

Global Cooperation in WEB-based Control Laboratories: USA and Armenia

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ABSTRACT

International collaboration between the University of Tennessee at Chattanooga and the State Engineering University of Armenia on developing remote control laboratory is described.

Keywords

WEB-based laboratory, Internet, control laboratory, distance learning

1. DEVELOPMENT OF A WEB-BASED CONTROL LABORATORY

Currently, it is quite common for different (e.g., electrical, mechanical, aerospace, chemical) engineering departments of leading universities to simultaneously offer undergraduate control system courses. Because of the multidisciplinary nature of the field, a consensus exists among control systems educators worldwide that laboratory experiences are particularly important with regard to the teaching of control systems [1-3]. Still in 1999 [1], the American National Science Foundation (NSF)/Control Systems Society (CSS) workshop on control education acknowledged the importance of laboratory experiences, and forwarded the following statement as one of its primary recommendations: "Promote control systems laboratory development ... and make experimental projects an integral part of control education for all students....".

Due to the multidisciplinary nature of control, it is generally accepted that the educational control laboratories should be shared among engineering departments [1-3]. As noted in the NSF/CSS workshop [1], shared laboratories have several financial and pedagogical advantages. For example, shared laboratories:

- avoid the duplication of equipment, and hence, enable the more efficient use of resources;
- increase the exposure of students to the multidisciplinary nature of the field;
- encourage interaction of faculty and students across disciplines.

Taking the shared laboratory paradigm a step further, the academic community witnesses also a trend toward the development of WEB-based laboratories. Among the main advantages of such laboratories are:

- *different experiments*: access to experiments located at different universities;
- *flexible time-schedules*: experiments can be accessed 24 hours a day;
- *saving travel time and cost*: student's presence at the experiment location is not necessary (the case that is particularly important for disabled students);

- *student safety*: any equipment malfunction will not endanger the remote user;
- *saving equipment costs*: expensive experiments are shared among universities.

The last item is especially crucial for the State Engineering University of Armenia (SEUA) since the educational laboratories at the university are not equipped enough with the up-to-date laboratory experiments. The existing networking infrastructure at SEUA is basically aimed at the implementation of the on-line (distance) teaching techniques. As for SEUA's educational laboratories, they have no computer networking equipment and thereby no access to the WEB-based remote laboratories.

A collaborative project between University of Tennessee at Chattanooga (UTC) and SEUA is being carried out now the main objectives of which are: creation of a shared control laboratory and networking infrastructure for implementation of the WEB-based remote laboratory experiments at SEUA's Cybernetics, Mechanical Engineering, and Chemical Engineering Departments based on the innovative solutions developed at UTC; creating the necessary premises for further replicating similar networking infrastructures at the regional branches of SEUA in towns Gyumri, Vanadzor, Hapan; familiarizing the educators and experts from SEUA with new trends, approaches, and technologies in the field of WEB-based laboratory experiment

The presentation will describe the development of the WEB-based experimental control laboratory at SEUA that can be used by local students and students at other universities in Armenia and in other countries around the world.

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