

# Towards a Virtual Classroom: Investigating Education in Synthetic Worlds

James Braman<sup>1</sup>, Andrew Jinman<sup>2</sup> and Goran Trajkovski<sup>3</sup>

<sup>1</sup> Towson University, Towson MD 21252, USA

Jbraman@towson.edu

<sup>2</sup>Institute of Digital Art & Technology, University of Plymouth, PL4 8AA, UK

Andrew.Jinman@twofour.co.uk

<sup>3</sup>Information Technology Programs, South University, 709 Mall Blvd, Savannah, GA 31406

Gtrajkovski@southuniversity.edu

## Abstract

Transcending the traditional classroom and that of web-based distance learning platforms, we present the use of Second Life® as a medium for learning and information dissemination. In a joint project we are implementing such a virtual space to be used by students, faculty and visitors as a collaborative learning environment and experimental space.

## Introduction

Emerging technologies have created uniquely rich and interactive 3D synthetic worlds, where new styles of interaction and learning emerge. These spaces transcend many of the limitations of the brick-and-mortar classrooms. Many institutions are taking advantage of the various forms of communication and learning paradigms offered by utilizing computer technologies and Internet applications for distance learning and education. The same concepts can be used and applied to education in synthetic worlds.

Here we use the general definition of a synthetic world following Castronova, as a term arising from the science of virtual reality and that of the gaming industry (2005). A synthetic world is any virtual space created and hosted by a computer that also contains an immersive aspect as creating an artificial 3D world. These worlds need not necessarily simulate the real world or a real environment. In recent years there have been multiple instances where home media (e.g. TV and games) and the Internet have been criticized for replacing social institutions and community (Putnam, 2000). Where this may be indicative of the decline of traditional face-to-face communication and the break down of certain norms related to the use of computer based communications. However we see these criticisms as useful in pointing out the changes in traditional methods of communication and conveyance of

information. Virtual and artificial spaces create environments that bypass the normal physical boundaries associated with “real life” and real time interaction. It is within these virtual spaces that users project conceptualized extensions of themselves during computer interaction. As in Second Life, it is through the use of self representative avatars. As our technologies evolve and change over time, so should our models and methods of interaction between humans and computers. It can be said that the “human” variable in Human-Computer Interaction can be thought of as “a cultural variable that shifts along with changes in technologies” (Trajkovski, 2006). The culture of the information age will change with the introduction of new technological developments in ways we cannot yet foresee or precisely imagine (Baron, 2001). As educators we should embrace the changes brought on by technology and explore its potential.

By these new platforms, educators can take advantage of the immersive capabilities of these environments and utilize them as a rich interactive educational medium that students can use from any location with an Internet connection. What makes Second Life such a useful medium is its interactivity and dynamic content meshed into a three dimensional social space where students and faculty can come together as if they were present together in a real life environment (Delwiche, 2006).

Within the Second Life environment itself, users have seen an influx of educational spaces which include areas created by various libraries, museums, high schools, colleges and other groups and organizations. Many large and prominent businesses have even begun to experiment with this ever growing and changing environment. The community of Second Life is one of unique potential that encompasses a wide range of users across the globe all connected by this computer mediated space. Like many other pioneers in the educational realm, we aim to explore new possibilities of learning and investigate how new mediums can be successfully used for a broad scope of purposes.

The purpose of this paper is to summarize the work done and our plans in establishing a novel educational platform in Second Life, together with the development of an experimental lab space online that will support our harvesting of human data online for experiments in interaction and emergent phenomena in immersive multi-agent environments. Our project EPii-Me, or “Emergent Phenomena in Immersive Multi-Agent Environments” is another focal point for using platforms like Second Life for research purposes.

## Overview of Second Life

Second Life is a 3D interactive synthetic world created by San Francisco-based Linden Lab®, with an ever growing population of “residents” with a myriad of connected virtual spaces. Currently, there are over 8 millions users (Secondlife.com, 2007). In Second Life, each user is represented by an avatar in which one may interact with the environment, objects and other avatars. It is a truly immersive environment without the need of the typical expensive gear often thought of when speaking of a virtual reality. It makes use of the standard input devices of a home computer (e.g. monitor, keyboard, mouse, speakers) to generate a realistic atmosphere. Even sound is projected spatially to increase the realistic attributes of this computer generated world. Each user creates an account in which they are prompted to create a name for their representative avatar. It is through their avatar that they can interact within the Second Life environment. Users connect to the virtual world through the Internet and connect with other users in three dimensions. Once connected, users can use their avatars to interact with the world and other users.

