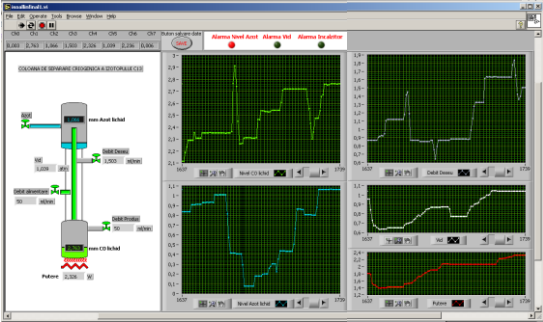
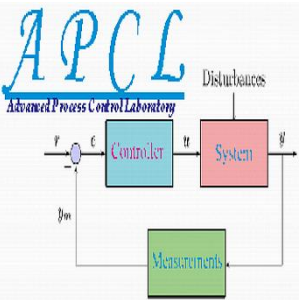



ADVANCED PROCESS CONTROL METHODS

Contact details

Name	Advanced Process Control Methods	
Acronym	MACP	
Logo		
Site	http://research.utcluj.ro/tl_files/research/Research%20Domain/Systems%20Engineering/8_Dulf.pdf	
Address	2 Observatorului Str., 400489, Cluj-Napoca, Romania	
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Areas of expertise

Complex process modeling and simulation

- Detailed models and simulations of various industrial applications

Tuning, design and testing of various control solutions including advanced control algorithms such as predictive, fractional or robust control

- Conceptual design of various control loops from classical PID to advanced control algorithms
- Control strategy implementation
- Control optimization

Particular advanced monitoring, supervising and control methods for non-conventional processes and technologies

- Conceiving of new, efficient technologies in isotopic and molecular processes
- Structural modeling, monitoring and control of isotopic and molecular processes
- Improved efficiency based on optimization; process maintenance

Team

Prof. Dr. Eng. Eva H. Dulf, Prof. Dr. Eng. Clement Festila, Assist. Prof. Dr. Eng. Cristina I. Muresan, Assist. Prof. Dr. Eng. Roxana Both, Eng. Marius Ticala, PhD, PhD students: Eng. Marius Gretinger, Eng. Adrian Cioloca, Eng. Sergiu Chetan, Eng. Ihor Slivinschi

Representative projects

SWEETCONOMY - Functional collaboration model between public research organizations and the economic environment for the provision of high-level scientific and technological services in the field of bio-economy, PNIII-P1-1.2 PCCDI 2018, (2018-2020)

BIOFIT – “Effective use of crude biodiesel glycerol in lactic acid production”, PNIII-P2-2.1-PED-2016-1237, (2017-2018), <https://biofitped.weebly.com/diseminare.html>

“Robust, fault tolerant, fractional order control strategies with application to isotope separation cascades”, PNII TE, (2015-2017), <http://evadulf.wix.com/pnii-ru-te-38-2015-2017>

“Noi Strategii de Control de Ordin Fractionar pentru Atenuarea Vibratiilor in Flancul Avioanelor”, PNII TE, (2015-2017)

“Distributed Control Strategies with Application to Robust Fractional Order Controllers for Distillation”, PNII CAPACITATI, <http://www.eng.ucy.ac.cy/hadjicostis/CyprusRomaniaProject/index.html> (2014-2015)

“Robust fractional control strategies for multivariable time delay processes”, PNII TE, <http://fractional-group.com/> (2013-2015)

SEPCAS-13C, “Modern Cascade for ¹³C Cryogenic Separation”, PNII PCCA, <http://roxana-eu.wix.com/sepcas-13c>,

(2012-2015)

SCMISC, "Structural Complex Modeling of Isotope Separation Columns for Advanced Control Strategies", PNII IDEI, <http://fractional.webraptordesign.com/> (2009-2011)

CONDNER-13C, "Nonlinear robust control of cryogenic ¹³C isotope separation column", PN II PCCA <http://aut.webraptordesign.com/> (2007-2010)

Significant results

The most representative publications of the past 5 years:

