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Investigations of Second Life® for Distance Training

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Abstract

The author conducts an investigation to explore the capabilities and limitations of the virtual community named Second Life® for the purpose of conducting distance training involving simulation of a robotic liquid handling machine. Beginning with no experience of the virtual community, the author utilizes a blog (web diary) to chronicle the tasks and learning required to implement and conduct one trial and one actual training session. The author considers the training sessions to be successful and indicates that further investigation is merited.

Investigations of Second Life® for Distance Training

1. Introduction and background

My name is James Lloyd and I am an avid video game enthusiast, currently playing [Kameo](#) on the Xbox 360. I returned to graduate school recently with the idea of making my own personal connection between the realm of video gaming and the profession of training. In particular I have been fascinated with the concept of using video game technology to provide learners an alternate perceptual relationship with the training subject.

I am also employed professionally as a training developer at a global biotechnology company. One of my continuing tasks is to find the means to provide training to technical support scientists in over 40 countries around the world. We regularly make use of both synchronous and asynchronous web-based training technologies including web courses, web video recordings and web meetings. These technologies provide many beneficial aspects for our training goals. They are also in some ways insufficient. For example, in a web meeting much of the available screen space is consumed by items needed to conduct the meeting (attendee lists, chat window, presenter video). Learners are also confined to observe only the items allowed by the software and

the training developer. In contrast, video game technology has become quite adept at affording much more freedom to the user to move about and focus on particular items of interest.

My problem over the past 9 months has been to personally understand how a video game environment can be used to conduct distance training.

2. Selecting Second Life®

I had my first 'Aha' moment about training and video games when I played the game "[Oddworld: Munch's Oddysee](#)" on the XBOX console (released Sep. 1, 2001). It was the first game I selected to play on the XBOX and I was extremely impressed in the way that it introduced itself to me. While it only trained me on how to play the game, I was stunned by how engaging the experience was. I was taught how to do everything necessary to accomplish the game in a playful tutorial. The process of having an action explained, demonstrated and imitated by me within the game environment has left a lasting impression of being an extremely powerful training tool.

My next 'Aha' moment occurred with the game "[Half-Life](#)" for Windows PC (released Oct. 31, 1998). A modification or 'mod' of this game is named "[Half-Life:Counter-Strike](#)" around which grew a large community of players, such as "[CStrike-Planet](#)". These communities were able to create their own 'maps' for the

game. One of these maps is named "[Rat Cuisine](#)" and it is unique in that it alters the perspective of the player by changing the conventional dimensions of the virtual environment. In this map, players are perceived to be the size of rats and the game is played on the floors, cabinets and counter tops of a household kitchen.

Figure 1. Rat Cuisine screenshot low view.

Figure 2. Rat Cuisine screenshot high view

As I played in this environment I noted repeatedly to myself, "wow, I could really show how to fix plumbing under the sink this way" or "wow, I could easily point out the parts that make a refrigerator work." My intuition told me that what I had experienced could be a powerful teaching tool. But my question was how can I show that to be the case?

My first attempt to test my intuitive sense about this concept occurred at about the same time that I transferred to my current job in the Scientific Training Department. I investigated the tools necessary to create a custom map like Rat Cuisine but found that they were very difficult to master. I also struggled in my investigations with how I might deliver the map to learners within our company. Using the map would require the purchase of videogame software which could prove difficult to justify to the company. Additionally, to conduct

synchronous training would require a specialized server which in turn would require the involvement of our company's network support department. The cultural and financial obstacles for this approach were daunting.

It is trite, but in this case true to state that good things come to those that wait. I postponed my investigation until the spring of 2006 when I returned to the University and learned from my advising professor about the emergence of new virtual world environments accessible on the internet. Partly inspired by the success of desktop video games that had expanded to include "massively multiplayer online role playing" (mmorpg), these new internet services transferred the task of game design to the participants and focused instead on creating open-ended virtual playgrounds. Titles leading this trend at the time were "There" <www.there.com>, "Active Worlds" <www.activeworlds.com>, and Second Life <www.secondlife.com>.

At the same time a new training project was starting at my job involving a small robotic machine. The machine, named "Maxwell 16™", is an automated liquid-handling robot about the size of a microwave oven. The Maxwell is an entirely new type of product for our company and because one of my responsibilities is to find innovative methods for delivering training, the Maxwell become an obvious choice for a subject for

this investigation.

Knowing my subject to be a small machine helped me develop criteria for selecting a virtual world for my investigation.

These were the criteria I used for selecting Second Life:

1. The virtual world must be globally accessible via the internet.
2. Any software required must be easy to install.
3. The cost of participation must be as low as possible.
4. The virtual world must provide tools capable of modeling and simulating a machine.

For my purposes Second Life had 2 important strengths.

1. The modeling tools seemed to be capable of simulating the Maxwell robot.
2. There is no cost for learners to sign up and participate in training.

Learning in Virtual Environments

Before making the plunge into this investigation I sought information about the transfer of understanding in virtual environments.

Latham (2002) describes several theories about the concept of transfer and provides guidelines about what is required for "transfer of training." She also discusses the issues of fidelity in model design not just in terms of mirroring the real-world but also "going beyond the real world" which supports my interest in exaggerated size. She describes going beyond the real world as providing a 'transparency' to real-world

limitations in understanding.

Darken and Peterson (2002) also discuss transfer and specifically investigate how the spatial sense acquired in virtual environments transfer to the real world. This was particularly insightful for the Maxwell project. While they highlight deficiencies, they do agree that in many cases there is transfer between the virtual and real.

In the same collection of articles, Cobb (2002) illustrates 3 phases of training design in a virtual environment which I found very useful in my own planning project. More importantly, she shares a discussion of the concept of "super-reality" which resonates with my interest in exaggerated perspective.

Learning in Second Life

Research is also beginning to accumulate specifically about Second Life. One of my favorite researchers is Sarah Robbins at Ball State University. She is exploring identity issues in virtual reality as part of her dissertation in rhetoric and composition and has conducted several interesting identity experiments in Second Life. Her name in Second Life is Intellagirl Tully and she discusses her Second Life research at this url: <<http://www.secondlife.intellagirl.com/category/research/>>

I have also been guided by other educators in Second Life. Aline Click (second life name: Ali Andrews) and Bryan Carter (second life name: Bryan Mnemonic) presented at the 2006 GLS conference and have been valuable in helping me find resources for building and scripting in Second Life. Jeremy Kemp (sl: Jeremy Kabumpo) is also a fellow Second Life educator and maintains a valuable resource for educators at the url: <<http://www.simteach.com>>

As a brief aside, I have to admit to being entertained by the jump from Half-Life to Second-Life. Do the numbers in the names of these programs imply that one is 4 times the other?

