ROBOPROX Symposium 2024

Introductory expert meeting of the project ROBOPROX: Robotics and Advanced Industrial Production, reg. no. CZ.02.01.01/00/22_008/0004590

Date: 14 March 2024

Venue: Red Auditorium, Building B, CIIRC CTU, Jugoslávských partyzánů 3, Prague 6

8:00–8:30	*Arrival of participants and Registration*
	Introduction of the project and partners
8:30–8:35	Welcome note and opening prof. Ing. Vladimír Mařík, DrSc., dr. hc, Scientific Director, CIIRC CTU
8:35–8:40	doc. RNDr. Vojtěch Petráček, CSc., CTU Rector
8:40–8:55	Short speeches by representatives of the project partners prof. Václav Snášel, Rector, Technical University of Ostrava (VŠB-TUO) prof. Ing. Josef Basl, CSc., Vice-Rector for Strategy and Development, University of West Bohemia (UWB)
8:55–9:00	Josef Schwarz, EC Representation in the Czech Republic
9:00–9:20	Introduction of the project, its partners, objectives and structure prof. Dr. Ing. Zdeněk Hanzálek, Principal Investigator
9:20–9:25	WP1: Control and optimization for systems, materials, and manufacturing Ing. Milan Korda, Ph.D.
9:25–9:30	WP2: Robotics and Computation Methods for Production prof. Dr. Ing. Robert Babuška

	Presentation by research area (RA) and research objective (RO):
9:30–9:55	RA1 Control of distributed-parameter systems and complex robotic structures prof. Ing. Tomáš Vyhlídal, Ph.D. ● Optimal control of interconnected time-delay systems ● Extending the system decoupling method ● Control and vibration suppression of light robotic structures ● Algorithms for industrial control ● Estimation and filtering ● Advanced manufacturing

9:55–10:25	*Coffee Break*

10:25–10:35	RA2: Control for modular systems, structures, and materials prof. Ing. Michael Šebek, DrSc. ● Methodology for collaborative assembly of modular structures ● Methodology for control of assembled modular structures
10:35–10:45	RA3: Convex relaxations for non-convex problems in materials and industrial design prof. RNDr. Martin Kružík, Ph.D. ● No relaxation gap in the moment-SOS hierarchy ● Better scalability of the moment-SOS hierarchy
10:45–11:05	RA4: Computer-aided design, simulation and manufacturing of (modular) materials, mechanisms, and structures prof. Ing. Jan Zeman, Ph.D. ● Simulations ● Optimal design ● Manufacturing and validation
11:05–11:20	RA5: Automation for nanoscale surface engineering - prof. Ing. Tomáš Polcar, Ph.D., doc. Antonio Cammarata, Ph.D. ● Robotic magnetron sputtering ● Automated nanoscale tribology

	● Design and manipulation of 2D materials
11:20–11:30	RA6 Advanced robot autonomy - RNDr. Miroslav Kulich, Ph.D. ● Robot workspace modelling, robot under uncertainty ● Perception-based navigation using embedded workspace features ● Long-term autonomy, fault detection and recovery
11:30–11:50	RA7 Human-machine collaboration - prof. Dr. Ing. Robert Babuška ● Modular knowledge-enabled architecture for HRC ● Interactive skill and task specification, learning ● Planning, scheduling and execution of tasks in the HRC workspace ● Interactive perception ● Application to a robotic system for radiation detection
11:50–12:00	RA8 Cooperative aerial robots for advanced industrial production doc. Ing. Martin Saska, Dr. rer. nat. ● Topological multi-modal mapping and cooperative localization ● Trajectory and high-level mission planning for agile multi-robot flight

12:00–13:30	Lunch at Testbed Control Room (groundfloor)

13:30–13:40	RA9 Resilient machines through continuous learning and sensing prof. Ing. Tomáš Svoboda, Ph.D. ● End-to-end learning with explainability ● Versatile, resilient robots through distributed reactive control and whole-body tactile sensing
13:40–13:50	RA10 Robotic routing in dynamic industrial environment with human presence doc. Ing. Tomáš Krajník, Ph.D. ● Robotic routing solvers with solution quality estimates ● Data collection planning in spatio-temporal fields
13:50–14:15	RA11 Scheduling, discrete optimization and decision-making prof. Dr. Ing. Zdeněk Hanzálek ● High-performance algorithms for the novel extensions of production scheduling problems ● Uncertainty and machine learning in discrete optimization ● Effective decision-making for long-term autonomy ● Metaheuristic methods application for large scale, high dimensional data ● Optimization of energy consumption and production

14:15–14:45	*Coffee Break*

14:45–15:05	RA12 Scalable formal methods in robotics and production Mgr. Mikoláš Janota, Ph.D. ● Scalable symbolic execution through bounded model checking ● Automated reasoning for industrial applications ● Reasoning about configurable systems ● Graphs, parameters, and optimization for agents
15:05–15:20	RA13 Complex systems for flexible production - doc. Ing. Petr Kadera, Ph.D ● Advanced models of complex production systems ● Modularization of production systems ● Quality control in flexible manufacturing systems ● Products, production systems, and devices

15:20–15:30	Conclusion and Wrap-up - prof. Dr. Ing. Zdeněk Hanzálek