

47th International Symposium on Robotics 2016

Munich, Germany
21 - 22 June 2016

ISBN: 978-1-5108-2577-2

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2016) by VDE Conference Department
All rights reserved.

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact VDE Conference Department
at the address below.

VDE Conference Department
Stresemannallee 15
D-60596 Frankfurt/Main
Germany

Phone: +49 69 6308-0
Fax: +49 69 6308-9865

service@vde.com

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

- 13:45 [Sampling-based Path Planning to Cartesian Goal Positions for a Mobile Manipulator Exploiting Kinematic Redundancy 1](#)
 Ruben Seyboldt, Christian Frese and Angelika Zube (Fraunhofer IOSB, Germany)
- 14:05 [Real Time Texture Generation in Optimized Large-Scale Polygon Meshes with KinectFusion 10](#)
 Alexander Mock and Thomas Wiemann (Osnabrück University, Germany); Dorit Borrmann (Julius-Maximilians Universität Würzburg, Germany); Tristan Igelbrink (Osnabrück University, Germany); Joachim Hertzberg (Osnabrück University & DFKI Robotics Innovation Center, Osnabrück Branch, Germany)
- 14:25 [Experimental Robot Inverse Dynamics Identification Using Classical and Machine Learning Techniques17](#)
 Vinzenz Bargsten (University of Bremen & DFKI Bremen, Germany); José de Gea Fernández and Yohannes Kassahun (DFKI Bremen, Germany)
- 14:45 [The Advantages of Using Behavior Trees in Mult-Robot Systems23](#)
 Michele Colledanchise, Alejandro Marzinotto, Dimos Dimarogonas and Petter Ogren (KTH - The Royal Institute of Technology, Sweden)
- 15:05 [Automatic Testing Framework for Benchmarking Applications31](#)
 Florian Weisshardt (Fraunhofer IPA, Germany); Florian Köhler (Leibniz Universität Hannover, Germany)

S2.1: Components

Room 1

Chair: Ulrike Thomas (Chemnitz University of Technology, Germany)

- 13:45 [Active Ankle - an Almost-Spherical Parallel Mechanism37](#)
 Marc Simnofske (DFKI GmbH - Robotics Innovation Center, Germany); Shivesh Kumar (Deutsche Forschungszentrum für Künstliche Intelligenz GmbH, Germany); Bertold Bongardt (Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI), Afghanistan); Frank Kirchner (German Research Center for Artificial Intelligence (DFKI) GmbH, Bremen, Germany)
- 14:05 [Optical Workspace Monitoring System for Safeguarding Tools on the Mobile Manipulator VALERI43](#)
 José Saenz (Fraunhofer IFF, Germany); Christian Vogel (Fraunhofer Institute for Factory Operation and Automation IFF, Germany)
- 14:25 [Tactile Sensors for Safety and Interaction with the Mobile Manipulator VALERI49](#)
 José Saenz and Markus Fritzsche (Fraunhofer IFF, Germany)
- 14:45 [Development of a Self-Adaptive Gripper and Implementation of a Gripping Reflex to Increase the Dynamic Payload Capacity56](#)
 Marc Manz (German Research Center for Artificial Intelligence (DFKI), Germany); Sebastian Bartsch (DFKI Bremen GmbH - Robotics Innovation Center, Germany); Marc Simnofske (DFKI GmbH - Robotics Innovation Center, Germany); Frank Kirchner (German Research Center for Artificial Intelligence (DFKI) GmbH, Bremen, Germany)
- 15:05 [An Optical Tactile Sensor for Measuring Force Values and Directions for Several Soft and Rigid Contacts63](#)
 Alexey Kolker (Novosibirsk State Technical University & Siberian Research Meteorological Institute, Russia); Michael Jokesch and Ulrike Thomas (Chemnitz University of Technology, Germany)

S3.1: Industrial Robots - Facts

Room 2

Chair: Jörg Franke (FAU Erlangen-Nuremberg, Germany)

