THE USE OF SECOND LIFE FOR DISTANCE EDUCATION*

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ABSTRACT

This paper explores the feasibility of utilizing the vaunted Second Life environment for distance education in the area of computer science. Two sets of user groups were enlisted to determine whether the virtual environment was suitable for conveying concepts ranging from the simplistic to the complex. Due to the overwhelmingly positive responses provided via the anonymous surveying of the participants, it can be determined that the Second Life platform is indeed a viable solution for distance education in the area of computer science.

INTRODUCTION

As the lines that divide local, national, and even international audiences continue to blur, universities can only benefit by expanding their curriculums to include remote audiences. No longer are students limited to peer groups within their own geographical regions. Budding technologies such as Second Life make international soirees a reality today.

Second Life (www.secondlife.com) is a 3D virtual environment created by Linden Labs. Users login through free (or premium paying) accounts, create 3D personas, and proceed to interact with other users across the world. The Second Life environment is unique in that there are no officially sanctioned goals for users to pursue and because Linden Labs provides relatively little content. What is provided are the tools necessary to collaborate in building a 3D world as diverse and immersive as the users can imagine. From streaming video to built-in VoIP and the codeless creation of 3D objects to the scripted animation of those objects, Second Life users are provided a wide array of tools to communicate, collaborate and create.

The ability to construct a realistic multi-agent environment, without the need to write code implementing physics or network communications, has already attracted attention from many educational institutions. Stanford University is actively engaged in the building of a digital archive for the Lynn Hershman Leeson Collection [1]. The New Media Consortium (NMC) has constructed a virtual university [2], and recently completed a survey [3] on Second Life. Respondents were upbeat on its potential for education and simulation; 87% of respondents rated it 4 or 5 on a 5 point scale for simulation activities and scenario based training potential.

Early efforts have also shown that the social aspects of Second Life are quite conducive to overcoming some of the barriers intrinsically tied to distance education. Speaking to the success of Harvard's first-ever class in Second Life, Ph.D. candidate Rebecca Nelson commented "Second Life really allowed us to create a sense of class community – something that develops fairly naturally in a face-to-face class [but] something that rarely, if ever, happens in distance education classes [using] previous technologies." [4] It is this social aspect, tied in so closely to the ability to create and interact that made Second Life a logical tool for distance education.

To evaluate how effective the Second Life environment is at distance education two groups were identified. The first group (Introductory Users) consisted of participants who utilize computers frequently, but rarely for reasons related to computer science. This group was given a brief demonstration covering some basic object oriented programming methodologies and then asked to perform a corresponding task. The second group (Advanced Users) consisted of participants who are actively enrolled in the university and have achieved enough prerequisites to be currently enrolled in 300 level courses. This group was asked to utilize Second Life as a supplement to their current lab work. At the close of both group exercises the participants were asked to complete a brief web-based survey covering their Second Life experience.

INTRODUCTORY USERS

College students spend more time then ever in front of a computer, yet the number of upcoming freshmen interested in pursuing computer science has been dropping over the years. [7] One of the motivations behind utilizing Second Life as a distance education tool was to somehow bridge the gap between the general use of computers for social activities and the use of computers for reasons related to the field of computer science. The first group of users possessed an interest in computers but had never undergone any formal technical training.

Fourteen individuals between the ages of 15 and 33 were asked to participate in an online training session within Second Life. Their avatars were created for them based on the generic templates available at login and placed on a plot of land owned by Second Life user Joruus Capra. They were given a span of a week during which they could contact Joruus via email and notify him that they were available to undergo a brief training session. The following process was repeated for each participant:

- Upon login each participant was greeted using the VoIP (Voice Over Internet Protocol) functionality within Second Life.

- For those that required it, participants were instructed on the basic functionality of the Second Life UI.
- Participants were first given a brief explanation of OOP (Object Oriented Programming) with the obvious correlation being drawn between objects created within Second Life and generic programming objects.
- Each participant was shown and then actively participated in the creation of an object within Second Life.
- Each participant was shown how each object in Second Life has properties that can be set either manually at creation time or later through various function calls.
- Each participant was shown how to create a script for their newly created object. The simple script caused the object to emit the phrase “Hello Avatar” over the in-game chat channel.
- Each participant was asked to think of a way they could make their newly created object interact with another object that was listening over the chat channel for the phrase “Fire”. If the user successfully completed this task, the listening object created a firework that shot it into the sky, exploding in a puff of virtual smoke.

At the close of each training session, each user was asked to fill out a brief web-based survey that covered their Second Life training experience.

