

# 3D virtual worlds using open source platform and integrated remote experimentation

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**Abstract** – This project seeks to demonstrate the use of remote experimentation and 3D virtual environments applied to the teaching-learning in the areas of exact sciences-physics. In proposing the combination of remote experimentation and 3D virtual worlds in teaching-learning process, we intend to achieve greater geographic coverage, contributing to the construction of new methodologies of teaching support, speed of access and foremost motivation for students to continue in scientific study of the technology areas. The proposed architecture is based on a model implemented fully featured open source and open hardware. The virtual world was built in OpenSim software and integrated it a remote physics experiment called "electrical panel". Accessing the virtual world the user has total control of the experiment within the 3D virtual world.

**Keywords:** 3D virtual worlds, Remote Experimentation, Open Source, Open Hardware.

## Introduction

This project seeks to contribute resources to meet the need to make experiments and to encourage students to follow careers in scientific and technological collaboration with the social integration of science and technology. Remote Experimentation Laboratories (REXLAB) seek help with tools that can promote improvements in teaching methods, modernizing teaching and approach concepts in practical activities. Through access to remote experiments via the 3D virtual world RExLab provides interactivity with a scientific and technological environment for users. This environment is characterized by reality, space requirements and devices, similar to the laboratories' hands-on ", however, distinguished by geographical separation.

## I. DEVELOPMENT

The implemented model uses the resources of the open source Learning Management System Moodle and open hardware platform Arduino and Microserver (developed in the laboratory). It also has a virtual 3D environment with access to real experiments that utilizes the SLOODLE (mashup of Moodle with Second Life)

and the OpenSim virtual world server. Figure 01 shows the system architecture.

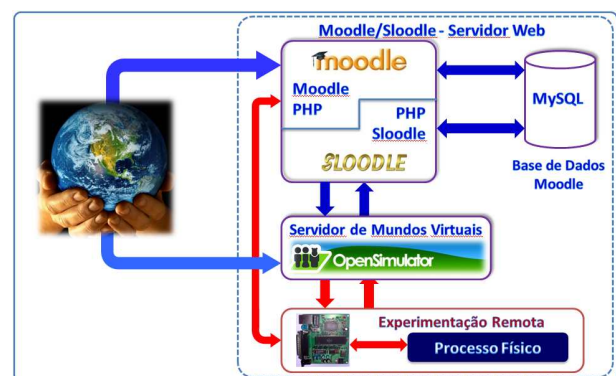


Figure 01- teraction between 3D virtual world and remote experiment

The material published in Moodle is available in the 3D virtual environment where students and teachers can use it in a digitized environment that simulates a classroom. Interacting on page available on the Internet developed in PHP and using JavaScript for the interface. Data are sent to the WEB Microserver addressed by IP. Interconnected with the experiments these codes are driven by .Cgi stored in the microcontroller. An IP camera is used to see the experiment in action.

These features open source and the integration of hardware with virtual worlds innovate scientific reality for educational purposes, allowing the implementation of the software without a license acquisition costs. With custom avatars, chatting, eye contact, digitized and interactive environments, students, teachers and even other partner institutions can share knowledge by simulating a real sense of presence and a high degree of immersion.

The system is multiplatform, allows users of different operating systems like Linux, Windows and Mac OS, can access the Remote Laboratory Experimentation through 3D Virtual Environment, interacting with real experiments and visualizing the results. Figure 2 shows the virtual world and experiment with remote avatars.



Figure 2- Interaction between 3D virtual world and remote experiment

## II. CONCLUSIONS AND FINAL CONSIDERATIONS

Virtual environments and remote experimentation are presented as appropriate tools for the teaching-learning collaborative process, they offer an interesting perspective for teaching collaborative and distributed across multiple applications. These are technologies that can promote a high degree of

immersion, providing a feeling of real presence and interaction.

In the exhibition the work aims to show the integration between virtual worlds and 3D remote experiments, allowing more attractiveness to students who are studying the fundamental concepts of science and technology careers.

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