The social aspect of Second Life is a common attraction for many people. Users can actually “see” the other person’s representative avatar and communicate through text chat or voice. Private instant messaging, announcements, note cards and advertisements are also common forms of communication. The capability of Voice communication has just recently been added to Second Life allowing users to speak to each other in real time.

The Linden dollar is the common currency in this synthetic medium. Surprisingly this currency can be traded for real US currency driving a strong economic market for real life businesses and individual entrepreneurs. The exchange rate for the Linden dollar changes almost daily. At present, L\$267 are worth about one US dollar (LindeX, 2007). The real aspects of this simulated world’s economic viability have driven many real world companies to advertise and create a presence within the world. Many users have opened virtual business to sell and custom design virtual goods.

Almost any object that can be imagined or that exists in real life can be constructed or modeled using the Second Life’s modeling features. All of the content within Second Life has been created by resident’s in-world while also

retaining the intellectual property rights to their creations. Since the environment is persistent, objects, buildings and other created content always remain and can be used by their owners as they see fit. Users also have the ability to own virtual property; the amount of property a user can own is proportional to a monthly tier fee which is a subscription fee for owning certain amounts of virtual space. A typical user needs not own virtual land or even bother with monthly fees; many spend the majority of their time in various social interactions, exploration and learning more about the other users and the Second Life.

## Current Work

In the beginning of our investigation, we were able to purchase several areas of virtual land in a heavily populated and traveled area within the Second Life world. Currently our project is located in the Dreyfus region. This was needed in order to achieve a high level of exposure for our project and to attract as much feedback from other residents as possible. We thought it also important to blend into the previously established virtual ethnography in our particular area we had chosen to build. Within Second Life several 3D buildings were constructed as part of the initial design to serve as a starting point for our research. It was actually through the visibility of the project’s real estate that this group of researchers was formed.

Once these buildings were completed, advertisements were sent out to encourage other students and faculty to become involved. Currently the project includes the Extension building supported by The University of Plymouth, which is an advanced virtual lecture hall and meeting center that can be used and rented out as needed. Within the Extension building users can display slide shows, play streaming video or audio and take advantage of voice chat capabilities among users connected in the building. The building also makes use of a unique architectural style that creates a setting similar to a real-life educational setting (see figure 1).

There is also a three level conference center and virtual display gallery hosted by Towson University where several projects are currently under way (see figures 2 and 3 respectively). Using the virtual display center, student and faculty projects are displayed and advertised in an interactive poster session format on the walls of the building as it would appear in a real life setting. Other users can discuss projects with students or faculty in real time; if they area unavailable to talk, users can launch their web browsers to view web pages outside of Second Life simply by clicking on posters or on other objects. Links to outside resources on the internet can be embedded into smart objects using Second Life’s Linden Scripting Language.

Our virtual space also has areas reserved for conferences, lectures and is also exploring the possibilities for various three-dimensional interactive models of various computer

components. The potential use of three dimensional models created in-world give students a unique and interactive view on various artifacts in which they can learn. Why simply read about a motherboard or logic gates in a book or website, when you can walk up to one in three dimensions yourself and touch it with your avatar?

As with traditional web-based distance learning, faculty can post information asynchronously for students when they log into the environment. In the display area is an interactive whiteboard where slide shows can be posted for viewing. Small text files can also be transmitted from avatar to avatar as well as handed out by objects in real time. Students who are present during a live virtual lecture can also view streaming video, view slide shows as they are discussed in real time and discuss the topic or ask questions during the live session. If a student needs to send a message or a small text file to an instructor it can be handled via a drop box object or directly through the instructor's profile. Currently there is even a small scripted agent that serves as a greeter and provides information if there is no real person available to speak with students. The agent can also direct students to areas of interest and even hand out links for further exploration.

## Experimentation

In exploring the applicability of Second Life in a real college classroom, one group of students from Towson University's Computers and Creativity course is exploring this world as part of the class curriculum. This particular course focuses on the intersection of computer technology and creative forms of self expression through art and creativity. The use of Second Life was envisioned as a medium of expression where students could enter the world from the classroom lab and using the platform's rich modeling and texture tools could create 3D art works, display projects and explore synthetic realities. Already the course focuses on learning basic graphical and photo manipulation software which include many of the same features as the graphical tools within Second Life. If students can master these 2D graphical programs why stop there? Students should be encouraged to push further and explore the representation of their two dimensional art into a three dimensional simulated reality. Students can use the Second Life building tools to create primitive shapes, change their basic configurations, textures and link them together to create many different shapes or other objects. One class project was for students to upload their favorite digital pieces of art they had created during the semester and make them into displayable posters in the Display Center. It was also asked for students to draw inspiration from designs of their previous works and develop 3D sculptures also to be put on display. These types of activities would never be possible without the use of Second Life in the curriculum, thus enabling students to experiment in an alternative reality mediated by the

