WS1 REMOTE LAB: DIFFERENT APPROACHES

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Introduction and Scenario

Laboratory classes play a crucial role both in schools and universities. On the other hand, laboratory management can be resource-intensive, requires a qualified staff and imposes significant logistics constraints to both managers (schools) and users (teachers and students). As a consequence school laboratories are rarely available to students out of the teaching hours.

Internet based Remote Labs (RL) may partially overcome these problems.

Suitable for RL are all the equipments locally controlled by a computer. But different strategies may be adopted, depending both on the type of the controlled hardware (totally or partially automatized), on the type of user (highschool or university students), on he level of freedom in use (predefined path through several choices, or free use with interaction with local operator).

The workshop, coordinated by G. Torzo, after an introduction by A. Longo, will propose three examples, which differs in flexibility, cost, complexity and efficiency, whith the goal of stimulating a broad discussion on the various aspect of RL.

The final discussion will be moderated by H. Jodl.

Contributions Summary

Prof**. M. Bocchicchio** and Ing**. A. Longo** from University of Salento , Italy will present *WeColLab, a general, scalable and reusable framework*, to put online a laboratory equipment in a collaborative virtual environment. Our goal is “not to reinvent the wheel” each time a device goes online, but trying to *define some guidelines for a standard approach in the design of remote lab*, with the aim of permitting the definition of a satisfactory and effective user experience. This is important when we need to put on line different lab equipments (like in remote labs for schools) or to interact with a number of remote equipments at a time (e.g. to observe the same celestial body with two or more telescope at the same time, etc.). They also will present the results of WeColLab’s usability tests they have performed in secondary school students during nocturnal astronomy lessons.

Proff. **H. Jodl** and **S.Gröber**, University of Technology Kaiserslautern, Germany will illustrate *Remote Controlled Labs (RCLs) :* real experiments which can be executed through the internet. Controlling the experiment is enabled by accessing an interface and a web server. Web cams allow the user to observe the on-going experiment.During the WS a particular example of RCL (*diffraction and interference of light*) will be used to demonstrate the general features of this approach.

Proff**. G. Torzo** and **P. Peranzoni**, ICIS-CNR and University of Padova, Italy will present an example of remotely controlled *Scanning Probe Microscopy* (SPM). This is an essential topic in nanotechnology teaching courses, but the high cost of SPM apparatuses makes hard the introduction of this topic in many situations.

A <live> example illustrates the use of *very simple web-based remote control tools*: Windows-PC equipped with Tight-VNC server and a webcam. A Skype audio-video connection allows a fast communication between remote and local operators During the RemoteLab session, the students, use a common web browser and ADSL connection, to take control of the PC driving the SPM hardware, and use the webcam audio/video to interact with the technical staff in the laboratory hosting the device. The students choose the sample to be analyzed and then perform by themselves the measurements and the analysis in remote mode.

WS1_T6_93 REMOTELAB SPM

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The Scanning Probe Microscopy (SPM) is considered an essential topic in nanotechnology teaching courses. However the high cost of SPM apparatuses makes hard the introduction of this topic in many situations. We exploited the ICT techniques to set up a web-based remote control of an SPM. We illustrate our experience using an educational device, that offers both STM, SFM and Microlithography in a single head, a PC equipped with a VNC server and a webcam. During the RemoteLab session, the students, using a common web browser and ADSL connection, take control of the PC driving the SPM hardware, and use the webcam audio/video to interact with the technical staff in the laboratory hosting the device. The students choose the sample to be analyzed and then perform by themselves the measurements and the analysis in remote mode. SPM is a technique which allows visualization, diagnostics and modification of a sample with spatial resolution at nanometric level. The working principle is based on the interaction between a thin probe (the tip) and the surface of the investigated sample, placed on a piezo-scanner. The interaction nature can be : either a tunneling current (in STM) or a force (in SFM). While scanning, the tip probes sample regions with differing physical properties, corresponding to changes in the tip- sample interaction. The local interaction is kept constant by a feedback loop, which moves the sample vertically using the scanner Z axis. This SPM technique is named constant interaction mode (constant force or

constant current). To allow the students performing the experiment through internet connection, a server application is installed on the PC directly connected to the NanoEducator, and a corresponding client application is installed on the PC used by the students. The students take control of the hosting-PC monitor, keyboard, mouse. Using an audio-video connection (Skype), we allow a fast communication between the remote students and the local operator who must, for example switch–on the device, swap the samples and give suggestions and assistance during the experiment. This workshop will include <hands-on> activities for MPTL14 attenndants.

WS1_T6_99 WECOLLAB: A REUSABLE FRAMEWROK FOR REMOTE LABS

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WeColLab is a general, scalable and reusable framework, to put online a laboratory equipment in a collaborative virtual environment. Our goal is “not to reinvent the wheel” each time a device goes online, but trying to define some guidelines for a standard approach in the design of remote lab, with the aim of permitting the definition of a satisfactory and effective user experience. This is important when we need to put on line different lab equipments (like in remote labs for schools) or to interact with a number of remote equipments at a time (e.g. to observe the same celestial body with two or more telescope at the same time, etc.). They also will present the results of WeColLab’s usability tests they have performed in secondary school students during nocturnal astronomy lessons.