

Pavel SMUTNÝ*

USING PANORAMA VIEWS FOR INTERACTIVE PRESENTATION OF THE LABORATORIES

INTERAKTIVNÍ PREZENTACE LABORATOŘÍ S VYUŽITÍM PANORAMATICKÝCH
POHLEDŮ

Abstract

This contribution describes practical experience from virtual presentation of the department laboratories. The main goal is to provide to students an overall summary of the laboratories presented via a multimedia content with elements of interactivity. They can get a fundamental idea about hardware and software equipment of it and visually connect electronic textbooks and tasks during fulfilling laboratory assignments which will improve educational process.

Abstrakt

Príspevok popisuje praktické zkušenosti s interaktívni prezentáci výukových laboratoří. Hlavním cílem je poskytnout studentům celkový obraz o vybavení a funkčnosti laboratoří s využitím multimediálního obsahu s prvky interakce. Získají tak přehled o hardwarovém a softwarovém vybavení laboratoří a vizuálně si propojí elektronické výukové texty a návody při plnění laboratorních úloh během výukového procesu.

1 INTRODUCTION

The Department of Control Systems and Instrumentation at VŠB – Technical university of Ostrava operates several laboratories for educational and research purposes.

Laboratory of sensors, measurement and control systems is used for a practical education of Microelectronic systems course, Logical components and systems course, Automatic control devices course, Measurement and sensor devices course and Final or Bachelor projects, which are served for Diploma thesis generation. In these courses are students introduced to possibilities of application control systems (PLC, microcontrollers, and external control units) in hierarchal control structure. Control Web 5 system is used for SCADA/MMI.

The helicopter model, magnetic levitation model, ball & plate apparatus are part of Laboratory of advanced simulations.

The department in last decade proceeds processes of improvement the quality of engineering education with integration of e-Learning elements. These cover video-sequences prepared as real time views, laboratory measurements or life lecture recording, electronic textbooks where static text descriptions complete the computer animations with dynamic and repeated views of described events. Interactive programs enable students with modelling theoretical and real time processes, when input parameters are being changed individually and then monitoring the result changes [Wagnerová & Landryová, 2007], [Babiuch, Fojtík & Kulhánek, 2006].

* Ing. Ph.D., The Department of Control Systems and Instrumentation, Faculty of Mechanical Engineering, VSB-Technical University of Ostrava, 17.listopadu 15, Ostrava-Poruba, tel. (+420) 59 732 3511, e-mail pavel.smutny@vsb.cz

2 BRIEF OVERVIEW OF THE LABORATORIES

An innovation of the laboratory of sensors, measurement and control systems was achieved in year 2008. It was supported by FRVS project and also by VEAProSys Company which affords PLC of ABB Company.

The overall goal of this innovation was to expand and complete range of hardware equipment for SCADA/MMI systems - they needed better technical utilities for their action in monitoring, evaluation tasks. Regards to the possibility to present assignments using a web environment there were installed systems which have full support for www output. There is a significant amount of innovation in the laboratory of distributed control system with possibility of the remote control using intranet.

Individual measuring workplace was expanded with I/O modules for fast and slow tasks. Data collection and monitoring assignments with use of Control Web 5 were updated for measuring characteristics of actuators and sensors. Hardware innovation opens more possibilities for Control Web 5 applications allowing configuration and monitoring real-time tasks (animation, communication and application performance). [Škuta, 2008]

Students work on these laboratory assignments:

- Calibration of pressure sensors
- Hierarchal control structure
- Speed control of direct current motor
- Hot-air aggregate model
- Controller adjustment
- Positioning system for drilling machine
- On-off controller of temperature
- Connecting PLC into star network topology
- Industrial field bus RS485

Laboratory of advanced simulations is used for teaching advanced control systems. The laboratory is equipped with six physical models and PC computers are used for control. Three models were purchased from Humusoft Company (the helicopter model, magnetic levitation model, ball and plate apparatus). MATLAB Simulink (Real Time Toolbox) and also special software which was part of the model delivery is used to control models. Other models were realised by department during solving bachelor and master final projects and also were supported from Czech Science Foundation project. For control of models is used software developed by department staff.

Information for students is provided about these laboratory assignments:

- The helicopter model
- Magnetic levitation model
- Ball and plate apparatus
- Asynchronous engine with frequency converter
- Demo of a proportioning module
- Demo 800xA

3 AN INTERACTIVE VISUALIZATION OF THE LABORATORIES

First attempt to visualize laboratory of sensors, measurement and control systems was to use Microsoft Live Labs Photosynth [Photosynth, 2008].

Photosynth is a software application from Microsoft Live Labs and the University of Washington that analyzes digital photographs and generates a three-dimensional model of the photos and a point cloud of a photographed object. Pattern recognition components compare portions of images to create points, which are then compared to convert the image into a model. Users are able to view and generate their own models using a software tool available for download at the Photosynth website [Wikipedia Contributors, 2009].

Generated three-dimensional model allows to users walk or fly through a scene to see photos from any angle, zoom in or out of a photo or smoothly change viewing angle between nearby photos [Fig. 1].



Fig. 1. Visualization of the laboratory using Microsoft Live Labs Photosynth

Disadvantage of Photosynth is obligation for users to install Photosynth viewer which is only available to the Windows Vista and XP operating systems. However the development team recently released a Silverlight version of the viewer. There is also no possibility to expand three-dimensional model with embedded content such as web links, images or video sequences.

