Labs R&D: Rendering Techniques in Rise of the Tomb Raider

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Figure 1: *Lara Croft in Rise of The Tomb Raider, actual gameplay footage.*

Abstract

In this course/talk we aim to give a cohesive overview of the advanced rendering techniques developed for the upcoming 2015 blockbuster, Rise of the Tomb Raider. We will present a collection of diverse features, the challenges they presented, where current approaches succeed and fail, followed by our own solutions and implementation details.

Overview

We present a broad range of advanced rendering techniques developed by a team of R&D graphics programmers for the next iteration of the Tomb Raider series, Rise of the Tomb Raider.

We use a homebrewed SSAO technique we call Broad Temporal Ambient Obscurance (BTAO). It is inspired by SAO (Scalable Ambient Obscurance) and is greatly superior to the popular HBAO (Horizon Based Ambient Occlusion) in terms of both quality and performance. BTAO is temporally stable and provides both near and far occlusion.

One of the game's key features is procedural snow deformation. We present a novel technique that is entirely agnostic of the original snow mesh and instead leverages compute shaders and hardware tessellation for a fast and detailed effect. Due to the agnostic nature of our approach we believe it will have many other applications in the future.

We use Sample Distribution Shadow Maps (SDSM) to get a perfectly tight fit on our CSM view frustum by analyzing the depth buffer of our scene. After the analysis, we render the CSM with a DrawIndirect call, thus eliminating latency. This algorithm allows for efficient shadow map rendering by adjusting itself to scene and camera position, thereby enhancing shadow quality.

Rise of the Tomb Raider also features improved volumetric lights rendering. We use a resolution-agnostic voxel method. Volumetric lights are generated using async compute after shadow rendering and correctly handles transparency composition.

It uses temporal reprojection and a Bayer-based dithering and blur in order to reduce banding.

Finally, we wish to give a brief but cohesive overview of our production and methodologies, discussing challenges that are common to our industry and the steps we took to overcome them.

References

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