3. Issue Investigation

To better convey the details of my efforts I have chosen to describe the investigation by issues relevant to the project and conclude with the implementation and outcome of the project - conducting a short training about the Maxwell robot with distant learners. During the course of this discussion I will regularly refer to an email discussion group named "Real Life Education in Second Life" who refer to themselves as Second Life Educators or "SLED" for short. I will also refer to discussions within this group using the term SLED (Information about Real Life Eduators in Second Life and the Second Life Educators Discussion

group can be found at this url: <http://secondlife.com/community/education.php>).

Accessibility

I created my first Second Life account on February 9th, 2006 knowing almost nothing of the world I was about to enter. Since that time I have become quite comfortable being 'in-world.' That sense of comfort did not come quickly or without overcoming several obstacles.

Computer and Network Requirements

The first accessibility issue I encountered with Second Life is that it is a computer and internet intensive application. The hardware and network requirements are quite demanding. I am fortunate to have resources at home and at work that allow a fast internet connection of at least 128 kilobits per second, and of computers with fast processors (1.5 gigahertz and higher) combined with lots of memory (512 megabytes) and good graphic card support. I am fortunate to know who the learners for this project are and to also know that through their workplaces, they have both high speed internet and amply capable computers. In discussions on the SLED list there are frequent references to the amount of hardware required

for participation and this is clearly a continuing struggle for educators.

Second Life Client Software

Another aspect of accessibility is the client software itself. The company that has created Second Life is named Linden Labs. Linden Labs has stated publicly their intentions to keep the software innovative and therefore it is constantly being revised. It is typical for the software to be updated 2 or 3 times every month which requires a 27 megabytes download over the internet. Educators on the SLED list have communicated regularly that this is a big problem for large institutions that do not allow software to be freely installed. Some institutions have banned the software outright while others will take several days delay to approve the upgrade. Some educators have found a solution in an application named "Mojopak" which allows a program to be run from a USB flash drive. Using this tool an instructor can download and install the Second Life program on a flash drive and let students run the application from there, bypassing the computer administration issue.

The client software is otherwise very education friendly since it is released in Windows, Macintosh and Unix versions.

Software & Server Reliability

An aspect of accessibility is to measure how reliable the Second Life platform is for educational purposes. This is a frequently discussed topic within the SLED group and there is still no general consensus as to whether Second Life is a reliable platform. The bi-weekly software update that is typical of Second Life is a constant frustration to educators. This is partly because the 'Black Wednesday' updates mean that the world is unavailable for up to 6 hours but it is also unpredictable. Often updates are cancelled and re-scheduled because of unplanned events such new software vulnerabilities or new abuse behaviors from users. Some educators in the SLED group have expressed outrage, but most seem to be willing to endure the continual upgrades for the improvement it brings. It does seem quite unconventional compared to other platforms and it remains to be seen how long Linden Labs can continue this practice.

Another aspect of reliability is more long-term. Second Life is privately owned by one company and is subject to the whims of that company. This is not so different from any other platform such as "Active Worlds" or "World of Warcraft" but it must be identified as a risk when considering investing time and effort into a virtual world project. Occasionally

rumors will appear in the forums that an offer has been made to purchase Second Life by Google, but these to date have not been validated. I have also been intrigued by the concept that Google Earth is a potential virtual environment (with avatars and persistent objects). There are several contributors to the SLED group who insist that an open-source, platform-agnostic virtual world is inevitable and will impact reliability and accessibility for all virtual worlds. On this we all can only wait and see.

Sight and Hearing Limitations

A final note on accessibility is within the client application itself. The program is graphically intense and therefore it is not well suited to participation from users with visual disabilities. There has been some discussion about haptic interfaces in the SLED discussion list but in general this is a hardware issue that is beyond the scope that Linden Labs has set for itself.

Sense of Place

Closely related to accessibility is the experience of actually using the virtual world software. In my experience there are some people who have an intuitive sense in virtual worlds and others have to work harder to participate.

The Land Economy

When I first entered Second Life I was very timid about moving around. I was afraid to touch things and mostly, I was concerned about going someplace I was not supposed to be. I did not want to trespass because I immediately had the impression that land defined ownership and belonged to other participants in the virtual world. This sense of place has to be one of Second Life's most compelling features. Many aspects of Second Life are built to identify, exchange, shape and define parcels of land. Second Life has enjoyed notoriety in the popular press due to participants (called 'residents') making real world incomes from their activity in Second Life. Resident Anshe Chung has been profiled in news magazines for the amount of US currency she has converted from her land activities in Second Life (http://en.wikipedia.org/wiki/Anshe_Chung). The most lucrative method of making money in Second Life is in the land transactions. The economy within the virtual world thrives on the purchase, sale and rental of land.

Land is also emphasized because of the ability it confers upon residents. It is only by owning land that a resident can achieve persistence. While there is no cost to create an account, create objects and keep a personal inventory of

objects, all of those things will disappear when the user logs out of the world. In order to have a persistent presence in the world, it is necessary to own land. This is also how Linden Labs makes money - they charge a monthly maintenance fee of all land owners based on the amount of land owned. Fortunately the costs of land ownership start at very reasonable levels. For this project I am a land owner of less than 2096 square meters and my monthly maintenance fees are \$25, which is less than basic cable television.

Representation of the Real World in the Virtual World

There is an ongoing discussion in the SLED email list about replicating the real world inside of Second Life. It is very common to see a first time resident create things that are representational of the real world. For example one of the first things most people do is build a house that actually looks like a suburban home. This is understandable since it is quite natural to start by building what we know. A good example of this can be understood by considering a classroom setting. In a traditional classroom the learners sit in desks arranged in rows facing the 'front' of the class. The teacher speaks in the front, audio/visuals are presented from the front and this defines the front of the room as being the location from where

the learning will be observed. I have encountered a high amount of representative constructions in Second Life even from the creators of Linden Labs. Pooley Stage is a common meeting area for residents. The CEO of Linden Labs, Philip Rosedale conducts town hall style meetings at Pooley Stage which is set up in the style of a traditional auditorium - speaker in the front, audience in rows facing the front.

