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Massively Multi-Learner: Recent Advances in 3D Social Environments

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MASSIVELY MULTI-LEARNER: RECENT ADVANCES IN 3D SOCIAL ENVIRONMENTS

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Introduction

Virtual Learning Environments (VLEs), also known as Course Management Systems (CMS) such as Blackboard, WebCT or Moodle are now commonly used to support teaching and learning in further and higher education. These environments offer affordances beyond simple document repositories, by featuring discussion forums, online chatrooms, gradebooks and the ability to give automatically marked tests such as multiple choice questionnaires.

But our students might object to the term “Virtual” when referring to Blackboard and its ilk. These web systems are only 2D, after all and many students already manoeuvre in a range of fully immersive 3D virtual environments – as they play the latest computer games. The affective experience students enjoy in these non-traditional and informal learning environments cannot be matched by existent CMS platforms. Yet. Indeed, it is a general trend that education technology lags behind commercial entertainment technology (Conole, 2005). In particular, Massively Multiplayer Online games (MMOs), offer the ability for hundreds, or even thousands, of players to simultaneously occupy the same shared virtual space. “Players” communicate and collaborate on complex tasks, spending hours in work teams generating new knowledge and shared expertise.

In this paper we review work on developing an atypical MMO for use as a learning tool in traditional college settings. The MMO under consideration is *Second Life* by Linden Lab in San Francisco, CA. The platform is unusual in many regards. “Residents” play by creating content for use by others, gathering in ad hoc communities and constructing fictional narratives unrelated to the typical medieval combat genre prevalent in MMOs. It is this ability to add content and lack of an inbuilt narrative which has already attracted the attention of educators worldwide. We review a range of the education work already undertaken in *Second Life* and comment on its prospects for use more specifically in a Computer Science curriculum.

Virtual Learning Environments

Popular current VLEs include Blackboard and WebCT, the two leading commercial packages, now part of the same company, and Moodle, the leading open-source alternative.

Lecturers tend to use VLEs simply as an online document repository. This enables flexible access to course materials – on and off campus with the security of password controlled access. More adept faculty employ a range of communication tools – email, discussion forums, virtual chat rooms and coursework submission drop-boxes – assessment tools and online gradebooks.

While the features that already exist are not generally used to their fullest, we need to consider the form of teaching and learning support offered by these VLE’s.

For the most part, the educational content is stored in static documents – copies of Powerpoint slides and Word documents. Assessment and interactive features are used more sparingly. It is clear that the full potential for interactive learning support is not being reached in the main. There is relatively little use of multi-media – and indeed these VLE’s do not readily support the creation of multi-media content. But richer multi-media presentations supporting learning of ‘hard’ topics has long been known to have value in student learning (Laurillard, 1997)

Figure 1 shows a page from a Blackboard document repository. Figure 2 shows the Blackboard ‘Virtual Classroom’. This combines the ability to type and

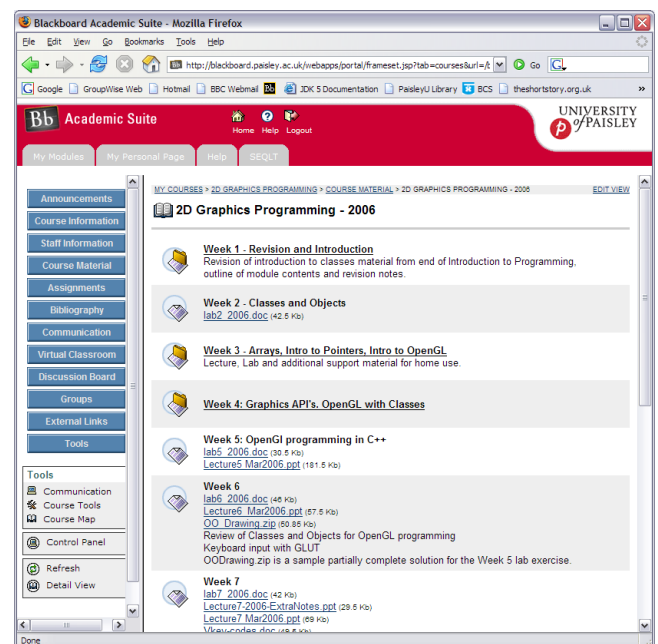


Figure 1. Blackboard, one of the leading commercial VLE’s. Perhaps the most common use of current VLE’s is a simple document repository.