Second choice for laboratory visualization was application of standard technologies used on the web at the moment – HTML, JavaScript, JPEG and cascading style sheets. French software company OpenStudio published under the GPL licence jQuery virtual tour script which is an extension to their simple panorama viewer that allows add interactivity to transform panoramic views into a virtual tour [jQuery virtual tour, 2008].

Visitors no need to install any software to experiment virtual tour – every web browser is capable to display it. The jQuery virtual tour script is using jQuery library which is a lightweight JavaScript library that emphasizes interaction between JavaScript and HTML. Other jQuery plugins such as ThickBox are used to display embedded content.

ThickBox is a webpage UI dialog widget written in JavaScript on top of the jQuery library. Its function is to show a single image, multiple images, inline content, iframed content, or content served through AJAX in a hybrid modal [Lindley, 2007].

This solution supports to add embedded content to three-dimensional model made from panoramic photos of the laboratory but from user's point of view it lacked easy use of rotate system through scene as known from web services like Street View in Google maps.

A solution based on using Flash technology for visualization of the laboratory was used to fulfil determined aims [Fig. 2].

Penetration of Adobe Flash Player browser plugin is 99,1% in Europe [Adobe Flash Player Version Penetration, 2008], therefore most of the users should have no problem to display webpage using this technology.

Pano2VR software to help create an interactive visualization of the laboratory was used. Pano2VR is an application that converts panoramic images into the QuickTime VR (QTVR) or Macromedia Flash formats with features such as customizable skins, hotspots and auto-rotation.

Over 130 images were taken to cover laboratory space from 4 different views. Autostitch software was used to create panorama pictures by automatically recognising matching images. This software allows entire panoramas to be constructed with no user input whatsoever [Brown & Lowe, 2007].

Features of the lab visualization:

- 360° view
- virtual tour
- interactive skins with controls
- zoom in/zoom out
- embedded content – link to course tutorials

Course tutorials include description of the assignment, theory analysis, procedure of the measurement and question for review of the learning process.

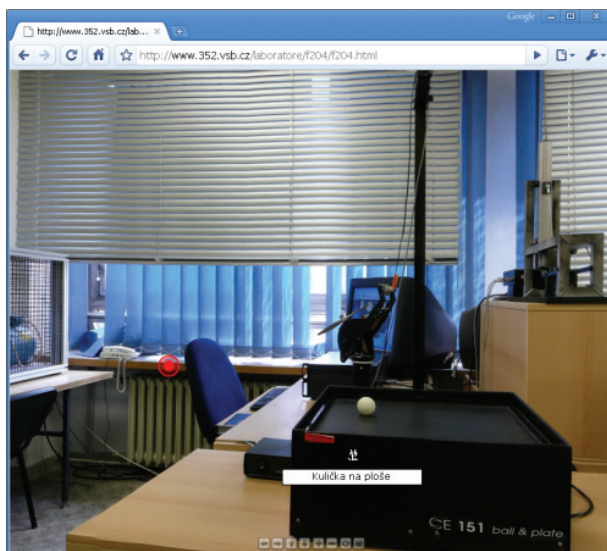


Fig. 2 An interactive panorama view on the laboratory of advanced simulations via web browser with support of Flash technology

**Zadání:**

1. Účel: regulace tlaku vzduchu ve vodní nádobě.
 - a) Seznámení se s možnými součástmi a současnou přípravou konfigurace této úlohy (funkční přístup a přístup přímý at Internet).
 - b) Nastavení parametrů PID regulátoru podle Vnitřní vybrané kritéria kvality regulace.
 - c) Ověření funkční regulace na vodní nádobě pod tlakem pomocí Internetového klienta.
2. Účel: ověření a kalibrace tlakoměrů tlaků.
 - a) Provozní kalibrace vybraného tlakoměru (referenční tlaková síla vzduchu):
 - pomocí vzduchu pro splnění požadovaných tlaků a srovnání.
 - vhodné měřidlo pro jednotku měřené síly a s výřky.
 - vhodné měřidlo pro jednotku měřené síly a s výřky.

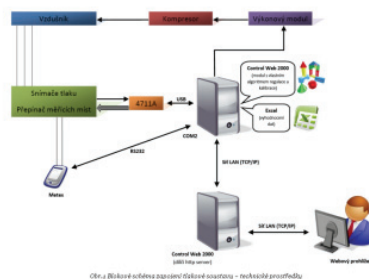
Schéma zapojení:

Fig. 3 Example of electronic educational textbook in Czech language for calibration of pressure sensors laboratory assignment

Project website can be found at <http://www.352.vsb.cz/laboratore/f204/> and <http://www.352.vsb.cz/laboratore/h303/>.

4 CONCLUSIONS

To effectively present innovations in The Department of Control Systems and Instrumentation laboratories and propagate available possibilities, an interactive virtual presentation of the laboratories was created.

With virtual presentation of the laboratories students can get fundamental idea about hardware and software equipment of it and visually connect electronic textbooks and tasks during fulfilling laboratory assignments which will improve educational process.

ACKNOWLEDGEMENT

The presented results have been obtained during the completion of research project FRVŠ A/b 118/2009.

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