Serious Games…and Less!

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Many of us first heard the term "serious games" a couple of years ago at GDC (Game Developers Conference), the premier gathering place for game developers, publishers and industry hopefuls. As it happened, a colleague of mine thought he would take a peek into the room where a talk entitled "Serious Games" was being held. Expecting to see only a few people attending, he was amazed to find that it was standing room only! The use of game engines for non-game related applications had generated an inordinate amount of interest among a group of people normally known more for destroying grotesque aliens with absurdly proportioned weapons than reproducing mundane or real-life tasks in 3D.

Ben Sawyer of Digital Mills and David Rejeski of Woodrow Wilson International Center for Scholars have been instrumental in helping industry and game developers connect through their serious games summits and conferences – events that enjoy phenomenal success. The game industry, in turn, has embraced a whole new market for their technology, and the future of that market can only get stronger as authoring applications get easier to use, the general public becomes more 3D savvy and business and industry discover how incredibly versatile and accessible this exciting medium is becoming.

Serious games, a phrase coined by Rejeski, covers just about any non-game industry use. Most of us, however, immediately think of big budget projects done for the military. High dollar, high profile projects requiring large teams of artists and programmers may, however, eventually take a back seat to a larger, but "lesser" market. In this case, less may become more. Think for a moment of a large complex game (see Figure 1). You may be required to learn several skills or techniques to successfully complete that game – everything from assembling a formidable weapon, to learning to control an unfamiliar vehicle, interacting with a local population, managing supplies or the health of a character – virtually any number of things.

Combined, the elements of good game play can become quite overwhelming to the average person and necessitate the involvement of a seasoned game development team to bring it to life. By breaking it down into component parts, or lesser amounts of the whole, one opens an entirely new set of possibilities. A separate application concerned only with the assembly of a product, the configuration of a vehicle or steps involved in performing routine or emergency maintenance on a piece of equipment brings the task down to a manageable size. For smaller projects, one no longer needs to contract an entire studio full of artists, programmers, researchers and managers to produce an impressive end product.

Coupled with some of today's powerful authoring tools, and a rising generation of 3D literate in the workforce, the task could conceivably become a one or two person job. With the vast array of uses for this technology, it is easy to see how I3D (Interactive 3D) authoring tools may well become as common for interactive content creation, as

Figure 1: *Digital Mill's* Virtual University, *developed for the Alfred P. Sloan Foundation, was designed to foster a better understanding of management practices in American colleges and universities. To date, this simulation, now in its second version, has been downloaded over 90,000 times, by over 800 institutions, in over 90 countries.*

Figure 2: *With today's technology, configurators such as this automotive example can provide users with an immersive, interactive experience as they choose colors, interiors and try out different options. While this example uses everyday technology, use of features found only in high-end graphics cards is starting to produce visually stunning results.*

Figure 3: *Eon Reality's sophisticated motorcycle configurator was designed as a high-end kiosk application for Suzuki. You can see, and cost out, various options and accessories, as well as spin the view to check out the details as you create your dream machine.*

Figure 4: *Deep Creator's* Woodworker's Bench Plane *serves as training sample. Low tech meets high tech in this example, where the user learns part names, how to properly assemble and disassemble the plane for initial set-up, maintenance and customization. After familiarization, tasks such as these could be set into timed challenges to test the user's recall. Product returns could be greatly reduced, saving manufacturers and customers costly mistakes.*

Figure 5: 000Hero *is a micro game developed with Deep Creator by Media Odyssey Pty Ltd of Brisbane, Australia. It was developed for the Queensland Government Department of Emergency Services and was hosted at their annual Ekka event, where over 10,000 people were able to participate in nine person rounds, all aiming to achieve the highest score over the 10-day event.*

Adobe's Photoshop has become for 2D graphic art. Additionally, as it becomes easier and more affordable, it would be logical to assume it will begin to replace more traditional means of training, visualization and content delivery.

Expanding Use

The uses for real-time applications are as varied as the 3D engines that power them. Starting with traditional game engines, it is a relatively small shift to tailor an already military theme to a specific scenario for a specific client. Flight sims have historically been driven more by real world need than by their relatively small but fanatic following of gamers, and have always tended toward the more serious side. Straying away from the serious applications that require a very specialized game engine, one finds plenty of other opportunities.

In sales and marketing, one sees what are called "configurators." These may be as simple as low resolution 3D apps that allow you to see a cell phone's various color schemes on the Web, to glossy high end kiosk-style applications that let the prospective buyer see how his or her car will look (see Figure 2), not only with different paint schemes and interiors, but wheels, air foils, window treatments and even custom license plates. But wait, you say, I was configuring my own cars in my favorite racecar driving game. Exactly! Once again, we see a smaller part of a game being put to use. Whether it is a motorcycle at your local dealer (see Figure 3) or a jet fighter configurator used by the aerospace industry to sell product internationally, real-time product visualization is becoming more and more common. Not only can one configure the product in question, but unlike traditional pre-rendered still shots, one can interact with doors, windows, knobs, levers and anything else the marketing department deems necessary.