- 13:45 [Do Robots Create Jobs? The Data Says Yes!69](#)
 Bob Doyle (Association for Advancing Automation, USA)
- 14:05 [Reduction of Heart Rate by Robot Trajectory Profiles in Cooperative HRI74](#)
 Barbara Kühnlenz (Coburg University of Applied Sciences and Arts, Germany); Kolja Kühnlenz (Coburg University of Applied Sciences and Arts & TU Munich, Germany)
- 14:25 [Attribute Enabled Programming of Industrial Robots80](#)
 Remus Boca (ABB Corporate Research Center, USA); Jianjun Wang (ABB Corporate Research, USA);

Harald Staab (ABB Inc., USA); Gregory Rossano (ABB Inc., Corporate Research, USA); Thomas Fuhlbrigge (ABB Corporate Research Center, USA)

14:45 [*Example Application of ISO/TS 15066 to a Collaborative Assembly Scenario88*](#)

Bjoern Matthias (ABB AG Corporate Research, Germany); Thomas Reisinger (ABB Automation GmbH, Germany)

15:05 [*A Flexible Architecture for Automatically Generating Robot Applications based on Expert Knowledge93*](#)

Miroslav Macho, Ludwig Nägele, Alwin Hoffmann, Andreas Angerer and Wolfgang Reif (University of Augsburg, Germany)

Tuesday, June 21, 16:10 - 16:30

Poster Session and Coffee Break

Rooms: Galary/Restaurant, Plenary, Room 1, Room 2

Tuesday, June 21, 16:30 - 18:10

S1.2: Planning

Room: Plenary

Chair: Uwe Zimmermann (KUKA Roboter GmbH, Germany)

16:30 [*Establishing Performance Guarantees for Behavior-Based Robot Missions Using an SMT Solver101*](#)

Feng Tang and Damian Lyons (Fordham University, USA); Ronald Arkin (Georgia Institute of Technology, USA)

16:50 [*Industrial implementation of a multi-task redundancy resolution at velocity level for highly redundant mobile manipulators109*](#)

Christian Scheurer and Mario Fiore (KUKA Roboter GmbH, Germany); Shashank Sharma (Bonn Rhine Sieg University of Applied Sciences, Germany); Ciro Natale (Seconda Università degli Studi di Napoli, Italy)

17:10 [*Data-Driven Human Grasp Movement Analysis118*](#)

Hamal Marino and Marco Gabiccini (University of Pisa, Italy); Ales Leonardis (The University of Birmingham, United Kingdom); Antonio Bicchi (University of Pisa, Italy)

17:30 [*Distance Metrics for Path Planning with Dynamic Roadmaps126*](#)

Andreas Völz and Knut Graichen (Ulm University, Germany)

S2.2: Technologies

Room 1

Chair: Bernd Kuhlenkötter (Ruhr-Universität Bochum, Lehrstuhl für Produktionssysteme (LPS), Germany)

16:30 [*Fast Edge-Based Detection and Localization of Transport Boxes and Pallets in RGB-D Images for Mobile Robot Bin Picking133*](#)

Dirk Holz and Sven Behnke (University of Bonn, Germany)

16:50 [*May I be your Personal Coach? Bringing Together Person Tracking and Visual Re-identification on a Mobile Robot141*](#)

Tim Wengefeld, Markus Eisenbach, Thanh Trinh and Horst-Michael Gross (Ilmenau University of Technology, Germany)

17:10 [*Texture Characterization with Semantic Attributes: Database and Algorithm149*](#)

Richard Bormann, Dominik Esslinger, Daniel Hundsdoerfer and Martin Hägele (Fraunhofer IPA, Germany); Markus Vincze (Vienna University of Technology, Austria)

17:30 [*ENACT: An Efficient and Extensible Entity-Actor Framework for Modular Robotics Software Components157*](#)

Tobias Werner, Michael Gradmann, Eric Orendt, Maximilian Sand and Michael Spangenberg (Universität Bayreuth, Germany); Dominik Henrich (University of Bayreuth, Germany)

- 17:50 [*Affordance Estimation For Vision-Based Object Replacement on a Humanoid Robot164*](#)
 Wail Mustafa (University of Southern Denmark, Denmark); Mirko Wächter (Institute for Anthropomatics, Karlsruhe Institute of Technology, Germany); Sandor Szedmak (University of Innsbruck, Austria); Alejandro Agostini (University of Göttingen, Germany); Dirk Kraft (University of Southern Denmark, Denmark); Tamim Asfour (Karlsruhe Institute of Technology (KIT), Germany); Justus H. Piater (University of Innsbruck, Austria); Florentin Wörgötter (University of Goettingen, Germany); Norbert Krueger (University of Southern Denmark, Denmark)

