Rendering Faster and Better with VRWorks

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Talk Overview

VRWorks Features

- Context Priority, VR SLI
- Multi-Res Shading, Lens Matched Shading, Single Pass Stereo

UnrealEngine 4 Integration
NVIDIA VRWorks
COMPREHENSIVE SDK FOR VR DEVELOPERS

GRAPHICS
- Lens Matched Shading
- Single Pass Stereo
- MultiRes Shading
- VR SLI

HEADSET
- Context Priority
- Direct Mode
- Front Buffer Rendering

AUDIO
- VRWorks Audio
- Touch & Physics
- PhysX

PROFESSIONAL
- Warp & Blend
- Synchronization
- GPU Affinity
- GPUDirect for Video
How is VR rendering different?
How is VR rendering different?

High framerate, low latency

High FPS, low latency

Stereo Rendering

Lens Distortion
Improving Async Timewarp
Context priority for asynchronous time warp
Reduces latency from head rotation

Frame (Left)  Frame (Right)  Warped Frame

Head Tracking (t)  Head Tracking (t+1)
Pascal Graphics Preemption

Improves responsiveness
VR SLI

Two eyes...two GPUs!

gameworks.nvidia.com
VR SLI

GPU affinity masking: full control

Left eye rendering

Shadow maps, GPU physics, etc.

Right eye rendering

UINT SetGPUMask(
    [in]UINT GPUMask
);
VR SLI

Broadcasting reduces CPU overhead

Render scene once
Multi-Resolution Shading
VR headset optics
Distortion and counter-distortion
VR headset optics

Distortion and counter-distortion

Image Displayed → Optics → User’s view
Distorted rendering

Render normally, then resample
Distorted rendering

Over-rendering the outskirts

![Rendered image](gameworks.nvidia.com)

![Distorted image](gameworks.nvidia.com)
Multi-resolution shading

Subdivide the image, and shrink the outskirts
Multi-resolution shading

Fast viewport broadcast on NVIDIA Maxwell and beyond GPUs
UE4 Multi-resolution shading performance

Performance

UE4 Infiltrator demo: +30% to +40% FPS

@ approximate VR render res

Everest VR seeing up to +40%

Best when pixel-bound

We’ve seen ~50% perf boosts
Lens Matched Shading
RENDEERS TO A LENS CORRECTED SURFACE
Lens Matched Shading

RENDERS TO A LENS CORRECTED SURFACE
TRADITIONAL STEREO RENDERING

REQUIRES 2 GEOMETRY PASSES

Left Eye (Pass 1)

Right Eye (Pass 2)
SINGLE PASS STEREO
RENDERS LEFT & RIGHT EYE IN ONE GEOMETRY PASS
Multi-Res in UnrealEngine 4
Multi-resolution shading

Unreal Engine integration

We’ve integrated multi-res in UE 4.10, 4.11, and 4.12
Currently limited support for post effects with multi-res
Available on GitHub

https://github.com/NvPhysX/UnrealEngine/tree/MultiRes-4.10

Pascal features coming soon
Questions?
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http://developer.nvidia.com/vrworks