

Proposal for Special Session at IEEE CASE 2021

Robotics technologies for control, smart manufacturing and logistics

Goal:

The primary objective of this track is to bring together specialists in different fields of industrial robots modeling, control, and their application in manufacturing and service. It addresses scientific and engineering problems that arise in the automation of various technological processes and robot-based transportation in the industrial environment. Particular topics covering by the track include optimal design, simulation and modeling of robotic manipulators and robotic manufacturing cells, robot calibration and estimation model parameters, manipulator accuracy improvement, advanced and intelligent robot control, human-robot collaboration, cooperation and interaction, as well as robot application in assembling, milling and welding. Particular emphasis is given to the innovative methodologies and advanced technologies in the area of modern industrial robotics and multi-robot cooperation.

Keywords. Industrial robots, modeling, advanced control, calibration, intelligent system, robot-based transportation, logistics

Track topics and their description

Modern industrial robotics gradually advances in the direction of intelligent control and automation of both primary and secondary operations required by the manufacturing process. This induced essential enlarging of research topics and developing of multidisciplinary approach. In recent years, they moved from conventional mechanical modeling and optimization of robot/process parameters to sophisticated perception and adaptive control, as well as multi-robot cooperation in presence of human being. To contribute to the above-mentioned areas, this track includes the following topics, but not limited by them:

- Industrial robots
- Optimization and optimal control of robotic systems
- Motion planning and optimization
- High precision manufacturing
- Robot calibration
- Force control
- Collision avoidance
- Intelligent and flexible automation
- Collaborative robots
- Human-robot interaction, collaboration and cooperation
- Learning and adaptive systems
- Deep reinforcement learning in robotics
- Augmented, virtual and mixed reality in robotics

Session Title: Robotics technologies for control, smart manufacturing and logistics

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Contributions:

1. Zhao, W., Pashkevich, A. and Chablat, D. Stiffness modeling of multi-link compliant serial manipulator and its interactions with environment.
2. A. Permakov, A. Klimchik. Robotic-based inspection of engine emissions in test production
3. D. Popov, A. Klimchik, A. Pashkevich, Real-time human-robot collaboration on the industrial floor
4. R. Dautov, A. Klimchik, Geometric model and calibration technique of a parallel pose-adjusting mechanism
5. A. Demian, M. Ostanin, A. Klimchik, Automation grasping with mixed reality
6. R. Boby, K. Almaghout, A. Klimchik, Analysis of Localization using Vision and Force/Torque Data for Robotic Assembly of Cylindrical Components
7. D. Popov, S. Mikhel, R. Yagfarov, A. Klimchik, A. Pashkevich, Collision Handling Framework for Collaborative Industrial Robots
8. Savin S., Klimchik A. Projection-based feedback control design for robots with non-backdrivable motors
9. A. Maloletov, Modeling of highly loaded cable-driven parallel systems in construction
10. S. Nedelchev, V. Skvortsova, B. Guryev, I. Gaponov, On the Minimal Energy Oscillations in TSA based Systems
11. Filaretov V., Zuev A., Zhirabok A., Protsenko A. Development of fault accommodation system for robot manipulators.
12. Filaretov V., Katsurin A. Method of remote control by joint work of two mobile robots
13. Yukhimets D., Gubankov A., Mursalimov E. Human-machine interface for simple programming of industrial robots
14. Yukhimets D., Gubankov A. Method of forming the trajectory of the robot working tool after performing the calibration procedure
15. Filaretov V., Gubankov A., Gornostaev I. Synthesis method of control signals forming system for Redundant Manipulators
16. Yukhimets D., Sakhnenko A. Development of algorithms for automated path planning of robot tool based on 3D models formed by the technical vision systems.
17. Kirill Artemov, Sergey Kolyubin, Stefano Stramigioli, Safety-Aware Implicit Force Control for Co-Bots,
18. Amiran Berkaev, Malik Mohrat, Alexey Burkov, Sergey Kolyubin, DNN-based semantic mapping for warehouse and office logistics
19. Evgenii Homutov, Dmitriy Ivolga, Ivan Borisov, Sergey Kolyubin, Nikita Molchanov, Ivan Maximov, Alexey Gonnochenko, Data-driven optimization of adaptive tooling for robotic manipulation
20. Dinar Sharafutdinov, Mark Griguletskii, Pavel Kopanov, Mikhail Kurenkov, Aleksey Burkov "Comparison of modern open-source SLAM approaches"