

ROBOTICS AND NONLINEAR CONTROL

Contact details

Name	Robotics and Nonlinear Control	
Acronym	ROCON	
Logo		
Site	http://rocon.utcluj.ro/	
Address	Dorobanților str 71-73, Cluj-Napoca, 400609, Romania	
Faculty Department	Faculty of Automation and Computer Science Department of Automation	
Telephone	+40 264 401 586	
Fax	+40 264 401 585	
Director	Assoc. Prof. Lucian Busoniu, PhD. MSc.	
E-mail	Lucian.Busoniu@aut.utcluj.ro	

Areas of expertise

Our group works on **Robotics and Nonlinear Control (ROCON)** at the Department of Automation of the Technical University of Cluj-Napoca. Our research interests range from **mobile robotics** and **robot modeling**, to fundamental **nonlinear control and estimation** using methods from **computational and artificial intelligence**. These two major directions are connected via **applications of nonlinear control to robotics**, with a focus on **assistive robotics**.

Team

Assoc. Prof. Lucian Busoniu, Assoc. Prof. Zsófia Lendek, PhD, Assist. Prof. Levente Tamás, PhD, Assist. Prof. Cosmin Marcu, PhD, Prof.dr.eng. Gheorghe Lazea, honorary member, Eng. Előd Páll, MSc
PhD candidate Koppány Máthé, MSc, Eng. Zoltan Nagy, BSc

Representative projects

Handling non-smooth effects in control of real robotic systems, Young Teams grant, 2015-2017. PI Zsofia Lendek, <http://lendek.net/TE88/>
Reinforcement learning and planning for large-scale systems, Young Teams grant, 2013-2016. PI Lucian Busoniu, <http://yt.busoniu.net/>
Artificial-Intelligence-Based Optimization for the Stable and Optimal Control of Networked Systems (AICONS), PHC Brancusi international cooperation grant, 2015-2016; PI on the Romanian side Lucian Busoniu, <http://rocon.utcluj.ro/node/77>
Observer design for structured distributed dynamic systems, Young Teams grant, 2011-2014. PI Zsofia Lendek, <http://lendek.net/TE/>
3D Reconaissance - SCIEX NMS Postdoctoral project, Switzerland, 2013-2014; PI Levente Tamas

Significant results

Representative publications in the past 5 years

1. L. Busoniu, L. Tamas (editors), Handling Uncertainty and Networked Structure in Robot Control, Springer, *Studies in Systems, Decision and Control Series*. To be published in early 2016. <http://rocon.utcluj.ro/roboticsbook/>
2. L. Busoniu, R. Postoyan, J. Daafouz, Near-optimal Strategies for Nonlinear and Uncertain Networked Control Systems. *IEEE Transactions on Automatic Control*, 2016. In press.
3. Lendek Zs., Guerra T-M, Lauber J.. 2015. Controller design for TS models using non-quadratic Lyapunov functions. *IEEE Transactions on Cybernetics*. 45:453–464.
4. Lendek Zs., Raica P., Lauber J., Guerra T-M. 2015. Observer design for discrete-time switching nonlinear models. *Lecture Notes in Control and Information Sciences*. 457:27–58.
5. Guerra T-M, Estrada-Manzo V., Lendek Zs. 2015. Observer design for Takagi-Sugeno descriptor models: an LMI approach. *Automatica*. 52:154–159.
6. Kato Z, Tamas L. 2015. Relative Pose Estimation and Fusion of 2D Spectral and 3D Lidar Images. *Computational Color Imaging*. LNCS:33–42.
7. Tamas L, Goron LCosmin. 2014. 3D semantic interpretation for robot perception inside office environments. *Engineering Applications of Artificial Intelligence*. 32:76–87.

8. Tamas L, Kato Z. 2013. Targetless Calibration of a Lidar-Perspective Camera Pair. International Conference on Computer Vision 2013, BigData3DCV Workshop.
9. Mathe K., Busoniu L. 2015. Vision and control for UAVs: A survey of general methods and of inexpensive platforms for infrastructure inspection. Sensors 15(7): 14887-14916.
10. Busoniu L, Morarescu C. 2015. Topology-Preserving Flocking of Nonlinear Agents Using Optimistic Planning. Control Theory and Technology. 13:333-344.
11. Busoniu L, Morarescu C. 2014. Consensus for Black-Box Nonlinear Agents Using Optimistic Optimization. Automatica. 50:1201–1208.

Patent: Automatic Obstacle Detection and Breaking System for Cars, nr A10006/16.02.2011: L. Tamas, Gh. Lazea.

What we offer to the economic environment

Research & development	Signal processing Control algorithms Monitoring and estimation Artificial intelligence and machine learning. Mobile robotics and robotic manipulation Advanced system control and monitoring Embedded software design
Consulting	Control system design and development Monitoring system design and development Robotic system design & engineering 2D and 3D mapping and surveys
Applied engineering services	Process and control engineering Robotics related services Process equipment related services
Training	Control and monitoring System identification Optimization and optimal control Computer integrated manufacturing Process equipment Industrial robotics Mobile vehicles