By contrast many of the educators of the SLED group have been working in world for a long time and discovered that the virtual world offers many options for building that are not representational. For example, in world where everyone can fly one can legitimately question the need for stairs. Similarly, since there is no weather or temperature a door on a building becomes less of a necessity. With some exploration it is possible to find innovative building concepts that explore the freedoms afforded by the virtual world.

The Non-Representational Classroom

In regards to a learning environment it is no longer necessary to have the didactic 'front' of the classroom. In fact, because it is possible for residents to separate their view of the world from their avatars, I have been inspired to develop a classroom where the avatars of both learners and

presenters face the same direction and learning content is placed behind them. All participants can then move their views to see all of the elements of the classroom at the same time. This is one example of what I find so compelling about Second Life - the ability to do things that are not possible in the real world.

Arguments for Representation

Even so, representational environments will continue in Second Life. And there has been good reason for this. Aline Click made a highly representational environment at Glidden Campus with a compelling representation of one of the most notable historical buildings of Northern Illinois University. She presented the argument that in order to secure approval and funding for her projects in Second Life, a representational environment is very familiar and therefore understandable to decision makers who need to connect a value to activities in the virtual world.

To welcome initiates to the virtual world, a representational structure provides both comfort and orientation, both compelling senses of being in a place. For that reason I knew that to pursue my investigations in Second Life I would need a place for experimentation and to conduct

learning. This was one factor in shaping the first steps of my implementation plan which involved finding land and building a learning environment.

Sense of Community

With the discussion of land and objects of Second Life it is easy to forget that behind the avatars and the constructions are real human participants. Along with human beings come representations and variations of real-world human behavior and culture. Second Life is also very compelling for the sense of community that has emerged within the constraints of its computer-mediated environments.

I previously described my fear upon entering Second Life for the first time. I was afraid of going to places I was not supposed to be or moving objects that I should not. Of course, part of that fear is that the land or objects would belong to another person. My personality makes me cautious in such situations so I began my explorations of the Second Life social world with great trepidation.

First Acquaintances

From my solitary real-world environment at the computer screen and keyboard I first used the search capabilities of

the Second Life software to look for activities related to education. I searched for 'classes' and immediately found a large number of results for classes at a place called "Teazers University". One of the first things I learned was how to teleport and I went to the Teazers University to see what the classes were like. The class environment was simply a large grassy field fenced into quadrants and classes were conducted out in the open air. For several days I would log in to Second Life and observe the classes from high in the air, still too timid to approach. I did not understand if it was necessary to sign up for a class. I had found a perch on a large building next to the classes and I can remember hanging out there and building the courage to approach a class.

After several days during which I refined my ability to move my avatar and manipulate the text chat tool, I finally approached a class. I asked if it was necessary to sign up and someone typed that there was no signup, just walk-in and participate in the class. So I stayed with this class which proceeded to demonstrate how to build a 'witch hat' that could be worn by my avatar. This class was a great introduction to so many things that I still use today. But what really impressed me was the friendliness of the instructor and the students. Everyone seemed very helpful. It was a great encouragement and

helped me to feel more relaxed and confident in the virtual world.

Shortly after attending the hat-making class, I made contact with a fellow real-world classmate at the University of Wisconsin who was investigating Second Life. Shree Durga invited me to a small piece of land where she had also gotten a pre-fabricated building to assemble. She was having difficulty installing the windows, which in retrospect was not possible because the small size of her land did not have the capacity for the window objects. Shree introduced me to her virtual neighbors in Second Life which also made me more comfortable with approaching and talking with strangers.

Virtual Shyness

I have heard that other participants do not have the difficulty that I had in becoming more social in Second Life. I suspect that it is a matter of a differing perspective on the consequences of a social mistake in the virtual world. For some, the fact that the world is virtual means that mistakes are lessened. For me, making a social mistake in-world seemed even more improper than the real-world. I believe that I have this feeling because of the limited bandwidth of social interaction. In the real-world I can easily read facial expressions and voice

inflection to realize that I've made a mistake, while in Second Life, I cannot.

Formal Communities

Though my acclimatization to the social aspects of Second Life was slow, I did begin to feel more and more like a legitimate resident rather than an interloper. I later learned that the Teazers organization was a community formed on the shared interest of 'furries.' In the real-world, Furrries are a people involved with the fetish of dressing up or even transforming into animal forms. I was a bit surprised by the fetish aspect of this community but I could not deny that they had been very generous in offering many classes and support systems for all residents of Second Life. It became clear to me that many of their classes were about costume design which supports the shared interest of their community.

The Teazers are an example of a formal community in Second Life. The software for Second Life provides many ways to support formal communities. There is a setting in the software where any resident can create and invite members to a group. Being a member of a group conveys a set of abilities to communicate and permissions to interact with objects in Second Life. The most common ability is to send an instant message

to all members of the group. Being a group member often gives permission to enter buildings and activate scripts such as operating a vehicle or other machine. Popular groups focus on specific interests about Second Life such as how to build and how to write object scripts which make objects move. It is free to become a member of these groups and IM the entire group with a question on the topic.

Second Life also encourages formal groups providing many community support options on the software website < <http://secondlife.com/community/>>.

Informal Communities and Anti-Social Behavior

There are also informal communities that emerge in Second Life. In the less vivid, though none-the-less virtual world of the internet, the phenomenon of email spam and web-site phishing are anti-social behaviors that challenge more accepted activities. Some practitioners of are simply motivated by the potential to profit financially, while others are motivated by a need to challenge the status-quo.

In Second Life there are also communities of residents that work to disrupt the activities of others. It is possible that some of these disruptive activities have a financial payoff, it seems that the motives are very simply to challenge

the strengths and weakness of the virtual world which often disturbs other residents. The most common form of anti-social behavior is called 'griefing' and is both a personal and social phenomenon. A griefer is typically an avatar that will appear where other avatars are gathered and dominate the visual and text-chat space. This can be accomplished by transforming the avatar in size to push out other avatars, deploying clouds or smoke to obscure the space, and by typing insults or gibberish into the text conversation. The terms 'griefer' and 'griefing' come from previous online games whether this behavior also emerged to challenge the norms of the game <<http://en.wikipedia.org/wiki/Griefing>> . In Second Life which emphasizes its social aspects over its game aspects, this is a particularly effective way to upset those behaving within the norms. Second Life does supply a complaint system and has the means to identify and expel griefers from the game, using the metaphor of a virtual police department and a 'news report' of recent actions <<http://secondlife.com/community/blotter.php>>. The practitioners of anti-social behavior become an informal community having similar goals and at the same time, make another informal community of those upset by the behavior.

