

Original article

Artificial and real laboratory environment in an e-learning competition

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Abstract

In this paper an approach to a study of multivariable system control is presented, where special attention is devoted to the implemented remote experiment. It has been realized through an e-learning environment, based on the E-CHO, Matlab, PHP software and a MySQL database. The e-management system E-CHO has been developed at the Faculty of Electrical Engineering, Ljubljana, Slovenia and is already widely used in different educational, business and academic applications, however, this is its first use in control design. The system is used for the communication with the users and the performance of the remote virtual (simulated) and/or real-time experiments using a laboratory pilot plant. The environment allows testing, design and evaluation of various modelling and control techniques. The system has now been used three times as an e-learning and e-competition game in 2007/2008, 2008/2009 and 2009/2010 and has been accepted very well among the students. In students' opinion the idea of e-learning competition introduces a novel, alternative approach to the study, enables more freedom in work organization, increases learning efficiency and stimulates students' interest. Since the presented system is very adaptable, direct extensions are possible in the sense of virtual and remote experiments with different models and real pilot plants.

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Keywords: E-competition; E-learning; Remote experiment; Virtual laboratory

1. Introduction

This paper presents an approach to an e-learning system, used for studying multivariable control design using a virtual experiment and a remote real-time laboratory pilot plant. The remote experiment was realized through an e-learning environment E-CHO, which served as an user interface and e-management system; Matlab 7.04, which was used for the execution of the experiments; and supplementary programs PHP and MySQL database, used for handling the requests and serving the waiting queue.

In the past few years, the Faculty of Electrical Engineering in Ljubljana, Slovenia, invested intensive efforts into the introduction of the Bologna study, which is a common study structure in most of the European faculties. The introduction of the new study also involves a renovation of the existent lecture programs. Since the new study allows more freedom for students to select their lectures, a large portion of the program renewal is focused on the attractiveness and new technologies presented in the scope of the individual lectures. Therefore, in the past 3 semesters (2007–2008,

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