DesignNews

Second Life: A Virtual Universe for Real Engineering

Matthew J. Traum, Contributing Editor
10/22/2007 Post a comment

EMAIL THIS PRINT COMMENT

First there was the drafting table and the pencil. Then there was 2-D CAD; next came 3-D drafting utilities like SolidWorks and ProEngineer. Now, San Francisco-based Linden Lab has evolved computer-aided design to its next plateau, offering free access to a computer-generated alternative universe called Second Life (SL) where users can build anything. Ironically, the SL developers did not intend to design a solid modeling tool. SL was just another massive multiplayer online experience until users spontaneously began utilizing it for engineering design.

“Some people call Second Life a game while others think of it as serious development tool,” says Assistant Professor Chang Liu (a.k.a. Chang Tuxing in SL) of the Virtual Immersive Technologies and Arts for Learning (VITAL) Lab. at Ohio University (http://rbi.ims.ca/5407-591). “The fun is still there, but Second Life can also be applied for useful ends.”

This unrestricted metaverse started as a bare abyss, existing only as lines of code on the Linden Lab servers. However, since its debut in 2003, SL has been populated and landscaped by its users who have created a virtual world that is as rich as it is expansive.

Virtual People Building Virtually Anything

“Second Life is just emerging into the mainstream and a lot of engineers are not there yet,” says Pam Broviak, PE, (a.k.a. Pam Renoir in SL) public works director and city engineer for La Salle, IL. “When I show engineers Second Life, their initial reaction is ‘it is just a game’ because it looks like a game. They have to get beyond that.”

In SL, virtual objects are created from scratch in-world using a library of primitives, basic shapes such as cubes and spheres. By manipulating these elemental objects, adding uploaded image textures and combining components, anything that can be imagined can be constructed: anvils, automobiles, airplanes and more. Completed objects are bequeathed additional layers of sophistication by adding software scripts, making them intelligent, responsive and interactive.

“Scripting is one of the many features that sets Second Life apart from objects built with 3-D CAD software,” Broviak says. “In Second Life, you can make a static 3-D object move and react as you make changes to it in real time. Scripting allows you to link cause and effect, which you cannot do with 2-D drawings or even CAD.”

Using her SL identity, “Pam Renoir,” Broviak manages the Second Life Public Works Resource Center, one of the first destinations in the metaverse focused on applying SL to real-world engineering. The Center serves as a clearing house for information related to engineering and public works in SL. It also functions as a meeting area for users affiliated with in-world engineering organizations and it hosts a museum where engineering information is exhibited for visitors.

Broviak built the Center in her spare time using the suite of SL building tools.

A Virtual Plunger for Real Stopped Drains

Broviak has also been using SL in her engineering practice to design plumbing systems. She realized the utility of the metaverse for engineering design while reconfiguring the piping in a residential building to prevent sewage backup.

“I was working with the homeowner and I was trying to convey the layout of the new system with 2-D drawings,” Broviak says. “It occurred to me that it would be easier to use Second Life to make virtual copies of the plumbing system before and after the proposed upgrade so (the client) could actually walk through the piping with me and understand the differences.”

Unlike real world piping, Broviak’s plumbing system now exists in cyber space, where it can be used as a kind of 3-D wiki. Engineers, plumbers and homeowners can use Broviak’s design as a template, modifying it for their own applications. Broviak imagines that eventually an entire 3-D library of plumbing solutions could be accessible to engineers visiting Second Life.

“What takes it further than conventional 3-D drafting tools is the level of interaction,” Broviak says. “Once you build something, you can pick it up or walk through it; its immersive, like the object is really there. You can’t do that with CAD.”

A Computer-Generated Computer Science Dept.

Ohio University has used SL to create a complete virtual engineering college, including a building slated for future construction. At this SL campus, engineering and computer science courses are taught in parallel with real-world counterparts.

“One of our buildings won’t exist for another year, but my students already had a class in it,” Liu says. “First we tried to replicate buildings exactly, but then we learned it was better to modify them from the original to make them more functional in Second Life.”

According to Liu, fruitful SL modifications to the virtual campus included exposing portions of steel structures so students could get a sense of the building’s internal framework and creating a huge transparent opening in the back of the virtual student center to showcase the building’s internal architecture. Conventional building construction rules do not apply when creating structures in SL.

“We built the new building from the roof down because builders don’t need to follow classical rules of physics — without walls to support it, the roof just floated on its own,” Liu says. “In fact, since it never rains, we really don’t even need a roof.”

Perhaps the best part about Ohio University’s virtual engineering campus is that Liu can hold office hours in SL simultaneously with his office hours in the real world.

Second Life’s Disruptive Potential for Real Engineering

For now, Broviak and Liu are engineering pioneers within SL; among the first to embrace this immersive alternate reality as a serious tool for real-world engineering design. Nonetheless, they share a vision for how SL may soon be used once its capabilities and scope are discovered and exploited by engineers.

“I see Second Life being used as the first step in the planning process for many future engineering design projects,” Broviak says. “Building something in there does not take a lot of time. Companies will soon discover that much of their initial design work can be accomplished in-world where everyone has a chance to use it and comment on it before anything is actually built.”

Broviak also foresees manufacturers and suppliers setting up virtual storefronts in SL where engineers can browse and specify parts for their projects. Potential buyers will interact with 3-D computer-generated components instead of thumbing through a 2-D catalogue or Web browser. Companies could even build large versions of their products embedded with interactive scripts to enable customers to walk through and see how the internal components function.

Liu sees SL as a pathway to reduce production cycle time and increase user input earlier in the development process.

“Normally what designers are doing is not accessible to users,” he says. “But, Second Life is different in the sense that products are built in-world, which totally changes the dynamic. Creation is no longer the work of a developer.”

It remains to be seen exactly how engineers will embrace and utilize SL to improve design. However, if Broviak and Liu are correct, this game-like, computer-generated virtual reality will soon become as integral to engineering design as CAD is today.