

ADEQUACY OF AN IMMERSIVE ENVIRONMENT AS A TEACHING-LEARNING TOOL APPLYING EXPERIMENTAL 3D LIMEN METHOD

Diego-Mauricio Torres-Arias and Trefftz, Helmuth.
NETSYS Institute and Universidad EAFIT

ABSTRACT

Immersive virtual environments or metaverse are representations of real or imaginative worlds created on the digital world with the purpose of making real situations or impossible experiences in the real world. Users on these worlds represent themselves via avatars that interact in representation of the user. At present, these virtual worlds are used for business processes, research and education. The purpose of this paper is to describe the process of using experimental 3D LIMEM method for adapting an immersive virtual environment to be used as a virtual teaching-learning tool of the English language as a second language.

Key words: immersive virtual environments, Avatar, metaverse, virtual reality, 3D LIMEM.

I. INTRODUCTION

In recent years, technological advances have been vital in the development of new paradigms of teaching in different educational areas. Approaching the classroom, teacher and knowledge to the student has been the focus of such developments. seeing how we move from the classroom to the web pages and hyperlinks, then the WebQuest, Wikis, forums, study groups, platforms such as Moodle and Blackboard, networks and knowledge in the cloud and others; these paradigms lead us to manage high levels of complexity, to live in diversity of opinion based on personal knowledge provided from a network as it narrates "the model for learning in the digital age" [2]. The next step in the evolutionary chain of virtual learning environments is the emergence of virtual immersive and semi-immersive environments within which we find a Unity (<http://unity3d.com/>), (<http://www.vastpark.com/>), OpenSimm (http://opensimulator.org/wiki/Main_Page), y Second life (Lindenlabs- <http://secondlife.com/>); being the last one the first in appearing as the sums of technology not only on 3D visualization and immersivity, but also as integrated technology of chat, IP Voice and interaction in real time through customized avatars, with a high quality in the process of immersion to the student and giant possibilities in many fields, and the language study among them.

Having been launched in 2003 by Lindenlabs, SecondLife is the VIW (Virtual Immersive World) most active and used in higher education, in which universities and other education centers make active presence [3]. An example of this is offered by recent research focused on sociological, psychological and economic aspects that are focused taking advantage of SecondLife as a support to people with social challenges such as overcoming social anxieties and fears, or testing the grade of satisfaction of participating on SecondLife according to their gender [5]. In the case that concerns us, languages, these already exist some projects, organizations, and schools on SL (SecondLife) dedicated to the teaching of English applying traditional philosophies such as constructivist and even creating new paradigms as dogma or SLOODLE, among them we find AVALON - <http://www.avalonlearning.eu> - and NIFLAR -<http://www.niflar.eu> - (experimental worlds for the language teaching of English in 3D), KAMIMO PROJECT (Island on SecondLife) ASIMIL8, VIRTLANIS (island on SecondLife to the study of a second language), TEACH YOU TEACH ME (island on buddy network - <http://tuwien.esnaustria.org/> -) and EDUNATION (island on SecondLife to the learning of languages). In the area of educational projects for example, AvatarEnglish.com as school of learning. Education II and III, special island where there are located different teaching centers; and educational institutions paths of great global relevance as the Instituto Tecnológico de Las Américas (ITLA), Harvard, Massachusetts Institute of Technology (MIT) and Stanford University, and in the colombian case, Los Andes University. These facts indicate us that the implementation of these new technologies in the field of teaching-learning "isn't a technological problem at all, as a social challenge that require an educational solution" [8].

Thus, some visionaries seek to incorporate the new ICTs and the 3D world to generate a new educational revolution with greater force in the field of the second language teaching, a fact that each day is taking importance for the future of students and professionals. However, none of the previous efforts, despite of the innovative nature of its works, have focused on making a measurement of the quality of the education and success of the strategies implemented to effectively make the student learn a second language more comfortably, in less time and in an easier and more affordable way.

The purpose, then, of the project described in this paper, is to perform an evaluation of the level of absorption of information learned through an ICT environment, remote and immersive 3D such as SecondLife (SL), in juxtaposition with classical classroom teaching in the classroom area using experimental 3D LIMEM method [14]. This is because there is neither relevant nor solid information about it and on which can make decisions effectively and justify huge expenses on virtual educational centers, islands (in this context, an island is a virtual portion of the land which is sold by SecondLife to an entity or real client, which builds an environment using 3D development tools) or huge invests of universities on SL. In this paper is described the process of adequacy of the environment used to these jobs according to LIMEM 3D METHOD guidelines.