ADVANCED USERS

Piquing someone’s interest in computer science with Second Life is one thing, but utilizing the environment to convey advanced concepts is something else entirely. The second group of participants was drawn from those students actively enrolled in the university’s Digital Logic and Computer Hardware course. Rather then attempting to convey a concept from start to finish in Second Life, students were instead encouraged to log into Second Life to aid them in their lab related coursework. Upon logging in to Second Life, they were able to interact with a 3D representation of the computational object they were being asked to create through more conventional simulation software.

The first lab related exercise utilized an adder, which is a digital circuit that performs additions of numbers. [6] A difficult concept for students to grasp is that identical hardware can add both unsigned numbers and s complement numbers. Also tricky is how a relatively small amount of additional hardware allows the adder to also subtract these numbers (adder-subtracter). As part of the student’s coursework they are required to create an adder in the lab using more traditional simulation software. As a supplement to that assignment the students were able to log into Second Life and view a 3D model that visually demonstrated the inherent circuit delays (with each stage of the addition taking 1 second before propagating to the next stage) for the computation -5+-2=-7. By studying the 3D adder within Second Life the students could conceptualize how to complete and double check their lab work.

The second lab related exercise utilized a Mealy machine, which is a finite state machine that generates an output based on its current state and an input. [5] Again a complicated concept for students to grasp is that the outputs generated by a Mealy machine are correct immediately upon the input changing. Even though the output signals

are correct at the moment of input variation, the state does not change until a clock pulse has been issued. Figure 2 is the fully functional Mealy machine that was created within the Second Life environment. Utilizing the message passing capabilities of created objects in Second Life, corresponding J and K inputs along with the Z output lines are color coded positive or negative immediately after the inputs have been switched by the student. The state is only modified when the student issues a clock pulse via the clock object. Again the students were able to compare their lab work against a working model of the assignment to ascertain if their own simulation was operating appropriately.

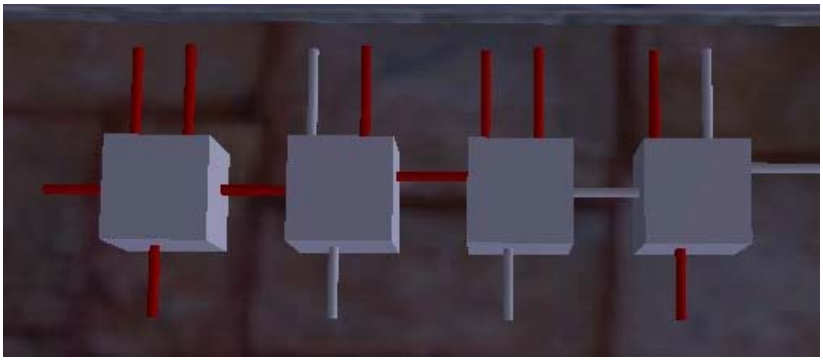

Figure 1 – Adder Circuit in Second Life

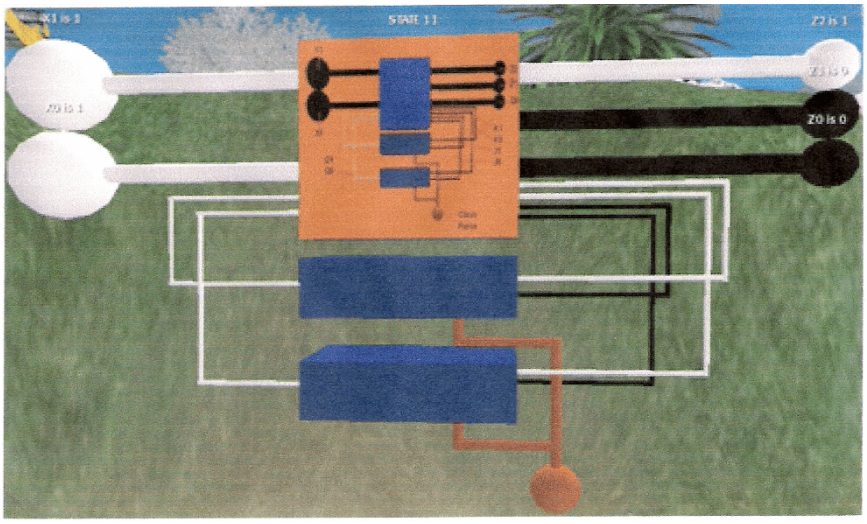

Figure 2 – Mealy Machine in Second Life

After the students completed the laboratory assignments they were asked to complete a brief web-based survey that related to their Second Life experience.

