Rendering the World of Mirror's Edge™

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Electronic Arts / DICE

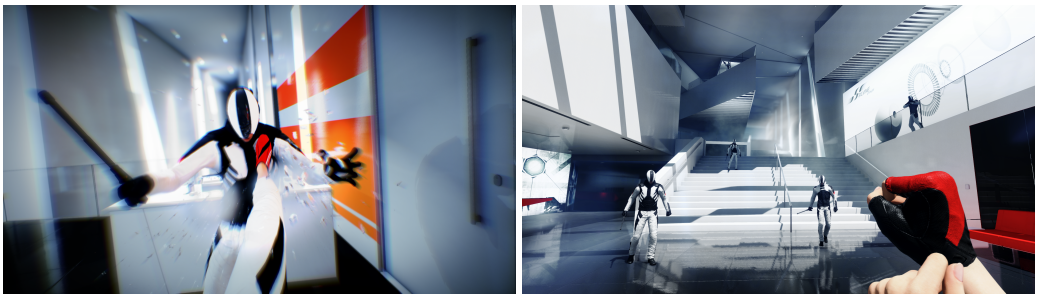

Figure 1: *Left: Faith defeats one of her opponents, blurring and distorting the screen. Right: Indoor scene with a complex lighting consisting of multiple reflective surfaces, area light sources and bounced indirect lighting.*

Abstract

Mirror's Edge (working title) is a reboot of the iconic DICE game from 2008. Using the *Frostbite™* game engine (used in *Battlefield 4™*, *Dragon Age™: Inquisition* and *Battlefield™ Hardline*), we are creating a totally new and unique gaming experience on a proven technology platform.

To create the look and feel of the futuristic cityscapes, that build up the fabric of the game world, we have developed several new systems for rendering large, diverse and photorealistic environments in real time on consumer gaming hardware. This presentation contains some of the work in a wide range of different rendering technologies that we have developed to make the artistic vision of Faith's story a reality. The intended audience is someone who is familiar with computer games production, rendering technology and tight deadlines. The work presented is still in progress and subject to change before the game is released.

1 Lighting & Shading

Lighting is a major part in the art direction and style of the game. We have spent a lot of time improving and adapting the existing indirect lighting solutions in *Frostbite* to fit our needs. The dynamic light environment, stark contrast and high specularity of surfaces in *Mirror's Edge* have proven to be challenging to deal with for us. We present some solutions we've come up with for these issues without sacrificing performance or the uniqueness of the art style.

Physically based rendering has become a staple of the current batch of *Frostbite* titles. For *Mirror's Edge*, in particular we have worked a lot with improving a few key areas which were identified early as key to create the pristine, clean look of our art direction. A significant amount of time has been spent focusing on improving existing techniques to fit our use cases, particularly involving transparent surfaces and reflections.

2 Postprocessing & GPU Optimization

Like other modern titles, we employ deep layers of post-processing to improve image quality. In this section we will analyze how they fit together to produce the unique visuals for which the franchise is known. We'll delve into a new technique for ambient occlusion, *Frostbite's* temporal anti-aliasing and brush up on the staples as we deconstruct *Mirror's Edge's* post-process setup.

To fit this ensemble of heavy processing tasks into our tight budgets, we've had to employ new techniques specific to modern graphics processors and the new console generations. Asynchronous compute, and homogenization of desktop-class graphics hardware, permits new levels of in-depth optimizations that we've utilized to squeeze more work out of the hardware than previous titles.

3 CPU Graphics Pipeline

Dramatically enlarging the game's area, along with additional stress from new rendering technologies, have placed significant stress on our existing CPU-side graphics processing. As we're detailing the innovations and improvements we've done in this important but often neglected area of graphics, we'll follow the path through the rendering framework from an object in the world to a draw call issued to the GPU.

New low-overhead graphics APIs are in vogue; therefore we're using this opportunity to detail the migration of *Frostbite* from cross-generational to next-generation titles and present some methods for making sure to keep up with the insatiable appetite of modern graphics processors.

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