
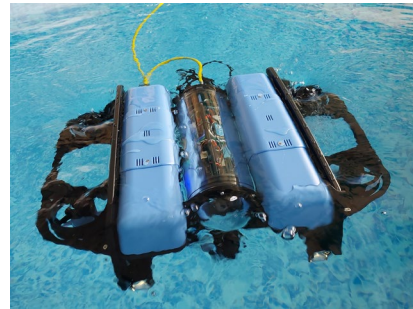


ROBOTICS AND NONLINEAR CONTROL

Contact details

Name	Robotics and Nonlinear Control
Acronym	ROCON
Logo	
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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 robot design, perception, and control; through fundamental nonlinear control, networked systems, and estimation; to machine learning, artificial intelligence, and deep neural networks. These methods are applied to marine, ground, and aerial robotics, precision agriculture, rehabilitation robotics, and so on.

Team

Faculty: Lucian Busoniu, group lead; Zsófia Lendek, Levente Tamás; Gheorghe Lazea, honorary member
Associate Professors: Alexandru Codrean, Tassos Natsakis
Assistant Professors: Cosmin Marcu
Teaching assistants and postdocs: Zoltan Nagy, Mircea Susca, Emmanuel Kravitzch, Bilal Yousuf
PhD and long-term research students: Tudor Alinei-Poiana, Maria Ceapa, Marius Dragomir, Etienne Gorski, Bogdan Lazar, Mihalis Maer, Davian Martinovici, Amalia Matyas, Szilard Molnar, Elvin Pop, David Rete, Matthias Rosynski, Tudor Santejudean, Stefan Pirje, Paul Sucala, Ioana Ulici, Laurentiu Popa.
Remote-work senior researchers: prof.dr. Constantin Morărescu, dr. Vineeth Varma
Technician: Adrian Lucaci. Executive project manager: Teodora Sanislav.

Representative projects (selection of 5 recent projects)

Montana: Hybrid Camera Calibration Methods for Autonomous Robots, PTE grant, 2025-2027, PI Levente Tamas, http://rocon.utcluj.ro/~levente/?page_id=663
DECIDE: AI Design of Decentralized Cooperative Control over Networks, National Resilience and Recovery Plan, component C9, investment I8, 2023-2026, PI Constantin Morarescu <https://decide.utcluj.ro/>
SeaClear2.0: Scalable Full-Cycle Marine Litter Remediation in the Mediterranean: Robotic and Participatory Solutions, Horizon Europe Innovation Action, 2023-2026, PI Lucian Busoniu, <https://www.seaclear2.eu>, see also the first iteration of the project at <https://seaclear-project.eu/>.
Control design for optimal estimation using heterogeneous sensors (HEROES), Young Teams grant, 2021-2022, PI Zsofia Lendek, <http://lendek.net/TE185/>
Targeted Robotic Upper-arm REHAbilitation (TRUE-REHAB). Young Teams Grant, 2020-2022, PI Tassos Natsakis, <http://rocon.utcluj.ro/true-rehab>

Significant results

Selection of 5 representative publications in the past 5 years

T., Sântejudean, M., Ceapă, R. Herzal, E. Pop, V.S. Varma, I. C. Morărescu, L. Bușoniu. *Multirobot path-aware global optimization*. Control Engineering Practice, 164, 106495, 2025.

B Yousuf, R Herzal, Zs Lendek, L Bușoniu, *Multi-agent active multi-target search with intermittent measurements*, Control

Engineering Practice, 2024.

Sz. Molnar, L. Tamas. *Variational autoencoders for 3D data processing*. Artificial Intelligence Review, 2024.

I.A. Ulici, A. Codrean, T. Natsakis, *Human-Robot Interaction with Sliding Mode Control for Rehabilitation*. IFAC PapersOnLine, 2023.

T. Natsakis, L. Busoni. *Predicting Intention of Motion During Rehabilitation Tasks of the Upper-Extremity*. 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC), 2021.

Patents:

Automatic Obstacle Detection and Breaking System for Cars, L. Tamas, Gh. Lazea, no A10006/16.02.2011.

Metodă De Vizualizare A Traseului Unui Vehicul Autonom Folosind Realitatea Augmentata, C. Militaru, L. Tamas, L. Tofalvi, request no. A/000368/2018, patent no. 133736.

System and method for mitigating errors occurring in data processing units implemented with digital circuits, O. Amaricai-Boncalo, A. Amaricai-Boncalo Zs. Lendek, patent no. 134587.

Corecția suprafețelor plane din imaginile provenite de la camere cu informație de distanță folosind rețele neuronale convoluționale, Marian Pop, Levente Tamas, patent no. A2021_00559

Metoda pentru estimarea normalelor pentru camere cu informație de distanță emițătoare de impulsuri, folosind rețele neuronale convoluționale, Szilard Molnar, Levente Tamas, patent no. A2021_00560

Offer to industry

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

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