S3.2: Industrial Robots - Technologies

Room 2

Chair: Heinz Wörn (Karlsruhe Institute of Technology (KIT), Germany)

- 16:30 [*A Framework for Robot Control Software Development and Debugging Using a Real-Time Capable Physics Simulation173*](#)

Fabian Aichele, Björn Schenke, Bernd Eckstein and Albert Groz (TruPhysics GmbH, Germany)

- 16:50 [*Modularization of skill ontologies for industrial robots181*](#)

Ludwig Jacobsson and Jacek Malec (Lund University, Sweden)

- 17:10 [*User-Defined Transition between Path Segments in Terms of Tolerances in Speed and Position Deviation187*](#)

Wolfgang Weber (University of Applied Sciences Darmstadt, Germany); Alexander König (University of Applied Sciences Darmstadt, Germany); Dany Xavier Nodem (University of Applied Sciences Darmstadt, Germany)

- 17:30 [*Robot Assembly Skills based on Compliant Motion Control194*](#)

Fan Dai (ABB AG & Corporate Research, Germany); Arne Wahrburg, Bjoern Matthias and Hao Ding (ABB AG Corporate Research, Germany)

- 17:50 [*Editing and synchronizing multi-robot playback programs200*](#)

Michael Riedl, Johannes Baumgartl and Dominik Henrich (University of Bayreuth, Germany)

Tuesday, June 21, 18:30 - 22:30

Conference Dinner

IERA and Engelberger Award Ceremony

Rooms: Gallery/Restaurant, Plenary, Room 1, Room 2

Wednesday, June 22

Wednesday, June 22, 09:00 - 10:20

S1.3: Control

Room: Plenary

- 09:00 [*From Virtual Testbeds to real lightweight robots: Development and deployment of control algorithms for soft robots, with particular reference to industrial peg-in-hole insertion tasks208*](#)

Georgij Grinshpun, Torben Cichon and Dipika Dipika (RWTH-Aachen University, Germany); Juergen Rossmann (Technical University of Aachen, Germany)

- 09:20 [*Experimental verification of the advantages of a modular open chain metamorphic manipulator215*](#)

Charalampos Valsamos (University of Patras & Mechanical Eng. and Aeronautics Dpt., Greece); Vassilis Moulianitis (University of the Aegean, Greece); Nikos Aspragathos (University of Patras, Greece)

- 09:40 [*Online Calibration of Industrial Robots using Inertial Sensors222*](#)

Hendrik Vieler (ISW - University of Stuttgart, Germany); Armin Lechler (University of Stuttgart, Germany); Jochen Grimm (ISW - University of Stuttgart, Germany)

10:00 [*Practical trajectory designs for semi-automation of forestry cranes228*](#)
Szabolcs Fodor and Leonid Freidovich (Umeå University, Sweden); Carlos Vazquez (Ålö, Sweden)

Wednesday, June 22, 09:00 - 10:00

S4.1: Service Robot Technologies

Room 1

Chair: Tamim Asfour (Karlsruhe Institute of Technology (KIT), Germany)

09:00 [*Energy-Aware Mobile Robot Exploration with Adaptive Decision Thresholds236*](#)

Micha Rappaport (University of Klagenfurt, Austria)

09:20 [*Autonomous Surveying of Underfloor Voids244*](#)

Miguel Julia (Q-Bot Limited, United Kingdom); Mathew Holloway (Imperial College London, United Kingdom); Oscar Reinoso (Miguel Hernández University, Spain); Peter Childs (Imperial College London, United Kingdom)

09:40 [*Design and implementation of a spherical joint for mobile251*](#)

Tim Fröhlich and Ulrich Reiser (Fraunhofer IPA, Germany)

Wednesday, June 22, 09:00 - 10:20

S3.3: Human-Robot Cooperation

Room 2

Chair: Martin Hägele (Fraunhofer IPA, Germany)