II. RELATED WORKS

Among the many related works to the use of immersive 3D learning environments, several are highlighted internationally, efforts of different universities and centers of study that explore new technologies for teaching-learning, this is the case of Harvard University, the New York one or MIT one, all of them highly internationally, which offer to their students educational interactions on 3D virtual environments. Within these institutions stands with Harvard University with its course on Secondlife called: "CyberOne: law in the court of public opinion", which is designed specifically for law school and its Extension School. There exist other courses on virtual environments offered as academic experiences such as: HRSA Play2Train, which simulates a hospital environment in which students must attend different types of emergencies using their avatar. In Colombia, universities such as EAFIT make research works on the SecondLife platform through an island called Telling East (EAFIT Colombia - Land 6144 sq / Corner Ocean Front / Class 5/Mature/Terraform, Tellings Beach East), a place where students have the opportunity to try constructions on 3D or in the case of SENA whose main island is SENA Colombia 3d (aaSENA 3D virtual SENA), and which has built a great center to show to the world the Colombian coffee, and a virtual hospital and a virtual farm. College Minute of God has also taken significant research on the subject, highlighting its work: "3D Virtual Environments, pedagogical alternative to the Foster of the Collaborative Learning and Management Knowledge in Uniminuto" investigation conducted by Juan C. Franci Quinche and L. Gonzalez, and which is intended to lay the groundwork for a future virtual Uniminuto using Sloodle experiences [6].

We also find universities like the Carlos III University, Seville University, Rosario University, Aveiro University, Navarra Public University and do Porto University among others.

So far, in the directory of Second Life's owners there are more than 95 educational institutions.

However, all these efforts are aimed at building a site to measure or develop a specific program unlike our research which neither aims to build an educational world through Second Life metaverse, nor create a complete

academic program to be followed, instead, what it is wanted to get is an evaluation of the effectiveness of using 3D immersive virtual worlds when executing a teaching-learning interaction of a second language compared to the traditional learning environment in the classroom.

To achieve the goal we propose a process outlined by the following steps, based on the experimental method 3D LIMEM, developing and design guidelines and implementation of e-activities in 3D virtual worlds [12] raised in the VI conversatorio 2011 in Secondlife:

III. CONTEXT

3.1. Definition the subject of study

For effects of recreating the best way the development of a teaching-learning interaction must choose a specific thematic but also with an intermediate degree of complexity, which can be developed in a reasonable time, which is commensurate with the student level (A2 in the Common European Framework scale) chosen for the process and that is part of the academic program of an institution with a certified program. Taking into account these characteristics, the thematic of present simple was chosen, specifically the use of the third person rules (use of inflection in verb endings and related auxiliaries), through the context of describing the daily routine of a student and building or answering questions about it. Therefore, it was necessary to design a method which has been called LIMEM 3D (Learning immersive 3D environment Method), build a blog based on the thematic to be taught and to adapt a simple environment of interaction with the student through Second Life, using a portion of the 3D land of the Universidad EAFIT.

3.2. Selection of the virtual platform

One of the features of 3D immersive environments is that the users are represented through avatars. The user "lives" that world through a virtual "I" that is called avatar "[1]. Additional to this, an immersive virtual environment must guarantee us the characteristics of Corporeity of the avatars and the environment as minimum. Interactivity between avatars and with the elements of the virtual world and finally persistence; in other words, not to disappear when going out the environment. Taking into account these characteristics and preliminary design of the experiment were evaluated 4 tools, they are: Open Sim, Second Life, Unity and Vastpark which compare their characteristics and is chosen the one with the best score obtained according to the case of use raised for the test in question. For that there has been used the Virtual tool World Finder, from the page: <http://www.daden.co.uk>, which offers the possibility to compare the 4 platforms listed according to the specific selection of parameters.

The consultation on that page showed as result that the appropriate environment was SecondLife, here there is attached the list of chosen parameters and the score obtained for each platform:

<i>Can build and customise in-world:</i>	<i>(rather than use an external 3D design tool or ask us to change everything)</i>
<i>Highest possible quality graphics:</i>	<i>(yes this is a use case not technical requirement, and note that not virtual world will currently match the best computer game)</i>
<i>NEED TO MODEL A LARGE AREA (> 1 sq km):</i>	<i>N/A</i>
<i>Custom client:</i>	<i>(e.g. no vendor branding, only functions needed by user etc)</i>
<i>Engagement mode:</i>	<i>(This is about users per activity - it is assumed that there will always be multiple concurrent users)</i>
<i>Runs in browser (with plugin):</i>	<i>(no 3D virtual world runs yet in a browser without a plugin)</i>
<i>Runs on mobile:</i>	<i>N/A</i>
<i>Deploy on own servers:</i>	<i>(i.e. behind firewall to keep data secure)</i>
<i>Robustness/security of code:</i>	<i>(i.e. minimal chance of code failures or exploitation)</i>
<i>Import of existing 3D models:</i>	<i>(e.g. from Collada, 3D Studio max etc)</i>
<i>Lowest Cost Possible:</i>	<i>N/A</i>
<i>Security of Supply:</i>	<i>(combination of size of user base and likelihood of vendor still being in business in 5 years)</i>

N/E: Not Apply.

