

Developing Educational Virtual Worlds with Game Engines

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Introduction

Game engines are often overlooked in the investigation of virtual worlds technology. First-person shooters, head-to-head death-matches, and full-blown massively multiplayer online role-playing games have a lot in common with virtual worlds. Modifying existing games, as well as using authoring engines and toolkits, not only creates a new opportunity for the educator but also allows them to dip into a well-supported and well-populated world of creative energy, talent, and help. Also, because educators are not the primary audience for the gaming industry, many game companies are eager to work with educators and some are very generous with their licensing. The educator's task is to repurpose these tools for their pedagogical requirements. With these tools in hand, this paper looks to address those pedagogical issues and in many places asks more questions than it answers.

VR at Case Western Reserve University

Over the years online multi-user virtual environments have evolved from simple text-based communities to fully rendered 3D worlds. Case Western Reserve University has explored more than 10 virtual worlds platforms over the past 16 years with usages ranging from social to educational. These virtual worlds initiatives have included MUSHes, MOOs, NTT's Interspace, Onlive!(now Digispace) Traveler, Adobe Atmosphere, SecondLife, and a variety of game engines.

The VR Cycle

A key reason for the multitude of platforms is due to a phenomenon that I refer to as the "VR Cycle".

The "VR Cycle" typically looks like this:

1. A company announces a new technology.
2. There is much hype (both internal and external).
3. They hold a big event (that everyone attends).
4. But it is difficult to build.
5. So there is no reason to return.
6. The company has no financial model.
7. And the company folds.

One way of avoiding this "VR Cycle" is to work with companies that are not actually selling virtual worlds solutions and have firmly established financial models i.e. video game manufacturers.

A Pedagogical Approach

Along the way it becomes essential to keep the 'eye on the prize' of the pedagogical soundness of the activities surrounding the development of virtual worlds. 'Building a better mousetrap' is only as good as the effectiveness of the mousetrap at actually

catching mice. To that end, it is in the educator's best interest to work backwards from a pedagogical goal and not forwards from a desire to work with an interesting new technology.

The Hammock Syndrome

Further, there is an additional imperative to avoid something I call "The Hammock Syndrome".

The Hammock Syndrome is best described by the following anecdote: Every night as I lie in bed I think of myself swinging ever so gently in a hammock. It is a virtual paradise. But every time I go to actually purchase a hammock I find that I don't like the way I feel in one. I end up feeling uncomfortable, unstable, and awkward. What I really desire is to feel the way that I think other people feel when I see them lying in a hammock. It isn't about lying in a hammock at all.

Relating this back to technology, there is this sense of universal insecurity that everyone else is getting 'it' and I want to get 'it' like they get 'it'. It is important to remember that for an experience to be effective it has to be real (even if virtually delivered). And in order to embrace a technology, the educator must strive to understand the technology. Remembering that each experience will be different for each person and that everyone might not get the same thing out of it – not everyone likes swinging in a hammock.

Moderating expectations from the start, building robust experiences, and acknowledging that not everything is for everyone is the first step to success.

The Inherent Fallacy of Virtual Reality

To the average person – the idea of virtual reality is like a technological nirvana - the pinnacle of technology and human computer interactions. This myth has been perpetuated by TV, film, and science fiction authors but not by those who are actually working intensively with these types of technologies.

If we look carefully at other areas of computing we find similar situations. If voice recognition worked perfectly it would still not be the best interface because speaking lacks privacy. In a similar manner the restriction of VR is that it tends to be immersive and single focused which is the antithesis of modern multitasked computing. In fact the only place where single focused computing appears to thrive is the gaming industry.

Educators shouldn't assume that because the platform is geared for single focus that students would give it that single focused attention. Just because we want students to give their education the same attention they give video games does not mean that putting their education into a video game engine will force the

same effect. In fact, if the student has to work hard and isolate themselves to achieve their goals then the opposite is bound to occur and quick failure will be blamed on a bad construct (and justifiably so). Students sitting in their dorm rooms logged into a virtual classroom (and probably messaging 20 people at once) should not be expected to be paying as much attention as students sitting in a physical one.

The other inherent fallacy concerning VR is that it somehow equalizes the student body giving a voice to the less vocal student. In reality what emerges is a dominance of the fastest fingers. Imagine a gregarious student talking at length whenever they desired without moderation – now imagine trying to get a word in edgewise with three such students typing at lightning speed. On the other side of the spectrum are students who are more willing to speak in class but less likely to have their words recorded (as is common in an online situation). Ever new technology comes with its own sets of pros and cons that need to be addressed and not simply reacted to.