09:00 [*New development for flexible robot supported quality investigations in the field of Human Robot Collaboration in automotive industries259*](#)

Sebastian Keller (BTU Cottbus - Senftenberg, Germany); Steffen Bindel and Alexander König (BMW Group, Germany)

09:20 [*Sensor Glove for an Intuitive Human-Machine Interface for Exoskeletons as Manual Load Handling Assistance265*](#)

Patrick Stelzer, Werner Kraus and Andreas Pott (Fraunhofer IPA, Germany)

09:40 [*Smart Workbench: Towards Optimal User Assistance in Industrial Human-Robot Applications271*](#)

Johannes Höcherl (Ostbayerische Technische Hochschule Regensburg, Germany); Thomas Schlegl (OTH Regensburg, Germany)

10:00 [*Model Predictive Contact Control for Human-Robot Interaction279*](#)

Angelika Zube, Jonas Hofmann and Christian Frese (Fraunhofer IOSB, Germany)

Wednesday, June 22, 10:20 - 10:40

Poster Session and Coffee Break

Rooms: Galary/Restaurant, Plenary, Room 1, Room 2

Wednesday, June 22, 10:40 - 11:40

S4.2: Assistive Robots

Room: Plenary

10:40 [*Control and Analysis of a Therapeutic Massage Robot: A Milestone of Human-Robot in Physical Contact286*](#)

- Ren C. Luo, Chien-Wei Hsu and Shen-Yu Chen (National Taiwan University, Taiwan)
- 11:00 [*A Sampling-Based Tree Planner for Navigation Among Movable Obstacles292*](#)
Elisa Tosello and Nicola Castaman (University of Padua, Italy); Enrico Pagello (University Padova, Italy)
- 11:20 [*What Older Adults would Like a robot to Do in Their Homes - First results from a User Study in the Homes of Users300*](#)
Markus Vincze (Vienna University of Technology, Austria)

S4.3: Service Robot Applications

Room 1

Chair: Tamim Asfour (Karlsruhe Institute of Technology (KIT), Germany)

- 10:40 [*Enabling Autonomous Locomotion into Sand - A Mobile and Modular Drilling Robot307*](#)
Felix Becker and Simon Börner (Technische Universität Ilmenau, Germany); Roy Lichtenheldt (German Aerospace Center (DLR) - Institute of System Dynamics and Control, Germany); Klaus Zimmermann (TU Ilmenau, Germany)
- 11:00 [*A robot for spray applied insulation in underfloor voids313*](#)
Mathew Holloway (Imperial College London, United Kingdom); Miguel Julia (Q-Bot Limited, United Kingdom); Peter Childs (Imperial College London, United Kingdom)
- 11:20 [*Automatic Tire Changing of Large Mining Vehicles with Industrial Robots320*](#)
Harald Staab (ABB Inc., USA); Remus Boca (ABB Corporate Research Center, USA); Carlos Martinez (ABB, USA); Gregory Rossano, Will Eakins and Dan Lasko (ABB Inc., Corporate Research, USA); Thomas Fuhlbrigge (ABB Corporate Research Center, USA)

S3.4: Control

Room 2

- 10:40 [*Sensorless Null-Space Admittance Control for Redundant Manipulators327*](#)
Arne Wahrburg and Bjoern Matthias (ABB AG Corporate Research, Germany); Fan Dai (ABB AG & Corporate Research, Germany); Hao Ding (ABB AG Corporate Research, Germany); Johannes Bös (TU Darmstadt, Germany)
- 11:00 [*A wireless haptic data suit for controlling humanoid robots334*](#)
Alessandro Graziano, Paolo Tripicchio, Emanuele Ruffaldi and Carlo Avizzano (Scuola Superiore Sant'Anna, Italy)
- 11:20 [*Fault propagation and graph-based path generation for skill-based robot programming342*](#)
Christian Lehmann and Duc Tho Le (Brandenburg University of Technology, Germany)

Wednesday, June 22, 11:40 - 12:25

K3: Keynote: Peer Fischer

Room: Plenary

Wednesday, June 22, 12:25 - 13:45

Poster Session and Lunch

Rooms: Gallery/Restaurant, Plenary, Room 1, Room 2

Wednesday, June 22, 13:45 - 14:30

K4: Keynote: Dario Floreano

Room: Plenary

Chair: Arturo Baroncelli (IFR, Italy)

