

研 究 主 論 文 抄 録

論文題目 Development of a Web-Based Laboratory for ICT Online and On-Campus Courses, and Linking it with a Collaboration and Learning Environment
(情報通信技術を活用したオンラインや対面授業のためのWebベース仮想実験室の開発及び協調学習環境との連携)

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主論文要旨

This work summarizes a PhD research project that has contributed towards the development of a web-based laboratory system/tool for supporting Information and Communications Technologies (ICT) online and on-campus courses. In this project we (my supervisor and I) put in mind the various requirements of the learners and the instructors while designing the laboratory, and considered linking it with one Course Management System (CMS) being used at our university.

In general, we thought that each learner needs a set of networked and remotely accessible machines to work on freely while completing the practical activities introduced in the course. To meet this criterion, rather than equipping the on-campus laboratory facilities with remote access tools or using software simulators, we used Virtualization and Virtual Network Computing (VNC) technologies for creating a number of Virtual Machines (VMs) on a single server and enabling managing them over the Internet respectively. We put these machines under the learners' control to use.

On another hand, we considered linking the laboratory with the CMS currently being used at our educational institute. In this way, we were able to leave the administrative tasks to be handled centrally and to include practical activities within the course context.

Until the time of writing (December 2010), two versions of NVLab, the intended

laboratory system, have been introduced. First, we launched a stand-alone version and had it tried by a group of learners in order to evaluate the progress achieved at that stage. Based on the results obtained from the trial, we rectified our work and proceeded towards the second stage where we linked the laboratory to Sakai Collaboration and Learning Environment (CLE). The newer version of NVLab has also been tested in the same way and we believe that we have achieved better results in the second stage. This design-evaluate-modify cycle has been used to guide the development of the laboratory as a tool for supporting ICT courses.

Thesis organization

The thesis I presented is divided in chapters to make it easier for the reader to follow and understand as follows:

- Chapter 1: Introduction.
 - o Section 1: Thesis statement.
 - o Section 2: The motivation.
 - o Section 3: Research methodology
 - o Section 4: Background and related work.
 - o Section 5: What's new.
- Chapter 2: Development progress and technical description
 - o Section 1: Mastering the technologies
 - o Section 2: Developing new tools
 - o Section 3: Linking with Sakai
 - o Section 4: Implementing layered Virtualization and adding the tracking and scheduling functionalities
- Chapter 3: Lessons learned and future prospects.

The thesis has also an appendix in which we included:

- Technologies
- Development and Deployment Environment
- Sample Trace File
- Published papers