AC 2010-685: A SECOND LIFE VIRTUAL STUDIO AS AN ONLINE TEACHING ENVIRONMENT

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Abstract

In this paper the development of a virtual learning environment in Second Life is detailed. The learning environment described is in the form of a virtual television studio for use in multimedia engineering courses, with an example implementation described for RMIT University’s offshore campus.

This paper details the problems associated with offshore learning and lists the requirements needed for creating an effective virtual learning environment for these offshore students. This paper also discusses the steps taken to create this virtual environment in the virtual world Second Life and the problems that have been faced due to hardware and software limitations in this particular virtual world. Finally, the steps to be taken to evaluate the effectiveness of this type of learning environment will be outlined.

Introduction

Distance learning is considered to be one of the most challenging areas in the field of education; students who have no access to on-campus facilities and little to no face-to-face contact with academic staff and fellow students face the risk of not being able to engage in course-work material and can feel isolated. Since its inception in 2003 Second Life (SL) has been considered as a potential aid in solving some of the problems associated with distance learning. SL is a virtual world consisting of a 3-dimensional environment with most of its environment and objects primarily designed and created by its users (also known as residents). Each resident in SL creates their own avatar when they sign up, these avatars are virtual representations of the resident and can be anything from an accurate reproduction of their real world appearance to fantasy creatures and 'furries' (animal avatars).

The appeal of Second Life in the area of distance education stems from several factors. Firstly, the diverse communication tools available, these include text chat, instant messaging and the relatively new voice chat feature. Chat is a useful communication method where every avatar within a certain radius of the speaker can 'hear' the conversation; this is clearly an important tool if a learning environment is being created as it allows synchronous (real-time) interactions between students and instructor or students and other students for collaborative work. Instant messaging (IM) is also an important tool that can be used in more asynchronous learning situations where a student can ask a question of the instructor even if the instructor is not logged in at the time. The voice chat option also has potential in lecture or tutorial style classes for a more auditory learning experience.

Another appealing factor in using SL in a distance learning situation is the perceived sense of being ‘together’ in the same space in the 3-D environment. This is strengthened by the ability to see other user's avatars. In the work by Dickey it was noted that off-campus students felt this
sense of presence and instructors noted that less students seemed to drop the course when they experienced classes in the 3-D virtual environment.

One other appealing point of using Second Life in teaching is the interaction SL residents can have with objects and the ability for all residents to design and script their own objects. The 3-D object creation tools and the in-built Linden Scripting Language (LSL) available, allow for a strong creative aspect to be included in course material where students can work together to create and script objects.

This paper will look at one way Second Life has been used to create a virtual learning environment. The environment created is a replica of a real-life television studio used by on-campus students. It is hoped that this virtual studio can aid in bridging some of the gap local and off-campus students have in their laboratory experiences.

**Background**

Multimedia Engineering courses are offered at RMIT University's Melbourne city campus as well as their international campus in Vietnam.

The Multimedia Engineering courses cover the technical aspects of producing multimedia content including describing multimedia standards, explaining different data compression used in audio, still and video content, the storage and communication of multimedia content and appropriate formats commonly used in the field.

A large component of these courses is the practical experiences students have in designing and creating their own multimedia content. Some of these practical components involve the use of advanced audio editing and mixing tools as well as a unit using the RMIT University television studio to allow students to produce their own mock television shows.

The television studio is particularly beneficial to the students as they get the unique opportunity to use and understand complex professional equipment which is used in the production of some programs which air on the local community television station.

It's clear from this, however, though that while local students located on the Melbourne campus get this unique studio opportunity, the students in Vietnam miss out on some of the benefits of having these types of facilities available to them on their campus. Therefore the online virtual world Second Life, with its rich 3-dimensional graphics content and diverse communication options is considered as one potential way in which a customized learning environment could be created where the gap between local and international student's experiences could begin to be bridged.

**The Real Life Learning Environment**

The RMIT University television studio is a fully operational television studio with facilities including lighting rigs with full DMX control, television cameras with direct communication lines from a control room to camera controllers and effects processing (real-time chroma keying,
special effects, etc) all able to be applied in the control room using mixing and switching tools. The second semester Multimedia Engineering course uses these facilities to teach the fundamental technical concepts behind the television industry and how to produce media content.

![Image of DMX lighting controller surface]

**Figure 1: Actual DMX lighting controller surface**

The lighting rig in the studio is used to teach the students about the correct way to light a subject before it is filmed, back lighting, key lighting and various fill lighting is demonstrated and students get the opportunity to experiment with lighting effects. DMX communication is also covered during this unit to explain to the students what type of data the DMX control surface (shown in figure 1) is sending to the lights to change them.