From products with parts that react to user input, the next logical use for I3D becomes assemblies and parts identification. Traditional "exploded" views of tools, products or machinery, showing how something comes apart is much easier to understand than photographs. However, it may require a disorienting number of views to show components on all sides, more renderings to identify part names and catalogue numbers and yet more to cover possible variations. With I3D, one interactive 3D model can replace all, and even be used to generate still shots for the traditional printed material. The assembly can be viewed from any direction, from near or far. Optimized camera viewpoints can be set up to take the user directly to the best place to view a particular part or animation, yet leave the user free to adjust the view whenever he wants. One can set up the model to display part names as the mouse moves over them, or give a visual color cue while displaying the part name elsewhere, thereby removing frustrating ambiguity (see Figure 4). Assembly, disassembly or "exploded" views become more than just pictures of parts. With the click of a mouse, the user can see exactly where a particular part is in relation to the whole, in what order it is removed and even if a particular movement is required to remove it.

If that last part sounded suspiciously like training or maintenance, it is. Audio or visual instructions can easily be added to guide a user through assembling a new product for use, providing routine maintenance or even emergency repair. Obviously, training and maintenance doesn't have to be limited to mechanical uses (see Figure 5). When

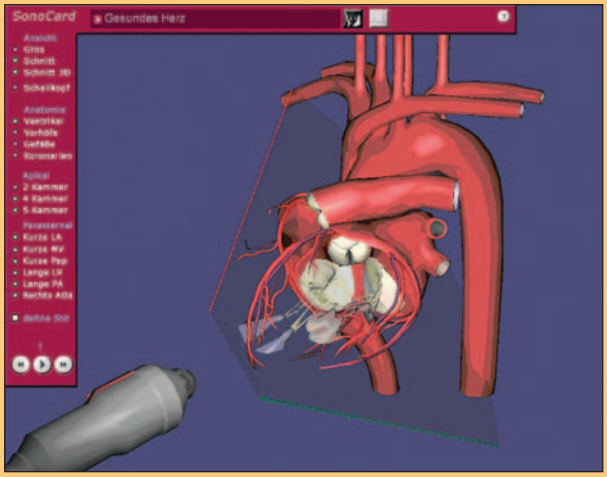

Figure 6: *Created with Virtools by Entec, in partnership with several German universities, the Sonocard Project is a case-based learning course for cardiac sonography initiated to provide better medical training. Students are able to experience extremely rare pathologies in the absence of actual clinical cases.*

Figure 7: *This historical recreation of Quendlinburg was created in 3D GameStudio by Procon GmbH and the German Foundation for the Protection of Historic Monuments. It features over 400 detailed buildings in a two square mile area and allows people to move in and around the town and buildings.*

someone mentions educational software, the first thing that comes to mind is those brightly colored kids games that teach math, reading and other fundamental skills. The term "educational software" has gotten a bad rap. Educational I3D applications can be as complex and serious as visualizations that teach medical students everything from bone, organ or tissue identification (see Figure 6) to their first look at the steps involved in performing a complicated medical procedure. Almost any situation that requires previous knowledge, skill or decision-making could be set in an interactive 3D environment for considerably more effective results.

Decision-making leads us back to simulations. They can be immersive as historical recreations of a medieval town (see Figure 7), where the user can get a glimpse of what life was like hundreds of years ago, or as practical as a training course for learning to drive a car. Simulations can be used to help people manage phobias – fear of flying, arachnophobia, agoraphobia, claustrophobia – the list goes on. Coupled with today's CAVE™ and power-wall technologies, and the ability of 3D to be changed and re-configured in real time, the psychological applications are truly impressive as hardware and software join to a create a reality that allows for longer periods of "suspension of disbelief."

Imagine learning a foreign language, as would a child of that culture. You could start out as a child in a playroom, interacting with objects and caregivers as in real life. By avoiding the association of the word in your own language, you avoid the "translation" process of left brain word/label to right brain image/concept. As your character ages, AI driven interaction with characters, objects and community readily encompass the standard dialogue scenarios found in almost all traditional curriculum. From language, learning how to adapt to a new culture is an obvious progression – the benefits for business executives, military personnel and anyone else faced with the trials and pitfalls of interacting with a foreign culture are undeniable. Even subtle body language can be deconstructed and de-mystified, moving it from subconscious interpretation to identifiable actions.