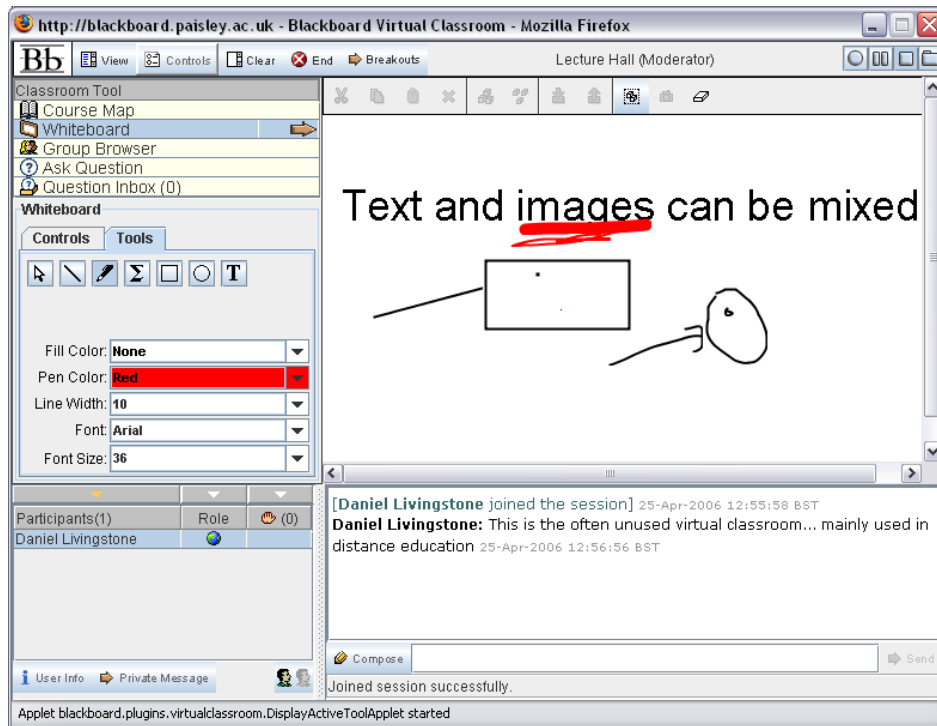


Figure 2. The Blackboard Virtual Classroom. Lecturer and students can compose chat messages for live discussion, and a virtual whiteboard allows text and images to be mixed.

receive chat messages from other participants in a simultaneous online classroom session. An integrated 'whiteboard' lets faculty and students illustrate their chat with simple sketches and images including mathematical equations.

Massively Multiplayer Online Environments

Today's "millennial" students are well exposed to far richer virtual environments from the massive electronic games market, which earned a record £1.35 billion in the UK for 2005 according to ELSPA (Entertainment and Leisure Software Publishers Association) (ELSPA 2006) MMO's in particular already allow large groups of people to meet online for play and chat in visually rich 3D environments. Such games provide immersive spaces where players can meet other players. Most MMO's include features which support chat and collaboration – indeed, in some games large virtual organisations form through player actions and these can undertake activities requiring considerable organisation and planning.

While educational technology traditionally lags behind entertainment technology, one approach to reducing this gap is through Games Based Learning (GBL). See, for example, Kirriemuir and McFarlane (2004). However, our current aim is to investigate how current games technology can help build more immersive and engaging learning environments – and not how to package learning content into game form.

Popular online games such as World of Warcraft or City of Heroes with predefined structure and narrative give players specific game objectives and goals. These have been modified and used secondarily ("modded")

to fulfil learning objectives not originally in the game such as language study (Tactical Iraqi, 2006) and fighting terrorism (IML, 2006), but are poorly suited to general learning environments.

Any all-purpose learning technology must meet the basic requirement of letting educators insert their own teaching materials. This requirement alone rules out almost all commercial MMOs, most of which are particularly unsuited due to a focus on fighting and warfare. Active Worlds (AW) and Second Life (SL) offer two alternatives with no preset narrative and ample facilities to develop and present learning materials.

A review of two distance learning projects using AW is presented in Dickey (2005), concluding that AW had significant potential for "facilitating collaborations, community and experiential learning" and that it allowed learners to become "situated and embodied" within the learning environment (p. 449). Indiana University procured grants totalling 570,000L in 2005 to continue developing "Quest Atlantis," a game for high school students based in AW. (NSF, 2006). In this study we will look instead at SL, a more recently developed MMO, in which the spontaneous creation of content has been considerably simplified (Antonacci and Modares, 2005). More information on a range of educational projects in a variety of MMOs can be found at SimTeach (2006a).