The best match for your requirements is Second Life with a score of 257

Second Life scored 257

Unity scored 243

OpenSim scored 245

Vastpark scored 217

As additional argument, the MVI more active and used in higher education is SecondLife (SL), launched in 2003 by Linden Lab2 where universities make presence not only as a pedagogical tool, but also to make known to the world and attend to different educational plans [3]. Furthermore, this platform was chosen because its physics engine is advanced (Havok 4), users can hear and see the video and audio streaming within SecondLife which is compatible with MPEG audio and Ogg Vorbis formats (it is required to install Quicktime).

The negative point is the necessity of the machine, which to run smoothly with the platform must fit with the minimum characteristics required by www.secondlife.com. And they are:

Internet Connection: Cable or DSL
 Cable or DSL
 Operating System: XP, Vista or Windows 7.
 CPU with SSE2 support, including Intel Pentium 4, Pentium M, Core or Atom, AMD Athlon 64 or higher. 1.5 GHz (XP), 2-GHz (Vista) 32-bit (x86) or higher.
 RAM: 1 GB or more.
 Screen Resolution: 1024x768 pixels or higher
 graphics card and XP or higher operating system.

IV. THE EXPERIMENTAL 3D LIMEM METHOD.

Experimental 3D LIMEM Method, is a useful tool for teaching-learning interactions through 3D environments. It is actually developing and has four possibilities in its application, as is showing:

- A. Learning path: This branch of application intends built a path through learners understand the suggested topic. This method application uses four different windows in order to present the thematic to develop (with their principal aspects), presentation of topic into a context or through character using the principal aspects, present a route with activities to develop during it within the 3D world - chosen environments) and present Links test about thematic chosen.
- B. Simulation: this branch focuses on simulate real situations, with complete details, into a controlled context through avatars and developed 3D sceneries in order to analyze situations in a deep way. This branch is focused on reactions and final results.
- C. Emulation: Through this line, 3D LIMEM Method applies design and function of machines (Simulate physical machine aspects and emulate functions, shape, states and interactions). It is useful for training in machines uses or usability test.
- D. Role play: it is similar to Simulation; however, the difference is that every role is specified by researchers for every single participant in order to find a particular result that is previously proposed as hypothesis. It branch is focuses on interactions and final results.

4.1 Adequacy or searching of appropriate environments for the development of the thematic to be implemented

Depending on how the environment is adequate and be developed, this will be attractive or not to the student (in this case user), which "receive plants of implementation in small groups. Instructors use these plans to determine the work on Secondlife and the selection of learning tools that students, as a group, are introduced according to their position" [10].

SecondLife is based on a metaphor of real estate located in an ocean, in which the users can buy islands. These islands can be "developed", which means that any 3D artifact such as buildings, cars, clothes, etc ... can be built using scripting language for SecondLife [5]. However, the use of environments already recreated and that fit to the purpose of teaching and a simple

construction, and that have similar characteristics to those of a virtual classroom such as: using interaction tools such as discussion forums, live chats and email, and that offer us certain advantages as: a more friendly environment for users, ease of configuration and the use of integrated tools (email, forums, chat, etc.). Integration on Internet. Management of a single program: the browser. Ease of adapting of content [11], are sufficient to obtain good results. It is so to set a section within an island we use prims (primitive object) or primitive (generally cubes extracted from an environment). Keep in mind that each island has an area of 512 m2, and that has a total of 15,000 prims (on SecondLife the term "prim" is used to refer to primitive objects. Except your avatar (AV or AVI), the floor of the simulator and the trees, all the objects on SecondLife are made of Prims. - http://wiki.secondlife.com/wiki/Acerca_de_los_Prims) to build approximately 117 new objects.

4.2 Defining shape, size and content of the screen Prims for our experiment.

According to experimental 3D LIMEM METHOD, for this experiment we need to build four screens previously designed each one for a specific function and all of them represented on a blog. To start the process of its construction we can use primitives from the 3D environment and use the incorporated tools in order to model the required screens.

We can also make constructions in applications such as SIMM ON A STICK, which simulates a 3D environment and permit to convert my team on served and user, build and export these constructions. Use OpenSimm, open Crocket or other creating programs of 3D objects that allow us to export or do rezzing (create or put something from your inventory to the virtual world) such as Maya or 3D MAX, as well as use public Sandboxes (places where you can build and then make a copy of the work to save in an inventory or apply on an avatar or island) to make buildings to be reused. However, when choosing this option it must take into account that Secondlife charges us for calculating the amount of object prims we want to load.

Additionally, there is a large market of components (reusable buildings or objects) that are readily available via the web or on SecondLife Marketplace (<https://marketplace.secondlife.com/>) and other related pages.

