A Comparison of Three Virtual World Platforms for the Purposes of Learning Support in VirtualLife

Kristina Lapin

Vilnius University, Faculty of Mathematics and Informatics,
Naugarduko 24, LT-03225 Vilnius, Lithuania
kristina.lapin@mif.vu.lt

Abstract. The paper addresses three 3D immersive collaborative virtual environments for their utility to learning support. We analyze the needs of a lecturer that intends to supplement face-to-face teaching with computer mediated collaboration. The analysis aims at informing the design of a new virtual environment that is being developed in the FP7 ICT VirtualLife project. We examine the modern learners' and tutor's needs as well as existing 3D virtual world platforms, which are free to download. We explore the usability features to include in the VirtualLife bundle intended for educational use.

Keywords: 3D virtual world platform, blended education, collaborative virtual environment, usability.

1 Introduction

VirtualLife is an ongoing 36 month project awarded by the European Commission to 7 small enterprises and 2 universities[1]. The project is aimed at developing of 3D immersive collaborative virtual environment with a number of innovative features: secure and trusted communication, virtual legal system, dispute resolution mechanism, user reputation management system and a peer-to-peer network communication architecture. The platform is intended as a serious virtual world for business and education.

Collaborative virtual environment is software that allows users to share the virtual environment and collaborate. Such an environment has to be consistent and scalable [1]. Consistency refers to a characteristic of a system to maintain the sole state of environment. Any change of avatar's state is visible for all users. Scalability is a characteristic that ensures effective consistency control even when many users enter the environment. VirtualLife is based on a peer-to-peer communication architecture that spreads the load between different clients to face the scalability challenge.

The 3D immersive virtual collaboration environments are often called virtual worlds. In the following we refer to the VirtualLife platform as a virtual world. Virtual worlds encompass the following features [2]:

[1] FP7 ICT VirtualLife - Secured, Trusted and Legally Ruled Collaboration Environment in Virtual Life, 2008-2010, http://www.ict-virtuallife.eu/

P. Daras and O. Mayora (Eds.): UCMedia 2009, LNICST 40, pp. 273–278, 2010.

- The world allows many users (avatars) to participate simultaneously.
- Interaction takes place in real time.
- The virtual world allows users to develop, alter and submit customized content.
- When an individual logs out, the virtual world continues to exist.
- The virtual world encourages the formation of in-world social groups.

This paper addresses the usage of virtual worlds for educational purposes. We analyze how a single tutor could complement a mere face-to-face learning with distance education elements. Such an education mode is called a blended education. The evidence shows that distance education is a fast growing sector of higher education and its technological demand constantly grows [3].

The following sections are organized as follows. The second section deals with educational needs of tutors and students in a blended education mode. The third section explores freely available 3D virtual world platforms that have a potential to implement educational needs. The fourth section provides the design solutions for a restricted educational suite of VirtualLife. At the end some conclusions are drawn.

2 Educational Needs

Today's students know more about technology than any generation before them. For communication with peers they fully use various features of cell phones and the Internet. A lot of students have profiles in social networks and avatars in virtual worlds. Web-based education is their natural expectation. They prefer the searchable learning materials where they find the information they need at the moment. Web 2.0 based learning tools showed their adequacy for modern learners' needs [4]. Experiments show that in the blended education students achieve better results than in a pure face-to-face education [5].

The amount of conveyed skills is constantly increasing. The large amount of the material does not leave much time for a discussion. Therefore after face-to-face classes conversation can be shifted to a virtual world. A learner receives there an instant feedback from other learners and the tutor. The feedback helps students to achieve learning goals and encourages them to continue learning as young individuals do like to stay and interact. Interactive 3D didactical means demonstrate the learner interesting features. Then the learner is directed to other places for further content. Such an interaction in an immersive environment creates a long-term retention [6].

In order to complement the face-to-face education with interaction in a virtual world the educator needs an available platform which does not require deep technical knowledge. Such a platform should facilitate the creation of interactive content.

3 Analysis of Existing Virtual World Platforms

Further we tackle some available platforms from the individual tutor's perspective. The following aspects are important for our exploration:

- a platform is freely available,
- the terms of usage are not restrictive and allow the user to create the content,

- hardware and Internet access requirements do not exceed an average level,
- a system does not require third-party commercial products such as graphics engines,
- the developer has a full control over the developed virtual world.

A long list of virtual platforms can be used for educational purposes [7]. A majority of these tools allows free registration whereas the creation of content is charged; see e.g. Second Life and Active Worlds Educational Universe. The Crocket Project and Open Source Metaverse Project are under development.

When a virtual world is placed on a service provider server, the user has to obey the rules provided by the supplier. For example, the terms of usage might note that the supplier "has the right at any time for any reason or no reason to suspend or terminate your account". We treat such a platform as inappropriate for educational purposes. In the case the user does not have full control over the environment it is not worth putting effort into the creation of teaching materials.