SURVEY RESULTS

The introductory group and the advanced groups separately completed a survey after their experience in Second Life. The results are available online [8, 9]. The results from the introductory group were overwhelmingly positive. Through careful planning related

to getting the users to the correct area in Second Life, only one user had any difficulty during the login process (and was eventually able to log in) and the majority of users found the environment nominally difficult to navigate. 93% of participants found their overall experience to be enjoyable while 86% of participants said the experience piqued their interest in the field of computer science. 100% of the participants were able to solve the in-world task of getting the two objects to communicate and many were curious enough to ask very pointed, intelligent questions about how the rest of the experiment was setup.

The results from the advanced group were equally promising. 83% of the participants were able to log in and the majority of them found the environment nominally difficult to navigate. Similarly, 83% of the participants recommended that Second Life be utilized in the future for the Digital Logic (as well as other) courses. The results for the individual labs exercises varied somewhat. Only 33% of participants found that the in-world adder aided in their understanding while 67% found that the state machine added to their understanding.

INTERPRETING THE RESULTS

While the results for the introductory group need little interpretation, the success of one lab aid over the other in the advanced group bares further contemplation. The intent in providing these learning aids was to give the students a working simulation to understand how the design is intended to work without giving the exact answer needed for the lab. Through controlling how much of the implementation was exposed, students were given an example rather than a packaged answer. In a topic matter as complex as Digital Logic many of the students who would glean the most benefit from studying a working simulation have the most difficulty creating the simulation themselves. Therefore one possible explanation for the perceived usefulness of the state machine simulation over the adder is that since it more closely approximated the desired results for the overall lab, it was deemed more useful. Another way to look at it is the level of complexity inherent in the state machine exceeded that of the adder, and thus the opportunity for the 3D aid to clarify any misconceptions acquired during lecture was greater. In either case it can be said that the more dynamic and interactive the Second Life object is, the greater the probability that it will be of use to the students in comprehending the underlying complexities of the lab.

DRAWING CONCLUSIONS

All this information begs the question: Is Second Life suited for Distance Education? One important fact points to yes: I have never met any of the participants face to face. I could not tell you what they look like in real life, nor could they readily identify me. 40% of the participants do not live in the same time zone as me and roughly 20% of them don't even live in the same country. Despite these perceived hurdles, the project was arguably a success. 86% of the introductory group said that the experience was intriguing enough that they would be interested in learning more about the field of computer science. 83% of the advanced group would like to see the increased use of Second Life in computer science courses. On a scale of 1 (being easy) to 5 (being hard),

76.5% of the participants ranked the Second Life user interface three or less in terms of usability.

FUTURE WORK

This project was by no means exhaustive and many opportunities lie unaddressed. It would be of enormous benefit for an entire course to be developed around Second Life to determine if the longevity of the success achieved here can be sustained over an entire semester. The following observations are of benefit to note for any future work:

While owning your own island certainly has advantages, it is not necessarily the most cost effective way to secure land for educational purposes. Two plots of 512sq ft land were purchased for less then $50 dollars and were more then adequate for the purposes of this project. As a property owner you control other user's ability to enter, run scripts, or even fly on your land. These measures were adequate for fending off griefers and maintaining a usable work space.

The amount of preparation time in setting up user accounts, in-world property, objects, and videos can be substantial. One way around this is to purchase a few thousand Linden (for ~$40) and purchase prefab buildings and objects from vendors within Second Life. Linden Labs also provides you with a number of stock objects, all of which are modifiable. A lot of information can be garnered by examining how each of these stock objects have been created and scripted.

Early in the process it was discovered that many of the tutorials and aids Linden Labs has developed to help guide users through the Second Life experience can actually complicate getting users to your land. When user accounts are first created they are placed on a type of "Tutorial Island" where, only after completing specific tasks, can they leave and enter the mainland. To circumvent this scenario an established user on the mainland can send a teleportation invite which will transport the new user to the established user's location. It was found to be of enormous benefit to undertake the creation and teleportation of the user accounts prior to first-time users logging in.

What about OpenSIM? OpenSim is a BSD Licensed Open Source project to develop a functioning virtual worlds server platform capable of supporting multiple clients and servers in a heterogeneous grid structure. [10] In short Second Life is run on Linden Labs servers and as such users are subject to abide by their rules and are limited to their server's performance. What the OpenSIM project is attempting to develop is a similar 3D virtual environment that can be run on any server and that would be free of any "for-profit" entity's control. Educational entities would benefit immensely by being able to run and oversee their own virtual environments, but at the time of this paper the OpenSIM project is not in a state where practical application is determinable.

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