4.3 Using the created screens according to experimental 3D LIMEM Method.

For this adaptation of specific environment we rely on the concept of active learning route proposed by us in the experimental method in development called 3D LIMEM, a strategy which in this case proposes the implementation of 4 screens based on the development of a blog (<http://sleedch.blogspot.com>) or web page about the thematic chosen to treat. Each one of the 4 windows must fulfill with a specific mission within the teaching-learning context planned as: window 1 (presentation of the language thematic to develop with its corresponding grammatical aspects), window 2 (presentation of a context or character with base on which to develop the thematic),

window 3 (Trip of the learning route and activities to develop during it within the 3D world - chosen environments) and window 4 (Links with the thematic test). Here there are attached the windows models built and the blog base (Figure 1):

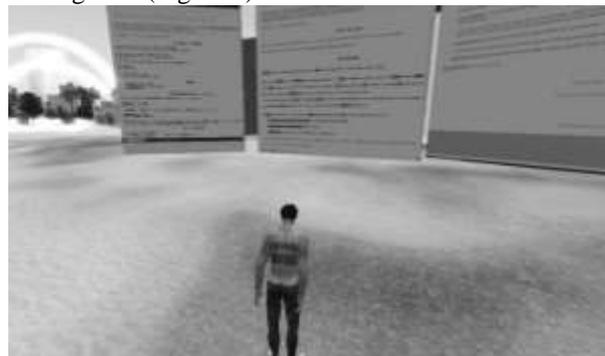


Figure 1: Created Screens at EAFIT – SecondLife

The final result of the LIMEM 3D method implementation for this experiment generates the following implementation for each window:



Figure 2: Window 1. Third Person Rules. Grammatical Structures Review (<http://sleedch.blogspot.com/p/screen-1.html>)



Figure 3: Window 2. Topic Presentation, Daily Routine. (<http://sleedch.blogspot.com/p/screen-2-topic-presentation.html>)



Figure 4: Window 3. Activities to be developed, places visit and expected products.
<http://sleedch.blogspot.com/p/screen-3-activities-to-develop.html>



Figure 5: Window 4 Testing their knowledge, exercises
<http://sleedch.blogspot.com/p/screen-4-test-your-knowledge.html>

NOTICE: you can see the original contents on the blog through: <http://sleedch.blogspot.com/>

In the window 1 is intended that the student has the summary of grammatical elements to be learned and to be used from the second language.

The window 2 introduces the grammatical elements seen in window 1 through application of them within a context in particular.

The window 3 proposes to visit different places within the immersive world in order to carry out various activities that will be tested and used as evidence in the training process.

Finally, the window 4 proposes a series of pages through which we can, through a test, evaluate the new knowledge learned.

The learner interaction with the screens is done throughout the whole process, either as a consultation (Screen 1), as applied example (screen 2), and calendar of activities to follow (Screen 3) or as part of the training of the learning (Screen 4). During the tour given on screen 3 students will generate deliverables that his/her teacher checks at the same time and to be able to keep constant communication via chat, teleport to a particular place in real time or use of email.

V. CONCLUSIONS.

For its technical characteristics of interaction capacity with the user and with other 3D platforms, the robustness of its development which includes excellent levels of security and continuous updates of its visor, as well as its imitation engine Havok 4, SecondLife becomes the tool for excellence for educational labor on 3D environments.

According to Experimental 3D LIMEM METHOD for performing a full teaching learning process does not necessarily require a complex development within a virtual world, adapting the environment to its purposes is useful. Take what already exists and what is functional to the educational process proposed, as long as there exists a previous planning process and clear learning objectives, a proper training in the management of the platform to be used and the technological means for its ideal operation. Make only that you can find.

Making changes to the surrounding environment, import objects or even build on 3D immersive environments is not a technically demanding work given the advances in panel tools available for these effects.

The success of the technical implementation of teaching-learning process of a 3D immersive environment is based more on its previous planning than in the manipulation of the available items, and in good internet connection and hardware component that guarantees the fluency of the expected interactions.

The field is promising for the future and requires more research processes that reinforce the proposed hypothesis in this article. In a first article based on the same research it is presented the final results of the application process [13].

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Author:

Diego Mauricio Torres Arias.

Data Systematization Technologist, Antonio Nariño University, 1995.

Systems Engineer, Antonio Nariño University, 1998.

Technological Specialization in Project Management, SENA, 2011.

Degree in Modern Languages, University of Quindío, 2012.

Magister in systems engineering and informatics, EAFIT University, 2013.

Specialist in management for engineers, Pontificia Bolivariana University (UPB), 2014.

Co-author:

Helmuth Trefftz, Ph.D.

Head, Department of Computer and Systems Chief, Laboratory of Virtual Reality EAFIT University.