Moving through a virtual world has its own possibilities (see Figure 8). Learning your way around a new environment could remove stress from hotel or airline terminal visits. Hotels could give little perks for guests who navigate the virtual hotel from their assigned room in an emergency simulation within a given time. Virtual cities, maintained by the local chamber of commerce, could be downloaded by guests to navigate to places of interest from a first person perspective as well as of a bird's eye view, allowing the guest to fix visual landmarks ahead of time and prevent frustrating backtracking and missed turns. Disoriented cruise ship guests could

Figure 8: *Produced with Quest3D, this mansion gives users a way to skip the official tour and explore at their own pace and inclination. Architectural walkthroughs give users the ability to experience traffic flow, experiment with lighting solutions and explore flooring, cabinet and counter top options.*

Figure 9: *Virtools was used for the simulation of Le Redoutable, France's first nuclear submarine. To navigate to and around the Cit_ de La Mer, the user must learn to control the submarine, including making constant adjustments in response to water temperature and saline levels.*

Figure 10: *Harro Besier created 3D Driving Academy with Conitec's 3D GameStudio. In addition to the massive AI controlling hundreds of cars, motorcycles, people and traffic lights in several cities, the game keeps tabs on the driving rules of six different countries.*

engage their own virtual pursers to guide them to and from functions and locations, as well as keep them informed of their schedule and optional activities.

It's Truly Possible

As we can see, the uses for real-time 3D applications are almost endless, and most scenarios mentioned either already exist, or are at least under way. Skeptics, remembering the hype of the early 1990s, are no doubt wary of this overly rosy picture. Clark Aldrich, in an article entitled "A Field Guide to Educational Simulations," diligently lists the pros and cons of various learning situations, and repeatedly finds one of the major drawbacks to be cost. 3D simulations, visualizations and training apps take a considerable amount of skill, time and creativity to produce, thereby pushing the cost beyond many a company budget. In the past, this has been a major roadblock. In the future, real-time 3D literate staff could become an integral part of more than just game industry businesses. Thanks to three specific factors – a rapidly growing workforce of 3D game-art trained artists, easy to use, affordably priced interactive 3D authoring programs, and the ability to quickly convert CAD data into a form suitable for real-time use – companies are no longer reliant only on traditional game developers (see Figure 9).

While most of us in the game industry have had to learn as we went along, there are now a growing number of schools that are offering game arts degrees. Besides being versed in the essential skills of 3D packages such as Discreet's 3DS Max and Alias|Wavefront's Maya, much of their curriculum is centered on game design and production. By the time they graduate, the students will have had experience producing and utilizing content in real-time engines under the supervision of industry professionals. Christian Bradley, Academic Director of Game Art and Design at Art Institute of California, San Diego, estimates approximately 800 jobs available in the U.S. game industry per year. With numerous colleges and trade schools ramping up to train students for their "dream job," one can quickly see an excess of game art trained workers entering the job market within the next few years. Bradley expects roughly half of his graduates will be hired into the serious games field.

This solves one of Ben Sawyer's worries about serious games being created by non-gamers. Sawyer feels " ...it's important to realize that talent will make a bigger difference than non-game designers trying to spin some idea into a perceived game form." Even training applications, visualizations and simulations need to be fun, interesting and challenging – both visually and intellectually (see Figure 10). The up and coming wave of 3D game artists, unlike their graphic art-trained counterparts, will be well versed in the factors that make games fun and addictive. They will understand how interactive applications must allow for users to influence outcome, reward the user for skills or knowledge gained and allow the user to learn from making virtual mistakes. Even the driest training application can have unexpected and amusing consequences when performed incorrectly. In this day and age, entertainment is expected and has already been proven a more effective way to share or transfer knowledge.

The need to out-source smaller projects to game developers is also becoming a thing of the past due to the growing number of I3D authoring tools on the market. From traditional game engines suitable for fps game-like simulations and high-end marketing visualization applications to versatile, easy to use packages capable of creating either type of content, the production of interactive 3D applications may no longer require high priced programmers to bring an idea to life. The tools the game industry has had to develop have been honed, refined and redesigned so that the artist, not the programmer, can easily add something as complex as physics, character AI or spectacular special effects. Even the pricing on many of these authoring tools has become affordable for smaller studios and individuals.

For game-like simulations, a traditional game engine such as Epic Games' Unreal engine or NDL's Gamebryo can be used. These solutions may require costly service agreements or licensing fees, but have the advantage of robust, well-proven engines (see Figure 11). On the more affordable end of the scale, Conitec's 3D GameStudio and Act-3D's Quest3D offer users an affordable way to produce this type of content with minimal purchase of extra modules. Eon from Eon Reality and Anark Studio appeal to the marketing and visualization crowd. Tailored toward product visualization and configuration, these applications provide a means for producing compelling web or kiosk-based content.