There are more malicious anti-social communities in Second Life as well and these involve programmers and designers

who attempt to disrupt the technology of the virtual world. An object script was released upon Second Life called "Grey Goo" and like the out-of-control nanotechnology it imitates, would self-replicate until it exceeded the ability of the software to represent it and first crash the client software, sometimes even crashing the server software. Linden Labs has been very aggressive at preventing and prosecuting this type of attack, which is part of the reason for the bi-weekly software update.<http://www.secondlifeherald.com/slh/2006/10/lls_fatigue_fac.html> For educators in Second Life it is important to understand the potential for this kind of disruption exists and to have a plan for the learning activity should the anti-social community invade.

Legitimate yet Offensive

In spite of the tools and firm stance of Linden Labs on anti-social behaviors there is a pervasive openness to Second Life. Like the internet, Linden Labs maintains that Second Life is defined by its residents. As described above, the Teazers group is fascinated by the Furry fetish and openly discusses and plays with the concept. There are groups interested in topics from trans-humanism (evolving faster and beyond natural processes) to exploring the limits and possibilities of virtual

sex. Indeed, the scripting language allows control of avatars to simulate many possible and some impossible sexual activities.

To help residents cope with a tremendous variety of interests and activities Second Life allows the categorization of regions to be "PG" or "Mature". When in-world the title bar of the software will plainly display the land category and this greatly influences the official response to complaints. If one resident is offended by another while in a mature region, the response is understandably less severe than if the complaint occurs in a PG region. In general practice it is a reasonable expectation to conduct training in a PG region and not be offended. However, it is always possible that something will disrupt a class and this must be taken into account. Educators must be prepared to reschedule or relocate in the event of a disruption.

As standard practice when I prepare friends to enter Second Life for the first time, I tell them that there are things that WILL offend them and they need to be prepared to deal with that.

Teen Second Life

Linden Labs have also taken a firm stance on age restrictions and specify that Second Life is only open to participants over 18 years old. There is a separate server and

client environment called "Teen Second Life" <<http://teen.secondlife.com/>>. Teens are allowed to create a free account and participate in an environment similar to Second Life. There are adults in Teen Second Life but they are only allowed in zones that are categorized as 'adult present' so that the teens know an adult is nearby. There is also a validation process for educators to be allowed access to what is known as the 'teen grid' ('grid' is a term used to talk about the server infrastructure of Second Life - such as "the grid is down" for when the servers are offline). It is possible to construct objects in Second Life and transfer them to the teen grid, but this must be performed with the involvement of Linden Labs staff. Some educators in the SLED group have expressed frustration with the separate worlds (for example, involving adult guest speakers), while others seem to taking advantage of the design to re-assure parents and school officials. To me it seems somewhat dubious as my own children have had myspace.com accounts since they were well below the age limits. It's not difficult to misrepresent age on a registration form. My project for Second Life does not involve minors so Teen Second Life is not a concern for me.

Sense of Identity

For use as an educational and training tool there is an assumption that an activity conducted by the virtual representation known as an avatar will transfer as experience to the participant or in Second Life terminology, the agent. I do not intend to debate this issue as I am already firmly convinced in the truth of this assumption. However, I do find it valuable to note that many educators are particularly interested in this concept and also interested in understanding more deeply the relationship between agent and avatar.

Am I my Avatar?

The projection of the agent into their avatar is part of the ongoing work by Sarah Robbins <<http://home.intellagirl.com/>> at Ball State University. I have participated in experiments Sarah has conducted in Second Life having to do with avatar identity though gender and race and I found the experience to be incredible enlightening. A good example is an event that occurred when I applied a female appearance to my avatar. I was otherwise absorbed with a building project when I received a text 'proposition'. I could not see an avatar nearby and at first ignored it. Then a second proposition was made and made a hunt to find the source. It turned out to be an avatar that was so small as to be invisible. I replied to the message and the

user changed the avatar appearance to a gothic male appearance. Prior to being 'female' in Second Life I had never experienced this behavior of a resident lurking about, clearly on the prowl for new female targets.

I have also communicated with other educators exploring issues of obesity and body image through the use of avatars who are also exploring the identification and projection of the agent into the avatar. There is a quirky aspect to the Second Life platform that is also quite revealing about the agent/avatar relationship. Second Life only allows participants to select a last name from a list provided by Linden Labs. This is a sore point for many users as indicated by the number of postings in the Second Life user forums. In those posts, people are interesting in preserving their real-life last names in Second Life in order to extend themselves more identifiably into the virtual world and to be recognizable to others.

There are benefits and risks for educators to consider with agent/avatar identification. If a learner is overly identified with their avatar they may be hesitant to experiment or afraid of losing their avatar. Yet if a learner does not identify enough with the avatar, the transfer of learning may be impacted. I can see why this is a fascinating area of study.

4. Implementation

What follows is a summary of my experience designing and conducting a training environment and lesson plan using Second Life. My notes of the process are publicly available at <http://lloudlabs.blogspot.com>

Lloud Labs begins

I had created my first avatar with the name "Jameschris Snickerdoodle" but had never been very pleased with it. Being a free account I knew that to start this project I would create a new avatar and account to manage the purchase of land. But the quirk of choosing a name in Second Life was a bit of a struggle to decide between being recognizable or choosing something more creative. During the account creation process I was drawn to the last name Laffer which was one of the names allowed by Second Life that day. For other projects I own the web domain www.lloud.com which is a variation on my real last name and thus my avatar Lloud Laffer was created. I also suddenly had an alliteration of the letter "l" which helped inspire a name for the place where I would conduct this project - Lloud Labs.

