GRAPHICAL PROGRAMMING IN MEDICINE, POWER ELECTRONICS AND MODERN EDUCATION

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Abstract

Structurally, the habilitation thesis consists of a technical presentation regarding four main research topics:

◊ Electromagnetic compatibility - First a very powerful tool developed by the author for studying the magnetic field of shaped slotted screens is described. The next chapter is concerned with predicting the electrical behavior of metallisation patterns printed onto dielectric substrates. The last chapter presents a new test procedure for measuring the shielding effectiveness (SE) of shielded coaxial cables.

◊ Graphical programming in biomedical signal and image processing - The first part of this chapter will describe a computer based signal acquisition, processing and analysis system using LabVIEW. Peak detection in electrocardiogram (ECG) is one of the solved problems using LabVIEW and filtering biomedical signals in different ways is a challenge that has to be solved. The next topic presented is graphical programming in event detection using Pan-Tompkins algorithm. Then the design of an optimal Wiener filter is implemented to remove noise from a signal. Two programs for compression and Wiener optimal filtering are developed in MATLAB. Two algorithms were implemented in LabVIEW. In the last part a real-time 3D echocardiography and the corresponding algorithms that improve the quality of the image are presented. The second image application concerns the compression and noise removal of mammography images because these realize a preprocessing for the identification of microcalcification clusters in mammograms. A nonlinear method is implemented in LabVIEW for performing image enhancement. The final chapter reviews ultrasound segmentation methods, in a broad sense, focusing on techniques developed for medical ultrasound images.

◊ Solar Energy and Power Electronics - The first chapter introduces the first station in Romania (Eastern Europe) outfitted for systematic monitoring of solar irradiance on tilted surfaces. The second chapter concerns Power Electronics. It is related to small signal transfer functions derivation in quasiresonant converters (QRCs). A matrix

method based on state-space averaging of the PWM parent converter and switch cell conversion ratio is proposed.

◊ E-learning techniques - The first part presents a comparison between classical hands-on laboratories and remote laboratories. The second part describes aspects regarding an E-learning approach of resonant ac inverters. The learning process is based on "Learning by Doing" paradigm supported by several learning tools: electronic course materials, interactive simulation, laboratory plants and real experiments accessed by Web Publishing Tools under LabVIEW.

The ful abstract at:

http://www.upt.ro/img/files/2015-2016/doctorat/abilitare/lascu/Rezumat_teza_abilitare_Mihaela_Lascu_en.pdf

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