computer while still exploring art from a technological standpoint. Another exercise was for students to create another 3D sculpture that was representative of their avatar in Second Life; the avatar sculpture idea is designed to engage students to explore their sense of self as a "projected" state of mind in such a synthetic environment. It was then asked of this new sculpture to include a custom script, that when touched by another avatar in-world would link to the student's webpage. In previous assignments, students had to design web pages that describe various aspects of their life and to talk about themselves or include content that describe their particular career or educational goals. These exercises essentially linked many of the student's creations both from the synthetic world to that of the outside real world. Other avatars that happened to visit the project in Second Life could then explore projects created by the students, in which may have otherwise have gone unnoticed.

The introduction to the Linden Scripting Language is also part of the course work as students can examine and develop small scripts and insert them into objects. Animations either simple or complex can be created for both avatars and other objects. In this way the creative nature of animation can be incorporated into class projects and students can work directly in creating their own designs. If students develop a strong sense of how these scripts work they can then later apply such knowledge to other scripting languages that are not part of Second Life. Allowing students to experiment with scripting in a visual setting may help some to understand certain basic principles of programming. It is our goal to expose students to as much technological knowledge as possible while also exploring the creative side of computer technology through the combination of such topics. Experimenting with scripting on the three dimensional level is just one more approach. Inserting scripts into objects allows them to exhibit behaviors beyond their normal scope. Scripts can be added to objects to make them spin, rotate, change shape or size, doors to open, dance animations, or more elaborate things like opening a user's web browser or to create small interacting agents.

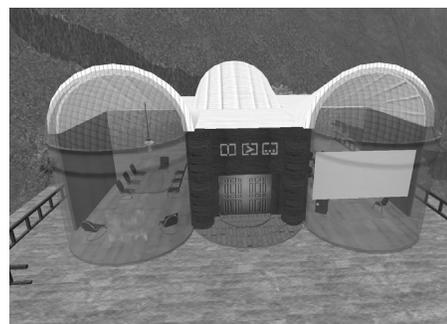


Figure 1: Extension Building  
[<http://slurl.com/secondlife/Dreyfus/224/192>]



Figure 2: Virtual Display Center  
[\[http://slurl.com/secondlife/Dreyfus/224/192\]](http://slurl.com/secondlife/Dreyfus/224/192)

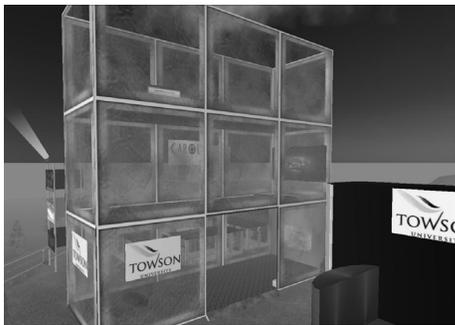


Figure 3: Conference center and Lecture Hall  
[\[http://slurl.com/secondlife/Dreyfus/224/192\]](http://slurl.com/secondlife/Dreyfus/224/192)

Also the prospect of taking virtual field trips with the entire class in real time is now a possibility. Again as part of the class lab, students were asked to visit certain locations in the educational areas and to spend time visiting art galleries within Second Life. Students can visit these exhibits, view live lectures, speak with the artists directly and ask lots of questions. Why only read about these topics when you can visit simulated replicas of cities, towns or view reenactments of events and interact with historic artifacts? Students can gain a broader understanding using a collaborative interactive virtual space. Education can be enhanced through various emergent processes through interaction and collaboration with teachers and students, not only from their own schools but also from many others around the world.

### Applications

Second Life as an educational medium can be employed as an extension to the traditional classroom or be used as a virtual medium for distance learning. Our main interest in investigating Second Life was to explore the potential of a synthetic world as an educational and collaborative tool of e-learning and social interaction. We intend to hold virtual lectures on various topics that include talks from instructors and professionals from multiple universities via Second Life. Slideshows along with live voice chat and interaction from an audience of students will show how this new medium can be used. We also intend to use our

virtual display center to allow students to display their work; not only for 3- dimensional art works, but also poster presentations of various research projects. In addition to students displaying their works at exhibitions and conferences on various websites, they now can display their research continually in a 3-dimentional setting for a fraction of the cost.