Wednesday, June 22, 14:30 - 15:30

S3.5: Industrial Robots - Planning

Room: Plenary

Chair: Arturo Baroncelli (IFR, Italy)

- 14:30 [*Planning and Execution of Collision-free Multi-robot Trajectories in Industrial Applications350*](#)
Andreas Angerer and Alwin Hoffmann (University of Augsburg, Germany); Lars-Christian Larsen and Michael Vistein (German Aerospace Center (DLR), Germany); Jonghwa Kim (University of Augsburg & Institut für Informatik, Germany); Michael Kupke (German Aerospace Center, Germany); Wolfgang Reif (University of Augsburg, Germany)
- 14:50 [*Anytime Assembly Sequence Planning357*](#)
Robert Andre (Technische Universität Chemnitz, Germany); Ulrike Thomas (Chemnitz University of Technology, Germany)
- 15:10 [*A Complete Automated Chain For Flexible Assembly using Recognition, Planning and Sensor-Based Execution365*](#)
Korbinian Nottensteiner (German Aerospace Center (DLR), Institute for Robotics and Mechatronics, Germany); Tim Bodenmüller, Michael Kassecker, Maximo Roa and Andreas Stemmer (DLR, Germany); Daniel Seidel (TU Munich, Germany); Ulrike Thomas (Chemnitz University of Technology, Germany)

S5: New Robotics Applications

Room 1

- 14:30 [*Improved Ergonomics via an Intelligent Movement and Gesture Detection Jacket373*](#)
Jan Kuschan, Henning Schmidt and Jörg Krüger (Fraunhofer IPK, Germany)
- 14:50 [*Development and Control of the Multi-Legged Robot MANTIS379*](#)
Sebastian Bartsch (DFKI Bremen GmbH - Robotics Innovation Center, Germany); Marc Manz (German Research Center for Artificial Intelligence (DFKI), Germany); Peter Kampmann (DFKI GmbH - Robotics Innovation Center, Germany); Hendrik Hanff (DFKI GmbH, Germany); Alexander Dettmann (DFKI GmbH - Robotics Innovation Center Bremen, Germany); Malte Langosz (DFKI GmbH, Germany); Kai von Szadkowski (University of Bremen, Germany); Jens Hilljegerdes and Marc Simnofske (DFKI GmbH - Robotics Innovation Center, Germany); Philipp Kloss (DFKI GmbH, Germany); Manuel Meder (University of Bremen, Germany); Frank Kirchner (German Research Center for Artificial Intelligence (DFKI) GmbH, Bremen, Germany)
- 15:10 [*The Neurorobotic Platform: A simulation environment for brain-inspired robotics387*](#)
Florian Röhrbein (Technical University of Munich, Germany); Marc-Oliver Gewaltig (EPFL, Switzerland); Cecilia Laschi (SSSA, Italy); Gudrun J. Klinker (Technische Universität München, Germany); Paul Levi (FZI, Germany); Alois Knoll (Technical University Munich Garching, Germany)

S3.6: Industrial Robots: Vision, Environment

Room 2

- 14:30 [*Camera-based Obstacle Classification for Automated Reach Trucks using Deep Learning393*](#)
Marian Himstedt (University of Lübeck, Germany); Erik Maehle (University of Lübeck, Germany)
- 14:50 [*Using a Flexible Skill-Based Approach to Recognize Objects in Industrial Scenarios399*](#)
Rasmus Andersen, Casper Schou, Jens Damgaard and Ole Madsen (Aalborg University, Denmark)
- 15:10 [*Real-time bearing fault probability estimation using onsite learning for industrial robots407*](#)

Joung Ji Hoon and Lim Hyunkyu (Hyundai Heavy Industries Co., Ltd., Korea)

Wednesday, June 22, 15:30 - 15:50

Poster Session and Lunch

Rooms: Galary/Restaurant, Plenary, Room 1, Room 2

[*Fast and efficient traversable region extraction using quantized elevation map and 2D laser rangefinder413*](#)