Constructing Virtual Worlds

So what should we build? And in a working backwards approach we ask ourselves not “what do we have?” but “what do we want?” and endeavor to describe a ‘perfect’ educational virtual world as a prototype for development.

This virtual world would include the following activities:

1. Communication
2. Exploration
3. Creation
4. Questing & Collaboration

1. Communication

The most common first build in a virtual world is the ‘virtual classroom’ a place to gather for teaching and discussion. This classroom tends to have all of the amenities of a modern high-tech real-world classroom with presentation, recording, and display technologies.

However, this is just a new twist on an old idea. And bringing people to one space remotely has more in common with teleconferencing and videoconferencing than to an actual classroom environment. In conferencing effective communication is all about learning the system of etiquette surrounding the technology (for example pausing in a phone call to let someone else speak).

A key consideration when developing the virtual classroom and using virtual worlds for communication is that a classroom is for the most part spatially unaware. Once inside a classroom the group is isolated from the world around them. Classrooms are containers where something happens - they are not communities. Groups of people form communities - not groups of classrooms. Classrooms are interchangeable.

A single classroom could be instanced again and again so that as long as people knew where to go, when to go, and how to act once they got there a level of success (from a communication standpoint) could be achieved.

A spin on this type of classrooms is performance venue or an event space. With this success is easier to achieve as it usually

marked simply by the number in attendance. The higher profile the event the more publicity and the more publicity the more attend. It is best to wary of this type of event. While it makes a big spectacle it also sets unreasonable expectations on the nature of educational virtual worlds. Its not always going to be an important speaker and a packed house and you don’t want all the experiences to be down hill from the first one.

2. Exploration

The next type of task an educator might give to a student is to go out and explore. Exploration can vary from going to a museum, researching in the library, or surfing the web. Exploration is about finding things and paths of discovery. It is about creating life experiences and it makes the education real.

Virtual exploration can be just as effective as real-world exploration because the experience encode in a similar manner. An advantage of the explored virtual world is that it can be engaging even if the explorer is alone.

Does an explored virtual world even need to be multi-user? If the space is designed as a persona environment for exploration then instead of an encountering an under populated virtual world the student is given a virtual world that is all their own, designed just for them.

Moderating expectations are critical. If a student expects others to be in the world and there find none then the exploration turns into a quest to find these others, which should be secondary to the task exploration of content itself.

So what should the educator build? Historical motifs lend themselves well for these types of experiences with many educators building cities, towns, villas, castles, and galleries all used as a framework for housing historical and cultural content.

The challenge is to then build a world that is rich enough to be continually engaging and not a “one visit wonder”.

3. Creation

Beyond collaboration and exploration comes the activity of creation. Creation is never simple and it involves both “art” and “craft”. A history student writing a history paper has to be able to research and develop a valid thesis (the “art”) as well as be able to express it via the conventions of grammar and rhetoric (the “craft”).

As with all creative exercises, virtual worlds development or creation in or around virtual worlds needs to balance the focus spent on the why of the creation (“the art”) with the how of creation (“the craft”).

With the exception of a course on virtual worlds development, how can educators empower students (and themselves) to create without the focus being exclusively on the craft of virtual worlds development?

Are there universal core skill sets that need to be developed to allow students to focus first on the “art” and then later on the more educational aspects of the “craft”? Is this asking too much? If so, can we instead develop tools that are easy to use and

effective in creation that do not require an expertise in modeling, animation or programming all the while designed for the average user?

A multimedia model for with type of product would be Pachyderm, the open-source learning objects authoring tool that is designed to let educators create online interactives without knowledge of programming or Flash (see pachyderm.org).

But the overarching questions must be: What is created? Why is it created? And what are the educational goals found in this activity?

4. Questing & Collaboration

The final and broadest types of educational activities are Questing and Collaboration. At this level Exploration, Communication, and Creation combine into a seamless framework of existence. It is a World of Warcraft model applied to education. Quests are focused goal oriented explorations. Collaboration is beyond communication – it is more than talking where people actually do something together and become active participants with the world and each other.

While this is the most complex of activities it should not be the goal for every project. “The right tool for the right job” also applies to pedagogy and a simple exploratory task should not be couched in a collaborative questing framework.

Deconstructing Virtual Worlds

With the recent success of SecondLife there has been a call for critical scrutiny about the ‘one stop shopping’ or ‘company store’ feel that embodies the, until recently, closed system of SecondLife. What should virtual worlds look like in the future? If virtual worlds are to survive “The VR Cycle” what critical factors will they have where does the economics come into play?