The use of 3D interfaces for manipulation of objects for practical learning applications has been used for quite sometime with various degrees of success (Shneiderman, 2004). Models can be used to help students have a “hands-on” approach to learning in situations that may not be economically or physically possible in a real classroom setting. In the context of learning, students often can understand certain concepts better if they can visualize the content they are studying in a virtual setting (Dede et al., 2005).

As part of our research on emergent phenomena and interaction within the Second Life environment, we are bringing another project into the virtual realm. The Intelligent agent Izbushka and its environment were created originally as a stand alone application where human agents could interact with the Izbushka agent. With Izbushka we could study emergent interactions and the formation of metaphorical constructs during sessions with users. The Izbushka environment itself was a “Zero-context” environment where preconceived notions of navigation or other metaphors typical of human-computer interaction were essentially filtered out, thus providing an “unnatural” environment for interaction. The human users interacting with the Izbushka agent unknowingly were situated in a 2D maze where there was no immediately apparent goal. The “goal” could be said, to only be the self-organization of the system itself and for one’s own understanding of the interaction to develop over the course of the process of interaction. Through the use of this program we were able to investigate the emergence of patterns and concepts that developed from the users. The overall goal of the Izbushka experiment was to study sessions of user interactions that resulted in both quantitative and qualitative data that will help us understand: 1) ways that humans and machines “learn” simultaneously 2) ways in which human and non-human agents combine to form a multi-agent system, and 3) ways people make sense of computer interaction and the metaphors used to characterize such interaction and computer agency (Trajkovski et al, 2006). Our goal in Second Life is to study the same concepts from within a virtual space and to recreate the Izbushka experiment to harvest data from users within an immersive multi-agent system. Second Life will provide a interactive space were we can situate users in a 3D grid where their visual senses are limited to “0” and then they will be asked to interact with the space to understand Izbushka’s objectives. Izbushka structurally couples with the human agents, the goals of which emerge during the course of interaction

(Trajkovski, 2006). Izbushka's motives are based on a subsumption architecture taking into account the current level of context and input from the human user.

Taking the Izbushka agent into Second Life will allow for a more realistic but unnatural spaces for interaction. We hope to investigate new generative metaphors used for humans to understand virtual spaces. From these new findings we then can begin to design more affective interfaces and methods for human-computer interaction.

### Immediate Future Goals

One of our goals in next phase is to acquire more virtual space as it would allow us to expand our current capabilities and allow for the creation of more buildings and social spaces. Linden Lab advocates educational research within Second Life and offers discounted rates on the purchasing of virtual islands. We also want to devote more space to students as "sandbox" areas where users can experiment with building and design as well as experiment and learn the Linden Scripting Language. Acquiring a greater amount of space would also allow for the simulation of a more natural appearing campus like environment by incorporating more natural elements into the area such as trees, water and natural lighting.

Our next phase also includes experimentation with the concept of agency in virtual mediums as we intend to create artificial agents and study emergent phenomena when situated in simple 3D environments. Using this medium we hope to discover new and useful generative metaphors that can be used to understand how users conceptualize changing environments such as Second Life and other computer mediated spaces. With our research we also are asking questions such as:

1. How can we develop a rich interactive virtual environment for distance learning and collaboration?
2. What are efficient and affective methods to get both instructors and students to embrace virtual environments for learning?
3. How can virtual objects create environments through emergent interaction and be used as extensions to the real classroom?
4. How has the culture of such Synthetic worlds developed? How do they impact the real world?
5. How can Virtual worlds be used to study cyber-anthropology and other social phenomena?
6. How do we perceive ourselves and conceptualize our interactions in a synthetic world?

We hope to also use Second Life to study the emergence of culture in virtual spaces and explore ways in which virtual societies impact itself and that of the outside world and real life interactions. The uses of new mediums are important for education as the concepts of learning and virtual spaces have changed over the years. We should be evaluating the potential for new paradigms of interaction

and learning instead of limiting ourselves to a static and traditional environment of the classroom.

### Conclusions

We present the possibilities of educational opportunities and potential in the synthetic world of Second Life. As the traditional classroom is limited and closed to some students in their educational pursuits, the virtual world opens the door to new possibilities. We see this medium as a viable source for future research in many areas including anthropology, art, multi-agent systems and intelligent agents. As an educational medium, the implementation of virtual spaces can be used as a unique method for information dissemination by use of 3D presentations and poster sessions, virtual lectures as a form of distance learning and by the use of streaming audio and video in a three dimensional interactive space. It is certainly a viable medium for many educational purposes for distance learning, collaboration and social interaction where students and faculty can share ideas and communicate in ways not always possible in the physical world. We are incorporating Second Life further into the curriculum and developing new ways to use synthetic worlds as an extension to the real classroom.

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