The above mentioned requirements are met in the three virtual world platforms: Multiverse (3D), OpenSim (3D), and Metaplace (2.5D). We find that Second Life, Active Worlds, The Crocket Project, Open Simulator and Open Source Metaverse Project do not satisfy our requirements. Further we explore the following issues:

- installation efforts,
- allowed actions,
- content development,
- import of content from outside tools,
- creation of interactive learning objects.

Multiverse provides a platform to create 3D virtual worlds on both the user's computer and a Multiverse hosting server [8]. The server installation and configuration efforts are similar to HTTP server installation and maintenance – command-line operations and textual configuration files. Such a task can be inconvenient for the user. Wizards are provided for supplementary tools only. The world visitors can move and chat. Additional functionalities should be developed by world creators. The content generation requires external tools for each type of content. A 3D modeling tool is required to create an object model. A graphical editor is needed to develop textures. Object libraries and the world editor facilitate static content creation whereas interactive objects are programmed with Python. We summarize that Multiverse is easy to access and is flexible to create a virtual world. The content generation is rather difficult for a novice user.

OpenSim, also called OpenSimulator, is an open source project with BSD license. The user has to install a browser, for example, Second Life Viewer. A visitor can move, fly and communicate by textual chat and gestures. The visitor is allowed to create objects in the case the world owner permits.

The server installation efforts can be compared with an installation of a HTTP server. The server is configured during the first activation by the way of answering questions. Such an installation is sufficient for a minimal usage. An advanced usage requires editing the configuration files.

The virtual world is comprised of grids that consist of regions. A region is a certain size square of earth and sea area that has the owner. He concedes the rights for

visitors. The in-world content is developed from geometrical primitives. Therefore the creation of simple objects is easy. But the creation of elaborated objects is cumbered. An external content can be loaded using convenient in-world interfaces. Interactive objects are programmed in SecondLife LSL, C# or any .NET language.

To summarize, OpenSim is an easy accessible platform. The creation of static user content is simple whereas interactive objects have to be programmed. The installation and maintenance requires server administration skills.

Metaplace [10] is a platform based on Flash technology. Therefore it is rather slow. The world is 2.5D – a three-dimensional illusion is attained showing 2D images from the perspective. It looks like an animated world. Therefore kids enjoy it. A virtual world can be placed on a HTTP server as well as on a Metaplace hosting server. The user can move and chat.

Users and creators do not need anything to install. Each user can create content inside the world. An internal object library is provided. A multimedia object can be created with an external tool and imported into the world. Interactive objects are programmed in Metascript, a modification of LUA script language.

In conclusion, this platform is the easiest to use and generate content while interactiveness requires extensive programming skills.

Table 1. A comparison of three platforms

Feature	Multiverse	OpenSim	Metaplace
User actions	Move and chat	Move, fly, chat	Move, sit, chat
Installation	Alike HTTP server	Automatic	Alike HTTP server
Content generation	External tools	Inside the world	Inside the world
Interactiveness	Python scripts	LS or .NET scripts	Metascript

Table 1 presents a comparison of the explored platforms. Only one platform diminishes installation efforts by offering automatic installation. The full control over the world requires a significant effort to install and configure the server. The simplest content generation is in Metaplace, although animated graphics is too infantile for young adult learners. Implementing interactive features in all the three platforms requires significant programming skills. The documentation of scripting languages is provided in the form of manuals and function catalogues. A novice user could hardly use them in order to learn scripting.

The analysis shows that it is difficult to adopt the virtual world for the purpose of learning. To make learning attractive, the world should provide some learning content. Without interactive content a virtual world does not spread its full potential. However, the creation of such content requires significant programming skills. The generation of the searchable learning materials from any object of virtual worlds is desirable feature but not present in existing systems.

4 VirtualLife Design Decisions

VirtualLife allows creating virtual worlds and having a full control over it. Considering the problems with the explored platforms, a VirtualLife bundle for

educational usage should encompass automatic installers for world creators (tutors) and users (students). Each user creates the content using graphical user interface. The developed assets are stored in the user's computer.

Our study shows that effective creation of interactive learning means still poses a challenge. Facilitating the creation of interactive objects, a rich library of default interactive objects, such as avatar motions, opening windows, rotating wheels, etc. is available. VirtualLife platform contains many ready-made virtual tools, like the web-board which visualizes web-pages in the 3D environment. The framework permits the creation of new objects, using an internal editor or importing them.

VirtualLife platform allows a high level of interaction both between avatars and between avatars and objects. The video demo[2] shows the simulation of a geometry lesson where the tutor presents complex geometrical solids. The teacher is using an interactive web-board, a virtual pointer and a set of interactive polyhedrons that enables her to introduce complex concepts (see Fig. 1). Static information is presented on in-world blackboards in the form of a webpage.