Locating the Training Environment

I had determined early on that I would need a location with Second Life to build the model of the Maxwell robot and that

it would need to have privacy. If for no other reason than the Maxwell robot is a proprietary product of my employer. So I began my Second Life project searching for a piece of land. Second Life provides a search tool and since land is the most important commodity in Second Life it was easy to find land for sale. The difficulty lies in choosing a location. Land is also rated by the amount of avatars that visit which is called traffic. Land with more traffic is of more value since traffic implies more opportunity for in-world sales and interactions. For training my interests were exactly opposite and so I sought land with low traffic. This also meant that the price of the land would be lower.

Second Life land is organized by regions called 'sims' which have a practical basis of being equal to one computer server. Sometimes a region or sim will be down (indicated by being shaded red on the world map) and this is a precise indication of that particular computer being offline.

Another aspect that I desired for this project was a surrounding that would not change too drastically. Linden Labs maintain parcels of land throughout the world for 'maintenance' that look like utility easements. I made a decision to purchase land alongside such a parcel so that there was some free space between the project area and other resident land. I ultimately

found a parcel in the region named "Lunaris." I purchased the land for about \$30 real money or L\$6000 of in-world currency called Linden Dollars. This amount of land also incurs a \$25/month maintenance fee which for this project I've paid for personally. If my employer should decide to pursue training within Second Life I would ask that the company take over the costs and purchase a private island, which has a monthly cost upwards of \$250.

Building and Buildings

With the purchase of the land for Lloud Labs it was now time to begin to explore the tools and techniques for building the items needed for the project. Prior to purchasing the land I had built the witch hat which familiarized me with the fundamental paradigm of construction in Second Life - the "prim". Prim is short for primitive and as the name implies is a simple geometric shape. Every thing is built from prims which was a bit of a surprise to me. When I selected to conduct this experiment in Second Life I believed that it would be possible to import 3D models from other programs such as AutoCad. I quickly learned that there is no import or export function. All constructions must be made in-world using the construction tools provided there. It was a surprise, but I continued on because

of I had observed some very impressive models already and I felt that my project was still possible.

First Important Tip for Successful Building

For my first construction project I decided that I would need to make a building for Lloud Labs. I had decided that I would have a more traditional type classroom space and also a very large laboratory space for the exaggerated-size robot. It took me about 2 weeks to explore and understand the tools to construct the building. My most significant observation during this process is that it was absolutely essential to understand how to manipulate my view of the world during the construction process. It is possible in Second Life to detach your view of the world from the default position behind the avatar. By holding down the 'ctrl' and 'alt' keys while left-clicking the mouse on a object the agent can center the view and circle in a sphere around the clicked area. The mouse wheel is used to zoom the view. Using this technique is absolutely vital to the tasks of manipulating primitive components in relation to each other. This technique also requires a fair amount of practice. Again after 2 weeks of building I felt that I was accustomed to using this technique and no longer had to think about it to use. It become an intuitive extension of being in-world.

The specific design of the Lloud Labs building was informed by dis-assembling a building that was included in my avatars inventory. Every avatar in Second Life has an inventory that contains quite a variety of item types, including clothing, furniture, text documents called notecards, location coordinates called landmarks and buildings. I dragged a building from my inventory (the Atoll Region Shack) which 'rezzed' it onto the land and started taking it apart to see how it was built. I first learned that primitives are made into more complex objects by linking them together - much like the 'grouping' command in PowerPoint. I selected the shack and then unlinked the component prims. I learned that windows could be created by using alpha channel transparencies in primitive texture maps. A texture map is uploaded to the avatar texture inventory and then can be applied to any surface of any primitive. I quickly learned that understanding the design and application of textures would be an important part of creating character in objects.

Object Texture and Character

At the same time that I was designing the building, I was exploring local history with my girlfriend and we went to a place called "Little Norway" which is not far from where we

live. It is an historical Norwegian settlement and I had the opportunity to take photographs of the buildings there. At that time I decided to use those photographs as the inspiration for the appearance of the Lloud Labs building. I decided to make it look like a sod-roof house which I think has the aesthetic effect of minimizing the size of what would be a rather large building. Using the web resources provided by Linden Labs I learned how to design and apply the photographs I had taken to the primitive objects I would use for walls, floors and ceilings in the building. I designed the sod-roof building to have the classroom as the entrance and then sank the larger lab room into the ground, again to minimize the apparent size of the building to the outside world. I added some nice features to the classroom such as photos of the Little Norway buildings to serve as pointers for the inspiration of the design and a fireplace with simulated fire to add warmth to the room. This room became quickly the most representational aspect of the building which is appropriate since this is where learners will begin the lesson. Taking clues from Aline Click and Bryan Carter, the classroom has a familiar feel to acclimate learners to the environment. At this point, I did not yet know how I would separate the laboratory from the classroom. Clearly I would need some kind of door and the door would need to be operational

and restricted to operate only by authorized avatars.

Making Things Move - Object Scripting

I decided that it was best to begin with a smaller project before attempting the door to learn about scripting. I decided to extend my learning by building a obelisk to stand on the land and identify it the location as Lloud Labs. I imported a partially transparent logo for the project and made it into sort of a sail on top of the object. I then decided that I wanted it to rotate and this became the first attempt at writing an object script. An object, which can consist of linked primitives, also has an inventory in which it can hold scripts which are text files written in LSL - Linden Scripting Language. LSL is very much like JavaScript with specialized set of commands specific to object properties and methods. Functions and operators are identical to JavaScript so anyone familiar with advanced web site design should have no difficulty understanding LSL. I was able in short order to make the logo spin on top of the obelisk and that success propelled me to build the barrier between the classroom and laboratory. Allowing myself a bit a creativity I decided why bother with a door when with scripting I could make the whole wall move. The moving wall script did not take long to write and soon I had a wall that would go up and down when it

was touched by an avatar.

Making Objects move other Objects

The last important concept I discovered while building had to do with the moving wall. It was not obvious that clicking on the wall is needed to move it. I wanted to create a switch that indicated "up" to raise the wall and "down" to lower the wall. By referring to the LSL website at <<http://www.lslwiki.com/>> I learned that objects can 'talk' to each other the same way that avatars text chat. One object must run a script that is 'listening' and the other object will 'say' things to the listening object. Objects have the option of listening and saying things that avatars can hear or can also listen to 255 other channels so that residents do not hear the conversation. So now the moving wall 'listens' for commands from switch objects in the classroom. I then concealed the switches behind a cover that only members of the Lloud Labs group can operate. With the moving wall as protection for the project, it was time to begin the model development.