The cameras (shown in figure 2) are used to teach the theories behind focal length, subject framing, the usage of zooming and dolly motion and when certain camera effects are appropriate to be used. The camera operators are also taught to listen and follow instructions from the control room to achieve the best possible results for recorded or live television situations.
The control room is also used in the teaching of switching between different camera feeds and pre-recorded material. The control room (shown in figure 3) is where instructions are given to the camera operators and where special effects are added. Concepts such as real time chroma (green screen) and transition effects are all taught. Using a series of monitors, camera switching can be taught so students can produce television.

One of the major projects in this course is a mock live television show where all the students play the role of certain people on set, from actors to directors, camera operators, audio mixers, lighting techs to floor managers. This collaborative project aims to combine all the theories taught in class and to produce a professional looking production for assessment. It further
teaches students the importance of team work with the quick realization that the production is only possible if all members are present.

**The Desired Virtual Learning Environment**

In planning the design of the virtual learning environment the subject material and the assessment tasks covered in Multimedia Engineering had to be considered. It was clear that not everything could be perfectly replicated in an online environment but the plan considered what aspects of the learning environment were critical in the instruction of multimedia technologies and what aspects would be good if the software constraints allowed for such things.

The basic model consisting of the essential elements of the studio included: Two rooms (a studio and a control room), a set consisting of appropriate props for the production of the major project, appropriate lighting effects and at least one camera object which can be controlled by an avatar. More complex requirements for the studio included simulating the line feed monitors in the control room so as to allow for switching between multiple cameras and being able to film the resulting production and save it on a hard drive for retrieval and assessment.

Of course communication within an educational environment is also an essential element, there’s the obvious need for communication between instructors and students as well as communication between students and other students to enhance their learning capabilities with collaboration and ideas sharing.

In the studio learning environment there are many communication channels that need to be in operation to allow for the smooth operation of the studio. Camera and lighting operators need to be in communication with switching controllers and the floor manager, actors need to be able to take direction and there needs to be constant communication between all students in the studio and the instructor.

**Developing the Virtual Studio**

The following describes the progress made in fulfilling the criteria outlined in the previous section in creating the virtual studio.

*The Physical Space:*
The development of the studio environment initially started with creating the physical building. The current design used for this building is much the same as the layout of the real life studio at RMIT University consisting of two rooms; a studio room with a stage area and a control room located upstairs from the studio.

Second Life allows textures (or images) to be applied to the surface of objects, these textures can be custom made in image editing software and uploaded at a small cost into SL. This gives a potential opportunity to create user generated backdrops that could be applied to the back wall of the stage area to enhance the scenery being filmed.
Even though the same design as in real life was used for the studio layout, SL’s design possibilities are almost endless so future studio buildings could be as extravagant as desired.

**Cameras:**
Figure 4 shows the television cameras designed for the studio. Second Life’s inbuilt 3-D building tools were used to create the cameras and they were then scripted to create the illusion of students using a real life video camera.

![Figure 4: A television camera in the Second Life studio](image)

This illusion was achieved by creating a camera script that takes basic keyboard controls from a seated avatar and translates those controls to camera movements to allow moving the cameras forward and backward and zooming in and out. This ability allows for the teaching of basic optics theory such as the effect focal length has on a film subject. The script also took keyboard controls to allow for more complex motion such as left and right motion and up-down tilting to occur in a realistic manner.

**Lighting:**
In the real life studio a substantial lighting rig is available for students to use, tutorials cover the theory of how to correctly light a subject to get the best effect on film as well as the theory behind DMX communications in lights.

In the virtual studio a set of static and intelligent lights were created using the powerful lighting effects available in SL, figure 5 shows an example set-up with intelligent moving head lights and static pans.
A control desk was created to change the color and intensity of the lights and to allow pan and tilt on the spotlights. The faders on this desk move to give a realistic experience of using the desk and to show the current levels the lights are set at.

A novel feature of this lighting setup developed in this work is a Second Life to real-life DMX interface. This interface works by sending DMX messages from the Second Life control desk (shown in figure 5) to a computer connected to real-life DMX lights. This computer then uses DMX software to send the messages in real-time to the real-life lights altering their characteristics in accordance to the interaction in SL.

This DMX system currently has the ability to change the pan, tilt and color of the real life lights at almost exactly the same time as the virtual lights are altered. It is hoped in the future that there could be a live video feed of the real lights being streamed back into Second Life, this ability could circumvent some of the limitations Second Life has with lighting and shadows (see limitations section).