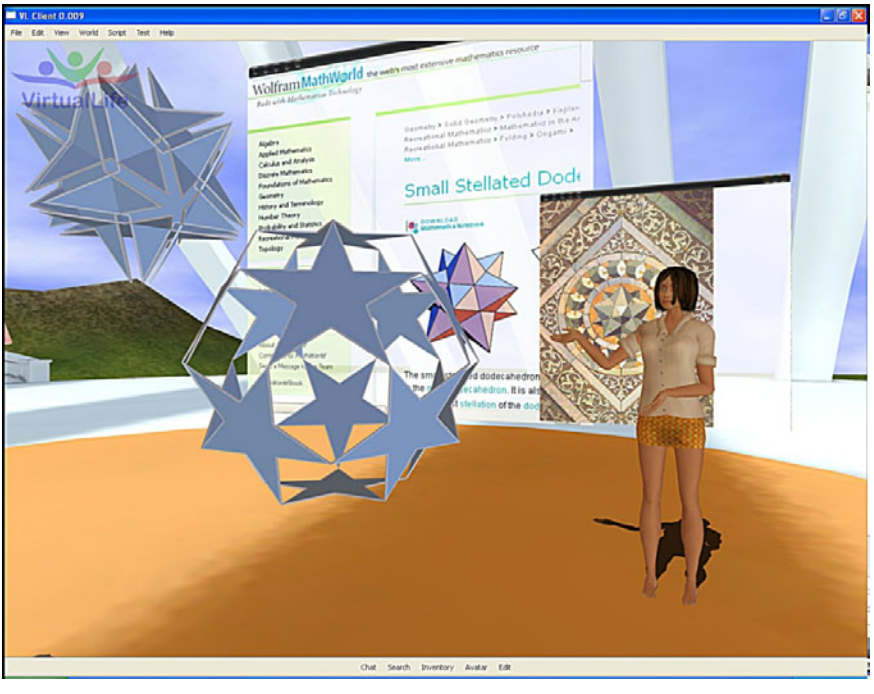

Fig. 1. Interactive geometrical solids and static learning material in a virtual world

A powerful and intuitive scripting language allows for the creation of complex interactive tools. The user is able to import web-pages and consult them in-world. A web-page generator function automatically creates searchable web pages for entities in the virtual world containing useful and descriptive information.

[2] FP7 ICT VirtualLife http://www.ict-virtuallife.eu/

5 Conclusions

We maintain that current technologies are difficult to adopt for education purposes by a single tutor without institutional support. Our analysis shows that creation of interactive 3D learning objects in existing open source environments is still time-consuming and requires high programming competence. The platforms have been analyzed with regard to installation and maintenance efforts. These activities require a significant level of technical knowledge. We argue that contemporary virtual world platforms require the tutor to concentrate on the tools instead of didactics. Considering the findings we argue that the usage of virtual worlds should not require deep technical knowledge.

VirtualLife has a potential to supplement face-to-face learning with on-line interactions. It provides simplified installation, content generation and a rich interactive object library. A web page generator facilitates the creation of searchable learning materials that create the searchable learning materials with links to interactive objects in the virtual world.

VirtualLife advanced features, including strong authorization with external certificates, contribute to trust and security and decrease the need of face-to-face activities.

References

1. Ling, C., Gen-Cai, C., Chen-Guang, Y., Chuen, C.: Using Collaborative Knowledge Base to Realize Adaptive Message Filtering in Collaborative Virtual Environment. In: Proceedings of International Conference on Communication Technology, ICCT 2003, vol. 2, pp. 1655–1661. IEEE Press, Los Alamitos (2003)
2. Virtual World Review, http://www.virtualworldsreview.com/info/whatis.shtml
3. Allen, I.E., Seaman, J.: Staying the course: Online education in the United States, The Sloan Consortium (2008)
4. Vassileva, J.: Toward Social Learning Environments. IEEE Transactions on Learning Technologies 1(4), 199–214 (2008)
5. Bule, J.: Adaptive E-learning Courses at Riga Technical University Software Engineering Department. In: Grundspenkis, J., Kirikova, M., Manolopoulos, Y., Morzy, T., Novickis, L., Vassen, G. (eds.) Local proceedings of the 13th East-European Conference Advances in Databases and Information Systems, ADBIS 2009, pp. 238–245. Riga Technical University, Riga, Latvia (2009)
6. Burns, R.: Organic Learning: Enabling Continuous Learning in Your Organization. White paper. Protonmedia (2006)
7. de Freitas, S.: Serious VirtualWorlds: A scoping study. Technical report, The Higher Education Funding Council for England, HEFCE (2008), http://www.jisc.ac.uk/media/documents/publications/seriousvirtualworldsv1.pdf
8. The Multiverse Network, http://www.multiverse.net/
9. OpenSim, http://opensimulator.org/wiki/Main_Page
10. Metaplace, http://www.metaplace.com