Simulating the Robot

In May of 2006 I had created a simple representation of the robot for a class presentation. It was just a cube with

the same dimensions as the robot with photo textures applied. It certainly looked like the robot, but did not have any functionality. What it did allow me to do was to show the concept of presenting the robot at an exaggerated scale in relation to the avatars in the room. I began construction of the robot in earnest in preparation for a trial lesson with my co-workers in Madison. I estimate that it took approximately 5 weeks to complete this first phase of the robot design. The design of the robot was to support the trial lesson plan. To save time I had made the decision to only design components of the robot that were vital to the lesson. I left un-needed details simply as photographic textures.

Trial Lesson

Before unleashing this project on colleagues overseas I wanted to have a trial lesson with people familiar with the training requirements. I selected a group of 4 people including the Maxwell project manager to attend a demo of the environment. The demo occurred on 21-Sep-2006 and all participants were gathered into a computer classroom where interaction was unmediated by the virtual world. The lesson plan for this meeting involves a short procedure that must be conducted when the Maxwell is delivered to a customer. I had spoken with the

project manager and determined that this was a simple procedure, but because it was so specific it was causing problems for people in the field. The procedure consists of 7 steps each containing 3 to 8 tasks. The tasks involve identifying components, moving shipping anchors from positions safe for shipping to positions safe for operation and then removing packing foam from the robot.

This group of participants was not familiar at all with Second Life so the trial meeting plan included 20 minutes of orientation in Second Life. I had prepared accounts for each of the participants and when they arrived in the computer lab, the software was running and an avatar for each of them was on-screen, ready for their introduction. In preparation for this meeting I had created the accounts as alternative or 'alts' to my own Second Life account. This costs a single time fee of \$10 for each account. There has been a fair amount of discussion on within the SLED group on the benefits of pre-created accounts and this was my opportunity to test the concept. During the creation of those 'alt' accounts I also made detailed notes from the orientation that is provided to all new users and simplified those notes for use in the trial meeting.

With the 'alt' avatars it did not take even the 20 minutes planned for the participants to grasp the basics of moving

within Second Life. The avatars started in the open grassy area of the Lloud Labs land so that there was plenty of room to practice movement. I also gave them instructions on how to change their view and focus on specific subjects during the lesson. We then proceeded to the classroom to start the lesson.

Failed Concept of Free-Play

I started the lesson by placing a proportionately-sized Maxwell robot on a table in the classroom. I told the participants that we would be presenting the procedure to adjust the shipping anchors. My intention was that I would build suspicion in their minds about how they would be able to observe the demonstration when the model was seemingly so small. I then lowered the moving wall to the laboratory containing the large Maxwell robot. As I expected there were expressions of appreciation of the large model. I could tell that it registered in their minds that they would now readily observe the demonstration. I then proceeded to review the procedure, using my ability to edit the model to move the components. It was then my hope that the participants could play freely with the model to have experience with their avatar performing the procedure. However, this did not work out as I had hoped. The avatars did not have the ability to move the objects as I did

and I found I could not constrain the movement of components accurately enough so that the learners could directly experience the procedure. I identified that I had imagined that avatars could freely play with the model to better understand but it quickly became apparent that this approach would not work.

Participant Response

I did receive some fascinating responses to the trial lesson. All of the participants easily acknowledged the benefits of the exaggerated size to their understanding of the procedure as well as the opportunity this presented for learners at a distance. Participants did object somewhat to the lack of fidelity in the model, but understood when I explained that I only modeled the components necessary for the lesson. I explained that the model could be enhanced with other components as needed by specific lesson plans. I also had a surprising response from one of the project engineers. I have always thought in terms of the Second Life training being a synchronous event with learners and instructors involved in real time. He proposed however that the model and its behaviors be used as a means to generate movies for later playback in asynchronous materials, much like the machinima that is becoming popular in online education right now. This was a revelation to me not so

much for the machinima movies, but more for considering how the simulation might be made more asynchronous.

The Final Lesson

Application of Trial Lesson results

I made two important conclusions from the trial lesson. The first was that the model was not suited to free-play and that instead the model should be designed with pre-scripted behaviors tied to the procedure. This also would have the benefit of making the model useful to avatars who wanted to use the model alone without an instructor present which opened the project to asynchronous activities. The second conclusion I made was that it would be impractical to conduct both the lesson and an orientation to Second Life in one synchronous session. So I decided early on in my communication plan that I would ask participants to create their own Second Life accounts and complete the orientation provided by Linden Labs. This allowed me to trim the meeting agenda significantly which turned out to be very important because of the slower pace of having communication in the meeting mediated by the Second Life interface. I had earlier explored the options enable voice with Second Life but abandoned the idea because I did not want the participants to have to deal with an additional application and

setup. I also rationalized this decision based on previous experience with web conferencing where we have found that a text-chat interface actually helps control the flow of information between participants.

The Task Tree - Scripting the Procedure

I explored several techniques to script the actions of the robot and make that available to the instructors and learners. The first technique I explored was a traditional approach of having a dialog box appear on screen with a list of actions. This was the easiest approach to implement, but it was unsatisfying to me because dialog boxes are isolated to each avatar and it is not possible to know if the group is synchronized. I also explored the option of having controls directly on the program interface. This is a common design approach in Second Life and is known as a 'heads up display' or HUD attachment. But like the dialog box, it cannot be shared with a group. So I determined that somehow I wanted the procedure steps to be displayed in-world. I thought of making a series of posters for each step in the procedure, but this had several disadvantages. The first issue is that text does not appear reliably when applied as an image on a poster. The second issue is that the participants would need to be

constantly moving their view from the poster to the model which would become very impractical and lead to not viewing the robot at the appropriate time.

