Project Name

Towards OPEN SUNY: A Novel On-line Learning Approach for ECE and ET Students

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Tier Tier One

Project Team

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Overview Summary

Creation of a virtual environment to support access to microprocessor boards, data acquisition device or even a medical device that students need to connect to understand certain software. Students connect their hardware to computers that do not have the required software environment and still be able to remotely access the developing tools.

Outcomes Summary

Resources included foundational PPT report on the feasibility of separating hardware and software to facilitate online lab experiences

Project Abstract

In electrical and computer engineering/technology programs, hands-on experience is very significant. To gain this experience, a developing tool (such as Microcontroller CodeWarrior IDE or FPGA Quartus IDE) and an attached hardware (such as a Dragon 12 Microcontroller or Altera Cyclone II FPGA evaluation boards) are needed. Most of the developing tools are expensive for students and need to be purchased, installed, and hosted by schools.

Problem Statement

On-line learning is the optimal solution for many students. However, current on-line learning approaches lack the hands-on experience. Hardware is always at the campus/server-side. To gain hands-on experience, a student should be on-campus to access the available hardware in labs. Hardware means any equipment such as microprocessor boards, data acquisition device or even a medical device that students need to connect to certain software. To date, there are three solutions to provide some kind of hands-on experience in on-line learning. First, simulation can be used. Students can rely on simulation tools installed on their computers or they can remotely access simulation tools which are hosted at their schools. In both cases, students do not gain the hands-on experience that is available to on-campus students. Second, some schools invite their students few times on-campus to expose them to the hardware and provide the necessary hands-on labs. It is not a practical solution since not all students will be able to make it. Third, students can remotely access the developing tools which are hosted at schools but the problem is the attached hardware will not be accessed. Students are not able to touch the connected hardware, give inputs, or even see and monitor the outputs.

Proposed Solution

Therefore, the Principal Investigator (PI) proposes a novel on-line learning approach. The idea is separating hardware from software. The software will be in the campus/server-side. A school will handle it including the license and upgrading issues. The hardware will be handled via students. Students will be able to locally connect their hardware to their computers and still be able to remotely access the developing tools. The challenge is to create a module that can have an image of any installed developing tool at a school side and provide this image to any authorized students who remotely accesses the school server. The ultimate advantage of the proposed approach is students can remotely access the expensive developing tools hosted by their school and locally connect the required hardware to gain the necessary hands-on experience. Moreover, it enables instructors to change a course to include a state-of-the-art hardware without changing any infrastructure on campus.

It is proposed to prove the concept of developing such environment that re-focuses on how to better leverage tools and services that directly support on-line teaching and learning approaches. A scalable and highly available information technology infrastructure, providing the students with an on-demand access of software development packages and attached hardware, is proposed and validated. User authentication and other security layers are required. Moreover, students will not only use their own laptops/PC to access the software resources but also each student will be able to have his own hardware (e.g. microprocessor, data acquisition, FPGA) that is used in labs to gain hands-on experience even if the course is on-line.

Potential Project Objective and Goals

The proposed approach is an important step towards the new OPEN SUNY initiative.
Enable students to have a mobile laboratory experience anywhere they choose, in short: deliver the classroom to the student and not the student to the classroom including the hands-on experience which was not included in the traditional and current teaching methods.
Successful prove of the concept at the unit level, would affect the SUNY in general by bringing a transformative culture in areas that are quite relevant to STEM disciplines.
Provide a cost effective alternative solution to standalone computer laboratories. Reduce the costs associated with maintaining a large number of fixed computer stations and simplify the logistic of ITS personnel.
The proposed approach can be implemented not only for on-line learning but also for on-campus students.

Reports and Resources

- [Mid-project report](#)
- [Project outcomes report](#)
- [PPT presentation](#)

Instructional Design

- Hybrid/Flipped/Blended Learning
- Online Education

Instructional Technologies

- Open Educational Resources (OER)