Figure 11: *In this game/simulation, Quest3D was used to create an interactive experience that helps prepare emergency teams for real-life situations. Use of spectacular special effects helps the user to prepare for real-life events.*

Figure 12: *Pratt & Whitney is using Right Hemisphere's Deep Server and Deep Creator to create this maintenance/repair application for their jet engines. Diagnostics are wirelessly uploaded to a computer, the database is searched and the required procedure is outlined and presented for repair technicians _ any time, anywhere in the world.*

Some, such as Right Hemisphere's Deep Creator and Virtools Dev, to name a few, are versatile enough to make almost any type of application. Extra modules may be required by some applications to attain that versatility. Prices for these authoring tools range from 3D GameStudio's $150 starting price tag through Quest3D, Deep Creator, Anark Studio and Eon Reality up to the $3,500 range, and top out with Virtools Dev that could range over $10,000 with the addition of their excellent physics module and other specialty modules. Many of these companies offer several pricing layers, functionality and even very affordable educational discounts.

One of the biggest breakthroughs in the I3D field has been to take huge amounts of CAD data from industry standard engineering packages such as Catia and ProE, then reformat, and reduce models for immediate use in real-time engines. In a recent demonstration for a leading aerospace company, Right Hemisphere personnel brought an extremely large CAD file into their Deep Server program, reduced polygons and had it up displaying on a stereographic power-wall display with Deep Creator in about eight minutes! While some artist input is still necessary to use texture unwrapping tools and apply mapping where needed, the ability to avoid costly modeling of individual parts has made the component assembly and training application field wide open. Coupled with the growing number of non-mechanical models for sale, acquiring content for I3D applications cuts both cost and man hours, as well as making updating of component parts an easy and affordable task.

Figure 13: *This test facility for Airbus, assembled in Deep Creator, shows how massive CAD data from actual engineering files can be re-purposed for interactive fly-throughs of existing facilities.*

An Exciting Future

Industry certainly has exciting plans for game technology. Pratt and Whitney, makers of jet engines, have a vision that is becoming reality with the help of Deep Server and Deep Creator. They activate a diagnostic tool plane-side using a wireless Internet-based maintenance system (see Figure 12). It locates the problem and immediately presents the repair technician with a full 3D view of the parts and the process needed to remove, replace or repair the problem – anywhere in the world! An instructor from the FBI Academy in Virginia expressed a desire to use real-time visualizations for court-based forensics. He wants the user to be able to stop a pre-arranged fly-through of a crime scene and view the re-creation from any desired position. He wanted to make sure it could be "dumbed down" enough for lawyers to use (see Figure 13).

A project lead in a major aerospace company "gets it." He observed that in a few short years, the workforce would consist of a generation of people brought up on video games. Do you give them a stack of dry manuals to read through or an interactive application that tests their skills and abilities with instant feedback, rewarding and "punishing" in creative and entertaining ways? The answer is clear. With the advent of today's up and coming authoring tools, a burgeoning 3D game-savvy workforce and the technology to re-purpose existing CAD data, the means are at hand. Training applications, interactive product visualization and situation simulations utilizing the component parts of today's highly successful game technology, whether serious or entertainment based, will play an important in our future.

For More Information

Links to game engines and interactive 3D authoring tools:
http://www.unreal.com
http://www.ndl.com
http://www.conitec.net/a4info.htm
http://www.quest3d.com/
http://www.anark.com/
http://www.eonreality.com
http://www.virtools.com/
http://www.righthemisphere.com

To more information on serious games:
http://www.dmill.com
http://www.seriousgames.org
http://www.seriousgamessummit.com/
http://www.socialimpactgames.com/
http://yanknowwhat.blogspot.com/
http://www.iitsec.org/

To articles on serious games:
Sawyer, Ben.
Serious Games: Improving Public Policy Through Game Based Learning and Simulation.
http://wwics.si.edu/subsites/game/index.htm

Aldrich, Clark.
A Field Guide to Educational Simulations,
http://www.simulearn.net/pdf/astd.pdf

Machinima, Filmmaking's Destiny,
http://digitalmedia.oreilly.com/2004/09/08/machinima.html

About the Contributor

Sue Blackman is a freelance artist and part time educator who freely admits to being a 3D junkie. She teaches 3DS Max and real-time animation for games and industry at several southern California schools. She is a contributing author and artist for several New Riders books. As the lead artist for Radish Works, she moved from creating 3D assets for games into producing sample scenes and tutorials for Cosmos Creator, an I3D application recently acquired by Right Hemisphere. A wide range of education, hobbies and interests led naturally into creating interactive 3D worlds, where one must often be a jack-of-all trades as well as have a thirst for knowledge and a driving obsession with the way things work and behave.

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