So I created what I call a Task Tree. It is an object that starts as a flat blue disk on the floor next to the model. Clicking the blue disk causes a red stem-and-leaf shape to appear made of rods and flat discs with text above them. The text is called 'hover-text' in Second Life and by design maintains good readability regardless for avatars at a variety of distances. The red task tree is the index of the procedure and the 'leaves' represent each of the 7 steps in the procedure. Clicking a leaf causes the index to disappear and be replaced by a yellow step tree. On the step tree, each leaf is the task of that step and causes the robot to perform the step. So for example, step 3.4.4 has the following tasks:

- Identify Anchor C
- Move Anchor C halfway up
- Identify the Magnet Rod Assembly
- Move the Magnet Rod Assembly down
- Move Anchor C all the way up

In addition to the index and the steps in the protocol, I included leaves to remove the case from the robot for even better viewing and also leaves to reset the robot to its initial condition and to quit the procedure. I was very happy with this

innovation and I feel that the task tree successfully presents a means to use the robot in both synchronous and asynchronous settings and optimizes the ability to see and understand the procedure.

Figure 3. The Task Tree and the Large Model

Figure 4. The Large and Small Maxwell models

The final meeting was quite successful and the participants expressed their enthusiasm for the project and its use. One participant pointed out she does not have access to the robot in real-life except when delivering one to her customers so she thought it would be useful, with the caveat that more detailed components are added to it. Another participant expressed frustration that the simulation would be just another reason to deny her the opportunity to travel to Madison for training. To me, that was as good a 'mission accomplished' response that I could have hoped for.

5. Conclusions

First and foremost I was absolutely thrilled with the exclamations of understanding when the big model was revealed to the participants. They immediately appreciated the opportunity the exaggerated model would provide and progressed through the

lesson as though it was completely acceptable to be standing inside of an object that is only 12 inches tall. I believe that potential for 'superreality' is just beginning to emerge in platforms like Second Life and I look forward to seeing more develop in this area.

I was also enthused by the general ease of access presented by Second Life. Either with pre-created avatars or with avatar they create themselves, learners have ready access to this platform and compared to other tools it is not difficult for a novice to get going with Second Life.

I do have lingering concerns about the long-term reliability of Second Life. It exists in a highly volatile consumer market and without warning could cease to be. But until there is a more universal common platform for 3D environments, Second Life has proven to be a flexible and very convenient tool for this training experiment. There are technical and social risks to be considered using Second Life, but there are also many re-assuring efforts by Linden Labs to mitigate those risks.

References

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Figures

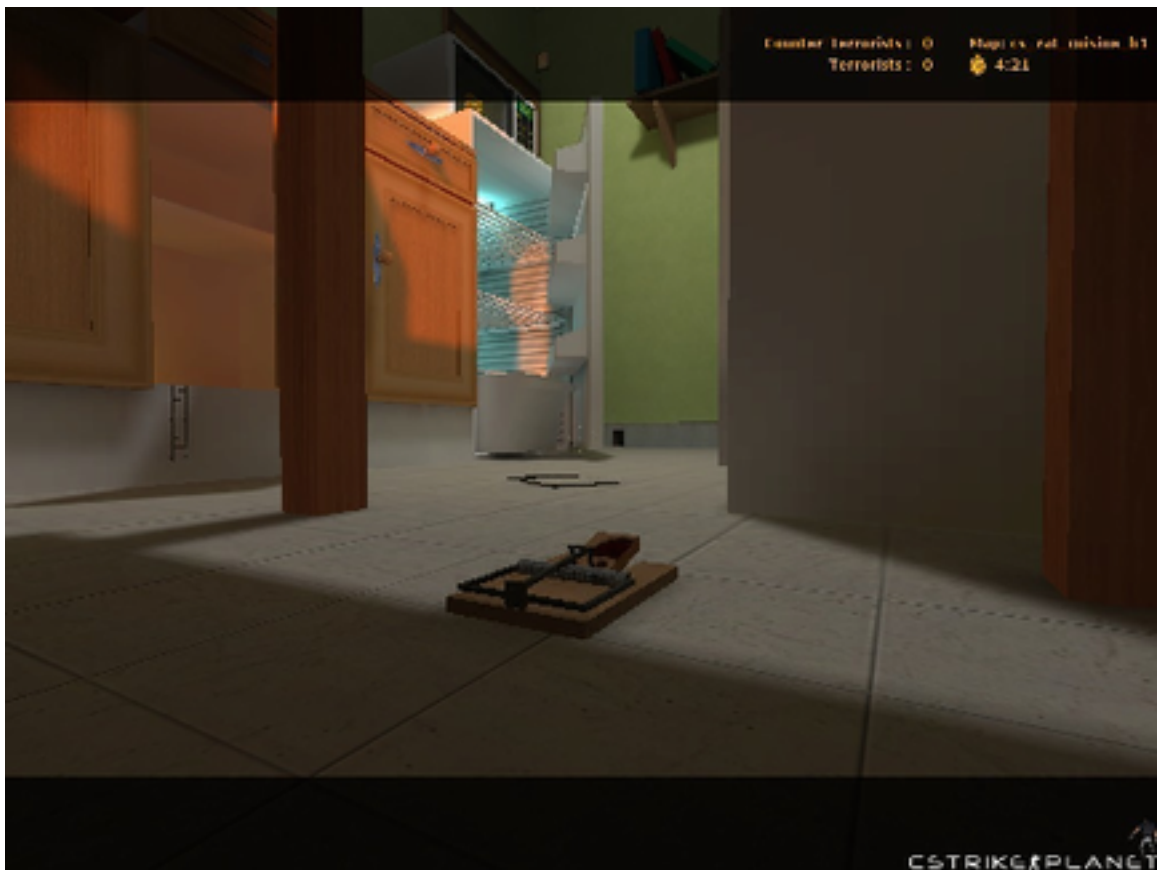


Figure 1. Rat Cuisine screenshot low view.



