

Imagery vs. Procedural Geometry – Back to the Future?

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ABSTRACT

Satellite imagery has become a common data source for visual systems because it enables generation of highly realistic scenes within most flight envelopes. It fails, however, at low altitudes and on the ground where true 3D features and content are needed to accurately represent the environment. Imagery requires significant storage capacity, varying resolutions and significant editing to remove visual anomalies such as “baked in” clouds, shadows, and vehicles. It is also difficult to represent seasonal change without having multiple images of the same area. Correcting such anomalies and populating large geographic areas with images can be time-consuming and costly. Even with high-resolution imagery that has been processed and populated, ground-level scenes can look artificial and lack realism because of the mismatch of resolutions and positions between photo-based and rendered content.

Procedurally generated terrain with geo-typical features generated at runtime has long been proposed as an alternative but this method faces limitations as well. With growing requirements to support mission rehearsal, Bohemia Interactive Simulations weighed the advantages and disadvantages of both methods for creating a whole-earth rendering engine. The resulting solution applies the concept of biomes, procedural algorithms used to generate eco-regionally appropriate vegetation and surfaces, and uses procedurally generated building geometry to extrude models of buildings from publicly available data sources. This paper discusses the advantages and disadvantages of using procedural generation of terrain versus satellite imagery-based paradigms. Finally, it describes a hybrid approach that leverages satellite imagery with procedurally generated terrain to produce a solution that can support scenes from space to the ground.

BIO

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Mr. Burwell has 30 years of experience with innovative technologies used for simulation and training. With a focus on simulation and virtual environments, John has supported companies developing image generation systems, on-line virtual worlds, games for training, computer graphics, video processing and geospatial imaging.

John started his career as a software engineer working on a DARPA project at Boeing to develop emerging image generation technology for guided missile development. This led to projects building full-mission simulators for training and engineering. With this background, John transitioned to Evans & Sutherland and eventually Silicon Graphics Computer Systems as advances in computer graphics technologies enabled new training opportunities. In 10 years at SGI, John played a pivotal role in the company’s advanced graphics division that including efforts that disrupted the traditional image generation market place. Most recently, John has been supporting product management and business development efforts for Bohemia Interactive Simulations.

Mr. Burwell has a bachelor’s degree in Electrical Engineering and Computer Science from the University of Colorado in Boulder, Colorado and an MBA in International Business from Thunderbird in Glendale, Arizona.