available on Github
  • https://developer.nvidia.com/physx-source-github
Gameworks: Continuous Innovation

- PhysX SDK: Rigid Bodies
- OptiX: Ray Tracing
- CodeWorks: For Android
- VXGI: Voxel Accelerated Global Illumination
- VXAO: Voxel Accelerated Ambient Occlusion
- FleX: Position-based Constrained Particle Dynamics
- PCSS: Percentage Closer Soft Shadows
- Volumetric Lighting
- Flow: Dynamic Grid Combustible Fluid Simulation
- HFTS: Hybrid Frustum Traced Shadows
- FaceWorks: Subsurface Scattering
- Clothing
- HBAO+: Horizon-Based Ambient Occlusion
- TXAA: Anti Aliasing
- SPH Fluids: Smoothed Particle Hydrodynamics
- WaveWorks: Ocean Surface Simulation
- HairWorks: Hair and Fur
- Turbulence: Fluids and particles
- HFTS: Hybrid Frustum Traced Shadows
- NvDOF: Depth of Field and Bokeh
GPU Development

• Nsight Visual Studio Edition 5.1
  • Integrates with Visual Studio
    • HUD
    • Graphics Debugger
    • Analysis tools
    • CUDA Debugger
Android Development

• NVIDIA CodeWorks for Android
  • Makes it easy to set up native Android Debugging
  • GPU and CPU debugging and profiling tools
  • Visual Studio integration

• CodeWorks is works with most Android devices
  • Parts of the tools are obviously Tegra specific
New Technologies this Year

- Designed to be easy to integrate
  - Volumetric Lighting as seen in Fallout 4
  - Voxel Accelerated Ambient Occlusion as seen in Rise of the Tomb Raider
  - High Fidelity Shadows (HFTS) as seen in Tom Clancy’s The Division
"To create that volumetric light spilling across the scene (sometimes called “god rays”) we worked with our friends at NVIDIA... The technique used here runs on the GPU and leverages hardware tessellation. It’s beautiful in motion, and it adds atmospheric depth to the irradiated air of the Wasteland."

Volumetric Lighting

Directional light with shadow map.
Volumetric Lighting

Extrude light volume geometry.
Calculate scattered light by integrating along line of sight.
Add scattered lighting to scene.
Image Quality comparison

Screen Space AO vs. VXAO
No ambient occlusion
Screen-space ambient occlusion
WITH VXAO
Hybrid Frustum Traced Shadows

HFTS: Combine frustum traced hard shadow with soft shadows.
Detachment

Too hard

Too soft

SHADOW MAPS
Graphics and Compute Samples

• OpenGL and Vulkan samples for many platforms
  • Windows/Android/Linux

Vulkan Everywhere! The Vulkan ThreadedRenderingVk Sample running on 5 platforms, all from the same source base. L to R: Windows PC (GeForce mobile), SHIELD Android TV, SHIELD Tablet, Ubuntu PC (GeForce), Linux for Tegra Jetson TX1
Coming Soon

• NVIDIA Flow

• Combustible fluid, fire, smoke -- Dynamic grid simulator -- Volume rendering -- DX11.2/11.3/12

• Library & sample application -- UE4 integration Q2-2016
VR Funhouse

- Demonstrate advanced GPU rendering and simulation techniques in VR

Simulated Hair and Fur with HairWorks

Slime guns with NVIDIA FloW
Get Started

• Sign up for our free developer program
  • gameworks.nvidia.com

• How to get our technology
  • Get access to GameWorks tools, samples and libraries from the website
  • Many of our technologies are now available on Github
    • OpenGL and D3D Samples --FaceWorks
    • Volumetric Lighting --HBAO+ --HairWorks --PhysX SDK
  • Many of our technologies are integrated into our branch Unreal Engine 4
    • HairWorks --VXGI --Flex --WaveWorks --HBAO+ --VRWorks --Flow(coming soon)

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Let’s Talk

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