Second Life

At first appearances Second Life is much like many other MMOs. Players navigate over many square kilometres of land and water features, wear fanciful

avatars and chat synchronously. The key feature that makes SL distinct is that the game company, Linden Lab, has not assumed the role of fantasu publisher, monster tender nor social engineer. Instead the company provides a set of in-game modelling tools and a scripting language which allows interactive features to be built into objects . Players aren't given a goal or even a way to keep score – other than the “Linden Dollars” scrip. In fact, many residents deny that SL is a game at all. They assert SL is a 3D internet-based platform (Scoble, 2006). Linden Lab encourages this by referring to active participants as ‘residents’ rather than players.

As a 3D world filled with user content, SL allows residents to create the types of environments and entertainments they want, and to trade items and services using the virtual currency ‘Lindens’. Despite the virtual nature of the in-world currency, a number of real businesses have been built in SL. Indeed, at the time of writing the cover article of Business Week magazine is a study of some of these (Figure 3.)

Teaching and Learning in Second Life

The open nature of SL has already attracted a number of educational projects, focusing on humanities and sciences. Most common are cultural studies projects looking at online cultures and architecture and urban planning projects.

Linden Lab offers discounted package rates for educational use. It is possible to set up short term projects in SL for absolutely no cost, under the Campus: Second Life program (detailed at

<http://secondlife.com/education>). Institutions may pay a small fee to identify their own students in-world with a common surname.

Larger areas with restricted access are available for a an additional fee.

Notable projects using private land include the Democracy Island project of the New York Law School. The project explores using 3D online technologies to support real work activists and advocates. The Berkman Center for Internet and Society at Harvard Law School is holding a conference “Beyond Broadcast” (May 12th-13th), which while hosted in real-life at Harvard, will also be present in SL, with a specially built site containing a recreation of some Harvard landmarks.

SL also hosts educational events that originate from within the environment with no outside affiliations. Most of these are focussed on learning how to interact with the world and how to build and script objects. Indeed, the scripting features of SL are sufficiently advanced that one game, Tringo, developed entirely inside SL, has since been ported the Nintendo Game-Boy Advance, and licensed for Digital-Television in the UK.

Limitations and Opportunities

Developing SL as a truly versatile learning environment will take much effort on the part of the nascent educator community. Many of the features of existing VLE's are either not-present in SL or require further development to make them viable for mainstream educational use. As with all SL buildings, scripts, avatar decorations, etc., it will be the users themselves who develop many of these tools. Current areas of development include in-world assessment tools, and improving tools for integrating educational sites inside SL with external web resources and VLEs – Moodle being the foremost candidate here due to its open source nature, (SimTeach, 2006b).

For classes using SL, it may be necessary to develop custom content. Creating content is, in many cases, a straightforward task – generally simpler than using the content creation tools that ship with many commercial games – but still a task to be undertaken. One interesting possibility is the development of re-usable learning objects (RLO) (McGreal, 2004) in SL. RLOs have rigorous requirements for indexing and searching that might be difficult to satisfy in SL. To do so will almost certainly require building additional functionality using the in game scripting language.

Adding Tools for Collaboration and Communication

The most exciting difference between SL and traditional, themed role playing games is the scripting



Figure 3. Business Week May 1st 2006. Cover feature article includes interviews with a number of people who have built real businesses inside the virtual world of Second Life.



Figure 4. A collection of ‘residents’ attend a talk in Second Life of the Future Salon Network. Many class room and discussion spaces inside Second Life are clearly modelled on real-world discussion spaces. Compare against figure 2.
 Source: <http://www.sluniverse.com/pics/pic.aspx?id=50270>

tools built into the system. The SL client includes an editor/compiler for writing scripts in the game's "Linden Scripting Language" (LSL). This allows the residents themselves build collaborative tools, whereas in a regular MMO game, company developers manage all features.

In-world scripting experts use LSL functions to create interactive objects like doors that open when touched, playable musical instruments, vehicles that obey the

real-world rules of physics, and life-like flocking behaviours. All of this creativity translates into micropayments for developers who peddle their objects in ubiquitous "malls."

But for educational purposes, innovative new collaborative communication features show the greatest promise for improving on previous game technology. Objects themselves communicate in-game with other objects and/or player avatars as well as connecting with Internet applications outside of SL.



Figure 5. The game's scripting language makes possible interactive tools such as this set of playable musical instruments.
 Source: <http://sluniverse.com/pics/pic.aspx?id=67811>

Objects in SL communicate externally using email and a limited subset of XML-RPC functionality. They also play sound and video files linked to from Web servers. The company is currently testing the ability to send HTTP requests and then to receive the response inside SL. This is likely to be a released feature of LSL by the time this article is published. Indeed, Linden Lab releases new versions of the SL client software almost weekly and keeping up with the feature set is sometimes a daunting challenge for the scripting community. These alterations sometimes cause released scripts to stop functioning, although Linden Labs does try to minimise such disruption.