Lae-Kyoung Lee (Pohang University of Science and Technology (POSTECH), Korea)

[*Laser scanner detection and localization of successively arranged mobile robots418*](#)

Rainer Halmheu (Technische Universität Dortmund & Audi AG Ingolstadt, Germany); Boris Otto (Technische Universität Dortmund, Germany); Thomas Pauleser (Audi AG Ingolstadt, Germany)

[*Analytic Forward and Inverse Kinematics of a Multi-Elastic-Link Robot Arm425*](#)

Myrel Alsayegh and Freia Irina Mues (Technical University of Dortmund, Germany); Jörn Malzahn (Istituto Italiano Di Tecnologia (IIT), Italy); Torsten Bertram (Technische Universität Dortmund, Germany)

[*3D Scanning of Workpieces with Cooperative Industrial Robot Arms431*](#)

Maximilian Wagner (Nuremberg Campus of Technology, Germany); Peter Heß (Technische Hochschule Nürnberg Georg Simon Ohm, Germany); Sebastian Reitelshöfer (Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany); Jörg Franke (FAU Erlangen-Nuremberg, Germany)

[*Visual/Tactile-based sensing strategy for grasping of planar non-rigid objects439*](#)

Pablo Gil, Carlos Mateo, Angel Delgado and Fernando Torres (University of Alicante, Spain)

[*Development of an intelligent care cart and new supply concepts for care homes and hospitals446*](#)

Birgit Graf (Fraunhofer IPA, Germany); Ralf Simon King (Universität Stuttgart, ISW, Germany); Christian Schiller and Andrea Rößner (Universität Stuttgart, IAT, Germany)

[*Test concept for a mobile robot with optimized traction452*](#)

Ludwig Barthuber, Peter Firsching and Klajdo Fyraj (Deggendorf Institute of Technology, Germany)

[*Energy Efficient Kinodynamic Motion Planning for Holonomic AGVs in Industrial Applications using State Lattices459*](#)

Frank Künemund (University of Applied Sciences and Arts Dortmund, Germany); Daniel Heß (University of Applied Sciences and Arts, Dortmund, Germany); Christof Röhrig (University of Applied Sciences and Arts in Dortmund, Germany)

[*A proposal of extracting of motion primitives by analyzing tracked data of hand motion from human demonstration467*](#)

Ngoc Hung Pham and Takashi Yoshimi (Shibaura Institute of Technology, Japan)

[*A New Multi-Modal Approach Towards Reliable Bin-Picking Application473*](#)

Veit Müller (Fraunhofer Institute for Factory Operation and Automation IFF, Germany); Roland Behrens (Fraunhofer Institute for Factory Operation and Automation (IFF), Germany); Norbert Elkmann (Fraunhofer IFF, Germany)

[*Simultaneous Calibration of Odometry and external Sensors of Omnidirectional Automated Guided Vehicles \(AGVs\)480*](#)

Daniel Heß (University of Applied Sciences and Arts, Dortmund, Germany); Frank Künemund (University of Applied Sciences and Arts Dortmund, Germany); Christof Röhrig (University of Applied Sciences and Arts in Dortmund, Germany)

[*Influence of Grasping Position to Robot Assembling Task488*](#)

Akira Suyama and Yasumichi Aiyama (University of Tsukuba, Japan)

[*A Virtual Space Robotics Testbed for Optical Sensors in Aerospace494*](#)

Thomas Steil, Marc Priggemeyer and Markus Emde (RWTH Aachen University, Germany); Juergen Rossmann (Technical University of Aachen, Germany); Georgij Grinshpun (RWTH-Aachen University, Germany)

[*Folding mechanism for a remotely deployable robotic vehicle501*](#)

Mathew Holloway (Imperial College London, United Kingdom); Miguel Julia (Q-Bot Limited, United Kingdom); Peter Childs (Imperial College London, United Kingdom)

[*Context-aware Planning by Refinement for Personal Robots in Smart Homes507*](#)

Nathan Ramoly and Bouzeghoub Amel (Télécom SudParis, France); Beatrice Finance (University of

Versailles, France)

[Dynamic modeling of new modular manipulators515](#)

Zoltán Forgó (Sapientia University, Romania)

