## NEW PERFORMANCE IMPROVEMENT TECHNIQUES OF CONTROL SYSTEMS USING EXPERIMENT-BASED TUNING

### Goal of the project

- Enhancement and development of data-based (data-driven) techniques and algorithms for improving control system performances using experimental data.
- Enhancement and development of nature-inspired algorithms n optimization of control system performance.
- Development of optical character recognition (OCR) applications.
- Development of new fuzzy control solutions for a wide range of industrial processes.

### Short description of the project

Enhance existing techniques, develop new ones for data-based control system performance improvement.

### Project implemented by

Department of Automation and Applied Informatics of UPT
http://www.aut.upt.ro/~rprecup/grant2011.html

### Implementation period

2011-2016.

### Main activities

- Application of Iterative Feedback Tuning (IFT) to controller tuning for nonlinear control systems.
- Model-Free Adaptive Control strategies applied to aerodynamic systems.
- An experiment-based approach to Reference Trajectory Tracking optimal control problem with constraints.
- Validation of iterative techniques on laboratory equipment: liquid level control, motion control systems with motor actuation (speed and position control).
- Enhancement of control systems performance by fuzzy control, IFT and nature-inspired optimization algorithms.
- PI and fuzzy controller tuning to ensure a reduced process parametric sensitivity.
- Improve the training algorithm of Convolutional Neural Networks using mixed Back-Propagation and nature-inspired optimization algorithms.

### Results

- 8 papers published in Thomson Reuters Web of Science (WoS) journals with impact factors.
- 7 papers published in conference proceedings indexed in WoS.
- 3 papers published in conference proceedings indexed in international databases.
- 1 book chapter published in a Springer-Verlag volume.
- More than 30 independent citations in 2016.
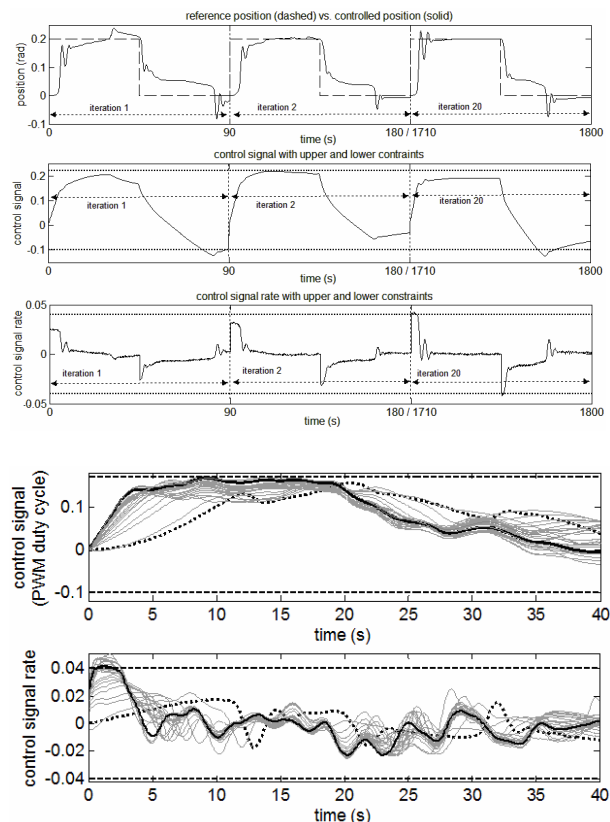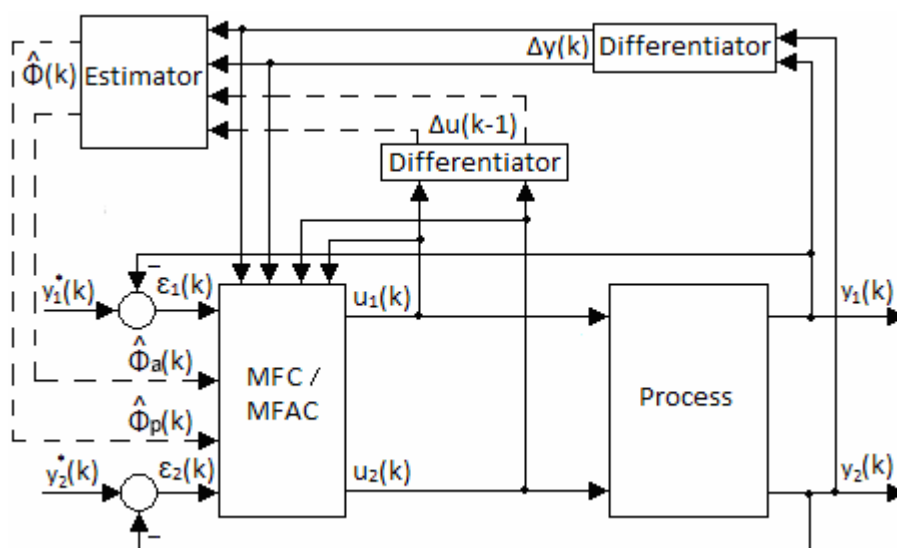
## Applicability and transferability of the results

Control systems with a reduced parametric sensitivity, tools for the computer-aided design of controllers, computer-aided techniques in iterative data-based control, nature-inspired optimization algorithms in control design and image processing, tools for the systematic development of fuzzy control systems.

## Financed through/by

## Research Centre

Automatic Systems Engineering Research Centre (CCISA).
http://www.aut.upt.ro/centru-cercetare/index.EN.php

## Research team

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