Developers have created instant-messaging, chat software and even fully-fledged e-commerce systems using the tools in the game. Web-based E-commerce sites such as SLExchange are able to take payments in Lindens (or even in US dollars), deliver goods to the purchaser's avatar and pay the vendor who offers the goods.



Figure 6. A "tour bot" awaits instructions at the Second Life Black Library. The ball on the right describes points of interest as it hovers along a preset path through the library.

Source: <http://sluniverse.com/pics/pic.aspx?id=67854>

Autonomous agents

The LSL scripting language makes autonomous agents possible. Scripters have implemented a subset of Artificial Intelligence Markup Language, useful for building "Chat Bots", (O'Reilly Networks 2006). By carefully writing a grammar for the bot, players may create tour guides and teaching assistants. This is exciting, because studies have found that "...an

animated agent programmed to deliver instructions aurally helps optimize learning from examples." Atkinson, (2002).

In another innovative use of agent technology developers created a "Chat tax" system which requires participants to pay money into the object and then be charged by the character and word for talking. This system encourages more judicious contributions to asynchronous class sessions.

Reinventing the Wheel

The current trend for large education institutions in SL seems to be something like planting a flag on a distant land. New York Law School, America's New Media Center and USC's Annenberg School of Communication, have all built large estates costing thousands of dollars to develop and maintain. So far, however, activities on those sites consist of presentations and events highlighting the newness of this phenomenon but not substantially improved from what they could achieve on their own campuses in real buildings.

The current phase of this technology seems very similar to the early days of cinematography. Artists in the early part of the last century used their new technology to create duplicates of existing dramatic works. They translated their existing models directly and without concern for the new abilities of their equipment. It will take time before the artists in this new 3D medium will do more than the equivalent of building platforms in a live audience theater production to film uninterrupted plays.



Figure 7. New Media Center's beautiful lecture hall sits empty.

Source: <http://sluniverse.com/pics/pic.aspx?id=67814>

Conclusions

A small but active community of lecturers and teachers interested in developing Second Life as a Virtual Learning Environment is forming. SL promises a fully embodied virtual environment rich with possibilities for interaction. Scripted objects will add great richness to virtual classrooms. The client is free and skilled labour to assist creating content is inexpensive and plentiful.

SL has already been used to support learning in a wide range of disciplines but requires better integration with current learning technologies and curriculum developers able to create new models for collaborative learning in 3D spaces.

References

- Antonacci, D., Modaress, N. (2005) Second Life: The Educational Possibilities of Massively Multiplayer Virtual Worlds (MMVW), EDUCAUSE Western Regional Conference, April 26, 2005, San Francisco, CA.
<http://www2.kumc.edu/netlearning/SLEDUCAUSES2005/SLPresentationOutline.htm>
- Atkinson, R.K. (2002) Optimizing Learning from Examples Using Animated Pedagogical Agents. *Journal of Educational Psychology*; 94(2) 416-427.
- Conole, Ingraham & Cook. (2005) The ALT Learning Technology Research Strategy 2005.
- Dickey, M. D. (2005). "Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education." *British Journal of Educational Technology* 36(3): 439-451.
- Entertainment and Leisure Software Publishers Association (2006) <http://www.elspa.com>
- Interactive Media Laboratory (2006).
<http://iml.dartmouth.edu/education/pcpt/VTRA/demo.html>
- Kirriemuir, J. and A. McFarlane (2004). Literature Review in Games and Learning. Bristol, Futurelab.
- Laurillard, Diana (1997) Learning Formal Representations through Multimedia, in *The Experience of Learning*, Marton, Hounsell & Entwistle (eds), 2nd Edition, Scottish Academic Press
- McGreal, R., ed. (2004) *Online Education Using Learning Objects*. Routledge, London.
- National Science Foundation Award Abstract. (2006) "Quest Atlantis: Advancing a Socially-Responsive, Meta-Game for Learning", <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0411846>
- O'Reilly Networks (2006). A. L. I. C. E. AIML Reference Manual
<http://www.xml.com/pub/r/898/>
- Scoble, Robert (2006). Second Life +is+ an OS, <http://scobleizer.wordpress.com/2006/03/27/second-life-is-an-os/>
- SimTeach (2006a) <http://www.simteach.com/wiki/>
- SimTeach (2006b) <http://simteach.com/moodle/>
- Tactical Iraqi (2006)
<http://www.tacticallanguage.com/tacticaliraqi/>

Authors Note

Daniel Livingstone has been exploring the virtual world of Second Life under various guises since 2005. You can send a message to him in game where he is known as 'Buddy Sprocket'.

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