1. Dulf, Eva-H.; Susca, Mircea; Kovacs, Levente, Novel Optimum Magnitude Based Fractional Order Controller Design Method Conference: 3rd IFAC Conference on Advances in Proportional-Integral-Derivative Control (PID) Location: Ghent Univ, Ghent, BELGIUM Date: MAY 09-11, 2018 Volume: 51 Issue: 4 Pages: 912-917 Published: 2018
2. Dulf, Francisc Vasile; Vodnar, Dan Cristian; Dulf, Eva-Henrietta; et al., Liberation and recovery of phenolic antioxidants and lipids in chokeberry (*Aronia melanocarpa*) pomace by solid-state bioprocessing using *Aspergillus niger* and *Rhizopus oligosporus* strains LWT-FOOD SCIENCE AND TECHNOLOGY Volume: 87 Pages: 241-249 Published: JAN 2018
3. C. I. Muresan, E. H. Dulf, and R. Both, "Vector-based tuning and experimental validation of fractional-order PI/PD controllers", *Nonlinear Dynamics*, vol. 84, pp. 179-188, Apr 2016.
4. C. I. Muresan, E. H. Dulf, C. Copot, R. De Keyser, and C. Ionescu, "Design and analysis of a multivariable fractional order controller for a non-minimum phase system", *Journal of Vibration and Control*, vol. 22, pp. 2187-2195, May 2016.
5. C. I. Muresan, A. Dutta, E. H. Dulf, Z. Pinar, A. Maxim, and C. M. Ionescu, "Tuning algorithms for fractional order internal model controllers for time delay processes", *International Journal of Control*, vol. 89, pp. 579-593, Mar 2016.
6. C. I. Muresan, E. H. Dulf, C. Copot, R. De Keyser, C. Ionescu (2015), "Design and analysis of a multivariable fractional order controller for a non-minimum phase system", *Journal of Vibration and Control*, vol. 22, pp. 2187-2195, May 2016.
7. E. H. Dulf, C. I. Muresan, M. Unguresan, "Modeling the (¹⁵N) isotope separation column", in *Journal of Mathematical Chemistry*, vol. 52, 2014, pp. 115–131
8. C. I. Muresan, E. H. Dulf, R. Both, "Vector Based Tuning and Experimental Validation of Fractional Order PI/PD Controllers", *Nonlinear Dynamics*, (2015), DOI: 10.1007/s11071-015-2328-2

Significant solutions:

Monitoring, modeling and control of isotope separation processes and separation cascade

Fractional order control strategies for time delay and MIMO processes

Products and technologies:

1. Mathematical models of complex chemical processes
2. Special transducer for cryogenic liquid nitrogen level in the condenser of an isotope separation column
3. Special transducer for carbon monoxide level in the boiler of an isotope separation column
4. Monitoring system for ¹³C cryogenic isotope separation column
5. Advanced control strategies for ¹³C cryogenic isotope separation column and a separation cascade
6. Frequency analyzer based on a direct, simplified algorithm

Patents:

1. R.A. Munteanu, E.H. Dulf, C. Festila, R. Munteanu, G. Todoran, "Analogue electronic transducer for measuring power in direct current circuits, has circuit for generating filling factor which is astable flip-flop circuit based on amplifier", patent no. RO128666-A2, July 30, 2013
2. R.A. Munteanu, E.H. Dulf, C. Festila, R. Munteanu, "Level capacitive cryogenic transducer with coplanar plates for liquid nitrogen", patent no. RO128052-A2, December 28, 2012
3. R.A. Munteanu, E.H. Dulf, C. Festila, R. Munteanu, "Intuitive method and electronic apparatus for determining phase shifting in frequency analyzers", patent no. RO128067-A2, December 28, 2012

The offer addressed to the economic environment

Research & development	Identifying fundamental principles and methodologies that enable systems to exhibit intelligent, goal-oriented behavior, and developing innovative instruments to monitor, manipulate, and control systems Tuning, design and testing of various control solutions using advanced control algorithms, such as predictive, fractional or robust control
Consulting	Consulting in simulation, design, implementation and maintenance of control systems for multiple industrial field; Consulting in structural and nonlinear modelling of complex processes Consulting in process management using different simulation environment
Training	Complex process modeling and simulation Tuning, design and testing of various control solutions including advanced control algorithms such as predictive, fractional or robust control