

A Remote Laboratory providing Teacher-defined Sessions

An experiment server emulating a traditional university laboratory for courses in Circuit Analysis and Electronics has been set up at Blekinge Institute of Technology (BTH) in Ronneby, Sweden. Students in different places around the globe can participate in lab sessions allowing up to eight client PCs to be connected to the server via the Internet simultaneously or they can perform experiments alone without supervision around the clock when the laboratory is not fully occupied. Regular sessions are supervised by one instructor using MS Netmeeting or other means of communication. The laboratory provides common instruments and the user interface is in English but universities or other learning organizations engaging the laboratory for their courses can use lab instruction manuals and other learning material in a language of their choice. In a traditional laboratory the students use a breadboard and components handed over by the instructor to form the circuits assigned and connect the test probes. In the remote laboratory a virtual breadboard and photographs of the components provided in each session are displayed on the client PC screen at startup. The students use the mouse to locate each virtual component on the breadboard and do the wiring to assemble the circuits. The teacher or someone in the laboratory staff mounts the corresponding real components in sockets in a switching matrix in Ronneby controlled by the virtual breadboard routine before the session. The instruments provided are computer-based and have virtual front panels. The time sharing scheme used to allow simultaneous access to one server imposes restrictions on the time period allowed for each experiment but in courses in electronics the time constants involved can without any inconvenience be selected within a proper range. The number of nodes on the virtual breadboard is also limited due to the hardware complexity of the switching matrix but is adequate for experiments in undergraduate education. Apart from the fact that each student or student team is working in a virtual environment without face to face contact with the instructor or other students in the laboratory the only difference compared to a traditional lab session is that it is not possible for a student to manipulate the components and the wires with their fingers. The laboratory is always open and can be used by everybody outside regular lab sessions. Only a 56 kbit/s modem and MS Internet Explorer are required. The client software can be downloaded from the laboratory web site. The address of the homepage of the experiment server is: <http://distanslabserver.its.bth.se/>. In this paper laboratory sessions in the remote laboratory will be compared with sessions in a traditional laboratory.