[On Cognitive Robot Wood Working in SMERobotics521](#)

Mathias Haage (Lund University & Cognibotics, Sweden)

[Learning and executing rhythmic movements through chaotic neural networks: a new method for walking humanoid robots528](#)

Giuseppina C Gini, Matteo Bana and Alessio Franchi (Politecnico di Milano, Italy); Michele Folgheraiter and Amina Keldibek (Nazarbayev University, Kazakhstan)

[Asymptotic optimal trajectory planning under consideration of kinematic and direction constraints for mobile car-like robots534](#)

Tobias Lindeholz (Zentrum für Telematik, Germany); Robin Hess (Universität Würzburg, Germany);

Daniel Eck and Klaus Schilling (University of Würzburg, Germany)

[KaCanOpen: An Open Plug&Play CANopen Stack for ROS in Modern C++N/A](#)

Thomas Keh, Andreas Bihlmaier, Julien Mintenbeck and Heinz Wörn (Karlsruhe Institute of Technology (KIT), Germany)

[Human Push-Recovery: Strategy Selection Based on Push Intensity Estimation547](#)

Lukas Kaul (Karlsruhe Institute of Technology & Institute for Anthropomatics and Robotics, Germany);

Tamim Asfour (Karlsruhe Institute of Technology (KIT), Germany)

[Implementation of a safe hybrid workplace for robot-assisted riveting598](#)

Ramez Awad and Manuel Fechter (Fraunhofer IPA, Germany)

[7DoF Hand and Arm Tracking for Teleoperation of Anthropomorphic Robots555](#)

Jan Graßhoff, Lasse Hansen and Ivo Kuhlemann (Universität zu Lübeck, Germany); Kristian Ehlers (Universität zu Lübeck)

[Semantic Translation Tool for Robotics Applications563](#)

Pablo Quilez (Fraunhofer IPA, Germany)

[Novel Intelligent Technologies for Industrial Robot in Manufacturing - Architectures and Applications570](#)

Haruhisa Okuda (Mitsubishi Electric Corporation, Japan)

[Two Autonomous Robots for the DLR SpaceBot Cup - Lessons Learned from 60 Minutes on the Moon576](#)

Sven Lange and Daniel Wunschel (Chemnitz University of Technology, Germany); Stefan Schubert,

Tim Pfeifer, Peter Weissig, Andreas Uhlig and Martina Truschzinski (TU Chemnitz, Germany); Peter

Protzel (Technische Universität Chemnitz, Germany)

[Ultra-Flexible Production Systems for Automated Factories584](#)

Remus Boca (ABB Corporate Research Center, USA); Harald Staab (ABB Inc., USA); George Zhang (ABB & Corporate Research Center, USA); Sang Choi (ABB, Inc. & US Corporate Research Center, USA); Carlos Martinez (ABB, USA); Thomas Fuhlbrigge (ABB Corporate Research Center, USA); Will Eakins and Gregory Rossano (ABB Inc., Corporate Research, USA); Srinivas Nidamarthi (ABB Inc, USA)

[Mechatronics Practice in Education Step by Step, Workshop on Mobile Robotics590](#)

Anton Yudin (Bauman Moscow State Technical University); Maria Salmina (Lomonosov Moscow State University, Russia); Vladimir Sukhotskiy (State Budget Vocational and Educational Institution Vorobyovi Gori, Russia); Jean-Daniel Dessimoz (Western Switzerland University of Applied Sciences and Arts & HESSO, HEIG-VD, Switzerland)

[Relative Motion Estimation Based on Sensor Eigenfusion Using a Stereoscopic Vision System and Adaptive Statistical Filtering604](#)

Gennaro Notomista (Istituto Italiano di Tecnologia, Italy); Alexander Kammenhuber (AUDI AG,

Germany); Parthasarathy Nadarajan and Michael Botsch (Technische Hochschule Ingolstadt,

Germany); Mario Selvaggio (Istituto Italiano di Tecnologia, Italy)

[Advanced safety solutions for human-robot-cooperation610](#)

Timo Salmi (VTT, Technical Research Center of Finland, Finland)