Figure 2. Rat Cuisine screenshot high view

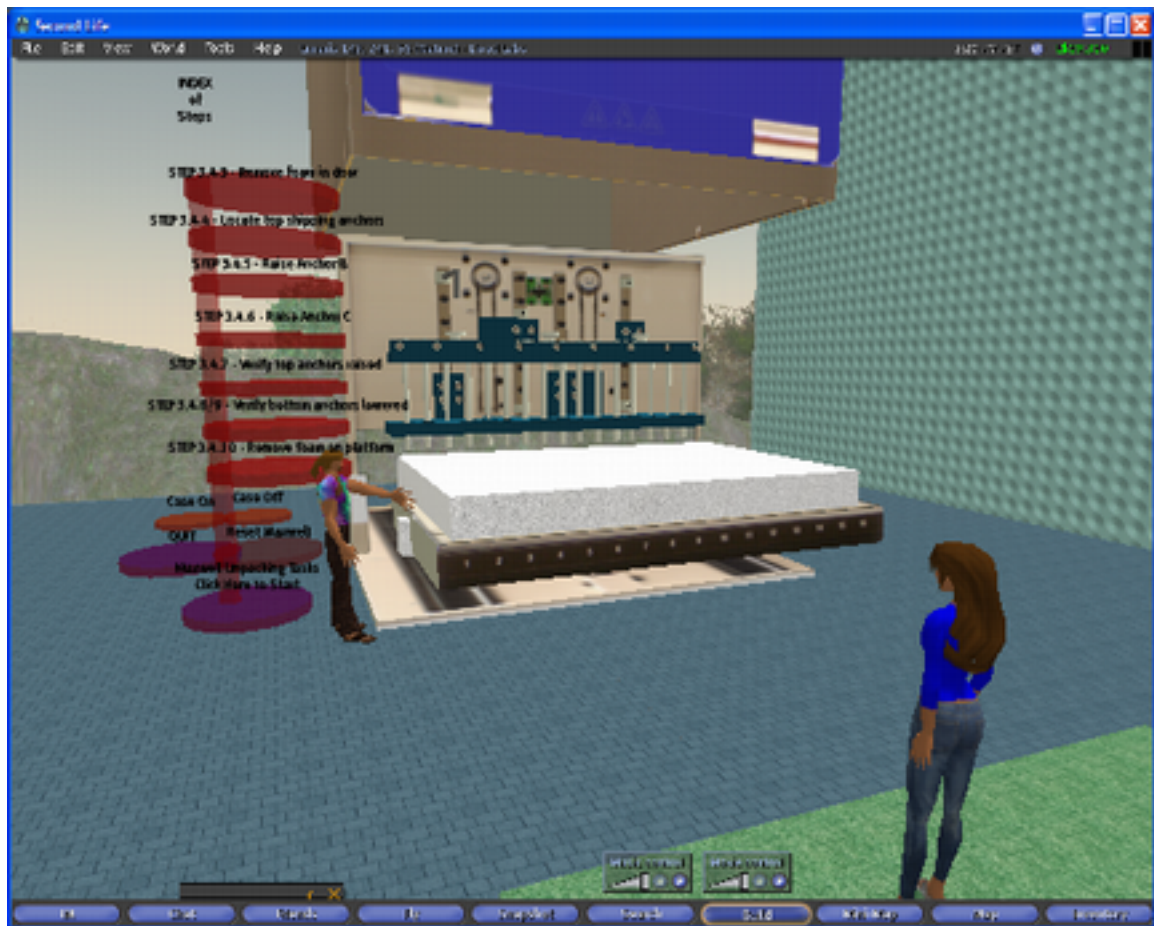


Figure 3. The Task Tree and the Large Model

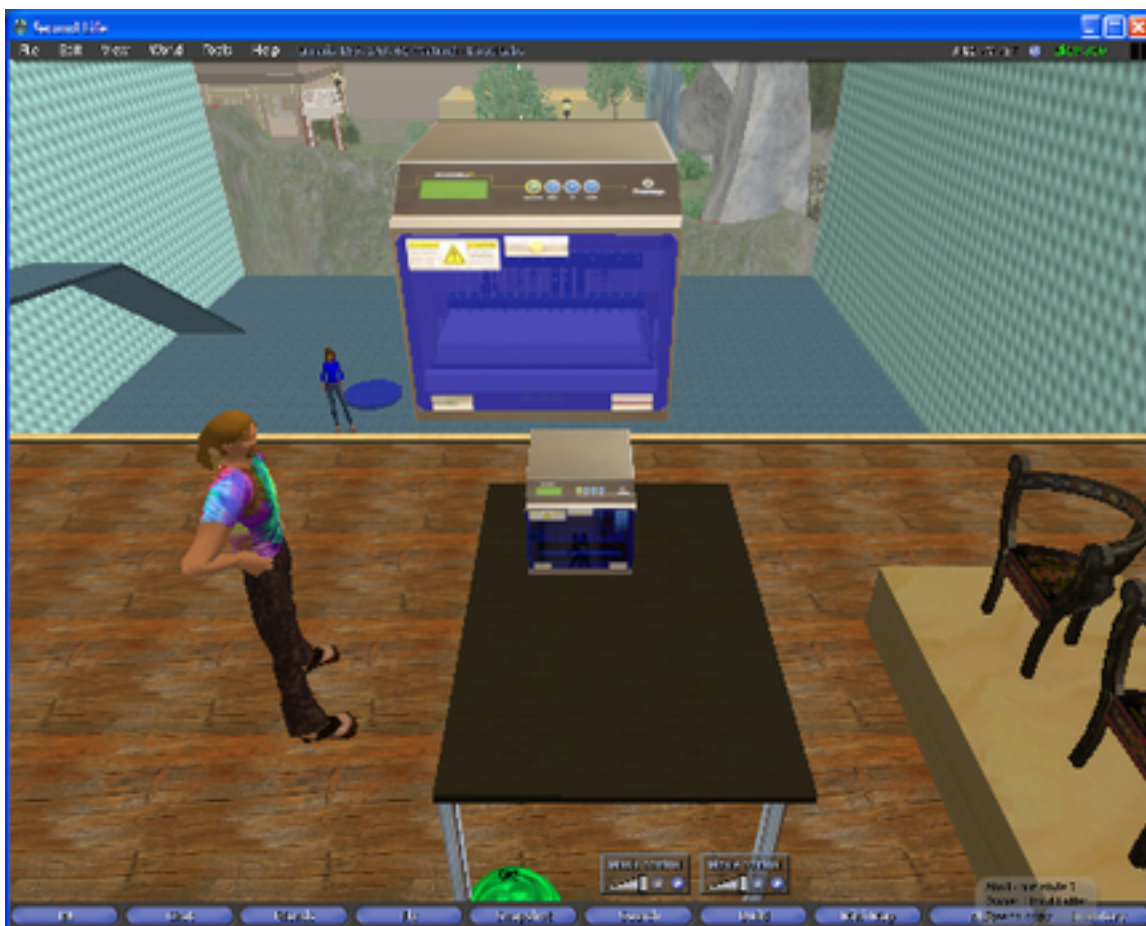


Figure 4. The Large and Small Maxwell models