Doing R&D for Open Worlds

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Figure 1: *Jumping head first into open world R&D.*

Introduction

Doing research is a costly and time consuming activity with uncertain return on investment. For small or independent studios without substantial financial backing it can be hard to motivate engaging in research. Today few game studios have dedicated research personnel, even among AAA. Most games are produced either with an off-the-shelf licensed game engine, or a publisher provided engine. Research is mostly done in response to pressing needs where no published algorithms or off-the-shelf solutions are readily available, or done haphazardly by individuals as part of regular day-to-day development.

At Avalanche Studios we think differently. R&D is an absolute necessity and part of the studio culture. Our long-term survival in the market place relies on our ability to innovate and be leaders in our niche, namely massive open world games.

Keywords: R&D, research, Avalanche Studios.

1 R&D focused studio

Avalanche Studios is a relatively small independent AAA game studio. Despite this, we have a small research department and a studio funded engine team that does a lot of research. We also have an active dialogue and collaboration with academic researchers in the field. We develop our own engine for our games and have our own tools and editors and our own content creation pipeline. We are increasingly coming forth with our results and presenting our insights at conferences such as SIGGRAPH.

2 Industry-leading in open world

Our research has resulted in a number of important innovations that will benefit the studio for a long time. In our upcoming title Just Cause 3 the player will notice dramatically different landscape compared to what you find in most games today. This is the result of our new volumetric landscape technology. This enables us to create landscape with a whole different level of verticality, with features like overhangs, tunnels, sea stacks and other formations seamlessly integrated in the landscape. For this we had to create an entirely new GPU based pipeline with a set of tools capable of working with a massive set of data. Meanwhile we have also created technology to populate the landscape with vegetation at runtime entirely on the GPU. These two topics are covered in more detail in other talks in the same session.

Collaborating with academic researchers we also pioneered Clustered Shading in games, developing our own version with improved light assignment and performance exceeding that of existing methods. [Persson and Olsson, 2013] We proved that Clustered Shading is practical for real games and more flexible to boot, a conclusion later reproduced by others. [Fauconneau, 2014; Thomas, 2015] Currently we are researching a new novel method for using new DirectX12 hardware features to create perfect light assignment. These topics are covered in the *Real-Time Many-Light Management and Shadows with Clustered Shading* course at SIGGRAPH.

These are just some of the more visible results, and with this presentation we aim to inspire other game developers to invest in research and contribute to the advancement of the art, while also improving their chances in the market place.

References

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