Using the web as a template I suggest the following 5 factors:

1. Money
2. Intellectual Property
3. Content Creation
4. Browser or Player
5. Server

The following analysis is not meant in anyway to be negative towards SecondLife, which as a company has done outstanding work in developing and mainstreaming virtual worlds technologies. That being said, is it possible to look beyond the SecondLife hegemony? Can we develop answers to some of the following questions and back a concept and not one particular horse?

1. Money

What is the currency of the future? The same as the currency of today - anything - as long as it is negotiable for the goods and services people want. There is no such thing as virtual banking because all banking is inherently virtual. PayPal has become a standard bearer for virtual money because it isn't virtual at all – it is simply a clearinghouse for transactions with escrow accounts for the storage of funds. The financial systems in place are sufficient to support any virtual or real economies and should be exploited and promoted.

2. Intellectual Property

One of the most difficult aspects of virtual worlds (and all of online activity) is that of intellectual property.

Did the web thrive because of the, until recent, lack of DRM? Did the ease of using things illegally in some ways lessen the need to do so?

On the web text and images are generally unprotected while audio and video generally are. Text and images are viewed in a “browser” while audio and video are experienced in a “player”. With the content line of “browser” verses “player” people seem more willing to pay for their audio and video but less likely to pay for text and images.

In the new realm of virtual worlds is the content more like audio and video or text and images? Will the public be willing to pay for virtual world content? Is this about DRM or is this more about the socialization of the average user concerning which side of the line virtual content falls?

3. Content Creation

Is the user going to purchasing content or create it?

If the user is going to create their own content then what tools will they use? Who will develop and sell these tools? Are these tools designed for the amateur or the expert (or for both)?

Can we split the difference and acknowledge that like in real life it is easier to put up drywall than to build a cabinet and that some users will learn to build but only up to a point? Can we foster the creative spirit without making users feel inadequate for their lack of skills and create a true economy of artisans and skilled laborers that are valued for their talents?

4. Browser or Player

Time and experience has demonstrated that browsers and players must be free, standards based, cross platform, and with choices or some level of market competition.

But as mentioned before – should virtual worlds be browsed or a played?

5. Server

Perhaps the most overlooked aspect of all of this is the idea of a distributed network of interoperated but individually maintained servers. Server technology would host the worlds, the content, the interaction and users would pass from place to place and from server to server. People acknowledge the need for servers and the role they play from an economic standpoint. In fact the average user is willing to pay for hosting and for traffic (or in lieu allow for 3rd party advertisements). But for this all to work these worlds must adhere to standards as Grace Hopper said, "The wonderful thing about standards is that there are so many of them to choose from".

A Case Study: The VR Gallery Maker

Falling under the categories of Exploration and Creation, Case Western Reserve University's Freedman Center has started work on a project called The VR Gallery Maker. The Gallery Maker is a tool for the educator (and the student) to create exploratory single user (at this time) virtual exhibitions for the display of 2D works of art.

The Gallery Maker allows the user to create an art gallery and an exhibition by taking an empty space, adding and rearranging the walls, and populating it with art. No knowledge of programming or modeling is needed and all of the design work is done with a simple drag and drop interface.

Once the walls of have been assembled the user brings in images and tags them with the appropriate meta-data such as year, title, author, measurements. The artwork can then be placed on the walls and rearranged as desired.

The final exhibition is then exported for playback/browsing. This player/browser reads in the content and allows the user to experience the virtual exhibition.

The software (the Gallery Maker as well as the player/browser) is rooted to a standard. The standard was the first thing we developed and defines virtual exhibition data such as the units of measure, the room, the walls, the artwork, the placement etc. The Gallery Maker is simply a tool that is designed to export that data; the player/browser a tool to read it.

Other tools could be developed for creation or playback/browsing to suit individual needs but that still conform to the standard. In fact The Freedman Center is developing two different players/browsers at the same time for the virtual exhibition data but for different uses. As development proceeds we plan on inviting others to "play in our sandbox" and develop their own tools or their own player/browsers in the humble realization that we are not as we might desire be the best at everything.

Current Development Tools

While the number of tools available for development is seemingly endless, these are the tools that are currently being used by the Freeman Center's development team for their cost, ease of use, and/or the company's willingness to work with an educational institution:

Half Life - <http://www.valvesoftware.com/>

FPS Creator - <http://www.fpscreator.com/>

RealmCrafter - <http://www.realmcrafter.com/>

Blitz3D - <http://www.blitzbasic.com/>

DarkBasic - <http://darkbasic.thegamecreators.com/>

MilkShape - <http://chumbalum.swissquake.ch/>

Caligari gameSpace - <http://www.caligari.com/>

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