**Vision Switching:**
Figure 6 shows the line-feed monitors used for switching between cameras. These monitors can switch between cameras placed anywhere in the studio building. Each camera feeds back information on its current location and angle so the correct view is shown to the avatar using the monitors in the control room.
From this point external software can be used by the students to capture the video from SL so it can be stored on a local hard drive for retrieval and assessment.

Communication:
Second Life has a vast array of communication options available making it easy to create a collaborative group environment. Apart from text chat, SL also has instant messaging facilities, the option to send e-mails and voice chat available for communication.

With the SL text chat facility there are over 4 billion channels which can be used. Channel zero is used in general chat scenarios and messages can be ‘whispered,’ ‘said’ or ‘shouted’ on this channel. ‘Whispered’ text can be heard by anyone within a 10 meter radius of the speaker, ‘spoken’ text within a 20 meter radius and ‘shouted’ text within a 100 meter radius. This is particularly helpful for synchronous instruction of students in a tutorial or lecture situation when everyone needs to hear the instructions.

When it comes to the other text chat channels they behave in a similar way to telephone lines, they are relatively private and can be tapped into by only certain people or objects when they need to hear the conversation on that particular channel. This is considered as a way to allow only one camera operator at a time to hear instructions from a switch controller and hence simulate the headphones worn by camera operators. This same method is also used to control the attributes and behavior of many of the objects within the studio (e.g. the color and intensity of the lights).

Instant messages (IM) and e-mail are also great tools for student-instructor and student-student communications. IM and e-mail are completely private and can be sent even when the intended recipient is offline making this an ideal tool for offline questions to the instructor or making times for students to meet up online.
Voice chat is also another communication tool available. For people who struggle with typing or for situations where auditory instruction is appropriate this option could be implemented.

**Limitations of Second Life**

While Second Life’s physics engine is quite impressive there are still areas where improvement is needed to allow the comprehensive teaching of engineering concepts behind television and video.

One particular limitation which is of concern in this project is the lack of shadow support in the SL client software. In a real life studio teaching environment students are taught that correct lighting is not just a matter of getting the colors and intensities of the light correct but is also about understanding the physics behind light emission and particularly the way shadows are cast on the intended subject. Getting the shadows incorrect can seriously affect the 3-dimensional qualities of a subject once it has been filmed.

On a related topic the lack of shadowing in the SL client makes it impossible to create truly directional lights (such as spotlights). Figure 5 shows the spotlights used in the virtual studio, clever building and texturing techniques have given some effect of directional beams, but the beams pass straight through any objects in their way, such as the piano in this figure. This is not ideal in situations where realism is essential.

One method to possibly bypass these problems is the Second Life / real-life DMX interface with streaming video as discussed in the lighting section; if a streaming video can be shown of the behavior of real-life lights students can get some idea of the physical attributes of the lights which would improve the learning experience.

It is noted that the Linden scripting language (LSL) does have a function intended to allow shadows to be cast (llSetStatus(STATUS_CAST_SHADOWS);), but the standard client software does not support this\(^5\). Hopefully it's an intention of Linden Labs to include this support in future client releases as graphics card technology universally improves.

Another limitation to using SL is the need for users to have powerful computers, high speed internet and high quality graphics cards to get the most out of SL’s environment and graphics. It cannot be assumed that all students have access to this sort of equipment therefore learning can be hindered by differing experiences due to these factors.

The variations in graphics card quality is of particular concern especially for the lighting unit as very few graphics cards are capable of displaying light and glow effects and even top-end graphics cards need to be set on the medium graphics level at the least before they will display light and glow.

Internet connections are also another issue, client-side lag is a potential problem when users only have access to a slow internet connection.
Conclusions and Future Research Directions

Apart from some concerns about the realism of the lighting effects in Second Life and the potential problems with students not having access to computers with the necessary hardware requirements, in its current form the virtual studio is already capable of being used in a classroom situation to teach basic concepts of television and video theory and to show the importance of teamwork required for a successful production.

Some work has already been performed on using coursework repositories to communicate to and from Second Life using HTTP requests. This could potentially be used to store information about the stage and lighting setup on the course server so students can set up the studio how they would like (props in certain locations and pre-set lighting effects) and then recall this information next time they log into Second Life. Currently work is being performed on this using a Moodle coursework repository server with Sloodle to achieve this.

It is intended in the upcoming year to trial this environment in the Multimedia Engineering classes and to obtain feedback on its effectiveness. The initial trials will involve local students rather than the off-shore students. By initially trialing and incorporating the virtual studio into the local course material the course coordinator can easily moderate its effectiveness and allow a quick response to any concerns or suggestions students may have. The local students could also be involved in the creation process by creating objects and scripts they may see as beneficial for the off-shore students therefore allowing them to make meaningful contributions to the virtual studio as well.

Bibliography