Wednesday, June 22, 15:50 - 17:10

S3.7: Industrial Robots - Coating, Painting, Welding

Room: Plenary

Chair: Arturo Baroncelli (IFR, Italy)

- 15:50 [*Automated spray coating of complex 2.5D workpieces in small batch sizes with complex geometries in throughput by an innovative machine combination616*](#)
Denise Klose and Thorsten Schüppstuhl (Technische Universität Hamburg-Harburg, Germany);
Dominik Osthues (Venjakob Maschinenbau GmbH & Co. KG, Germany)
- 16:10 [*Automatic Gyro Effect Simulation for Robotic Painting Application622*](#)
Xiongzi Li (ABB Robotics, USA)
- 16:30 [*Detection of Assembly Variations for Automatic Program Adaptation in Robotic Welding Systems626*](#)
Alexander Kuss and Ulrich Schneider (Fraunhofer IPA, Germany); Thomas Dietz (Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), Germany); Alexander Verl (Stuttgart University, Institute for Control Engineering of Machine Tools, Germany)
- 16:50 [*New Applications of Cutting and Welding Robots with Automatic Offline-Programming632*](#)
Jobst Bickendorf (Autocam Informationstechnik GmbH, Germany)

S3.8: Industrial Robots: Assembly, Manufacturing

Room 1

Chair: Bjoern Matthias (ABB AG Corporate Research, Germany)

- 15:50 [*Teaching door assembly tasks in uncertain environment638*](#)
Stefano Michieletto and Francesca Stival (University of Padova, Italy); Enrico Pagello (University Padova, Italy)
- 16:10 [*A variant-flexible assembly cell for hydraulic valve sections using a sensitive lightweight robot645*](#)
Christian Lehmann (Brandenburg University of Technology, Germany); Jost Philipp Städter (Brandenburg University of Technology Cottbus - Senftenberg, Germany); Kornelius Wächter (Brandenburg University of Technology, Germany)
- 16:30 [*Analysis and Development of the Fused Layer Manufacturing Process using Industrial Robots652*](#)
Michael Rieger (Ruhr-Universität Bochum & Lehrstuhl für Produktionssysteme, Germany); Benjamin Johnen (Ruhr-Universität Bochum, Germany); Bernd Kühlenkötter (Ruhr-Universität Bochum, Lehrstuhl für Produktionssysteme (LPS), Germany)
- 16:50 [*Repair of Composite Structures with a Novel Human-Machine System660*](#)
Rebecca Rodeck and Thorsten Schüppstuhl (Technische Universität Hamburg-Harburg, Germany)

S3.9: Industrial Robots: Handling, Forming, Processing

Room 2

Chair: Christian Schlosser (TU-Hamburg-Harburg, Germany)

- 15:50 [*Machine Learning In Incremental Sheet Metal Forming667*](#)
Denis D. Störkle, Patrick Seim and Lars Thyssen (Ruhr Universität Bochum, Germany); Bernd Kühlenkötter (Ruhr-Universität Bochum, Lehrstuhl für Produktionssysteme (LPS), Germany)
- 16:10 [*Robot based automation of artistic stone surface production674*](#)
Gregor Steinhagen (TU Dortmund, Institute of Production Systems); Johannes Braumann (Association for Robots in Architecture | University for Arts and Design Linz, Austria); Carsten Krewet (TU Dortmund University, Institute of Production Systems, Germany); Jan Brüninghaus and Sigrid Brell-Cokcan (RWTH Aachen University, Chair of Individualized Building Production, Germany); Bernd Kühlenkötter (Ruhr-Universität Bochum, Lehrstuhl für Produktionssysteme (LPS), Germany)
- 16:30 [*Mixed Case Palletizing with Industrial Robots682*](#)
Christian Wurll (Swisslog Automation GmbH, Germany)
- 16:50 [*Automatic programming and control for robotic deburring688*](#)
Julian Ricardo Diaz Posada, Shivaram Kumar, Alexander Kuss, Ulrich Schneider and Manuel Drust (Fraunhofer IPA, Germany); Thomas Dietz (Fraunhofer Institute for Manufacturing Engineering and Automation (IPA), Germany); Alexander Verl (Stuttgart University, Institute for Control Engineering of Machine Tools, Germany)