

# Robert Krug | Curriculum Vitae



Drakenbergsgatan 47 – 70219 Örebro – Sweden  
☎ +46 (0) 734 237 296 • 📞 +46 (0) 19 30 3499  
📠 +46 (0) 19 30 3463 • ✉ robert.krug@oru.se  
🌐 <http://aass.oru.se/Research/mro/rtkg>  
Citizenship: Austrian • Date of birth: 12/07/1981

## Current Position

2014–present **Post-doctoral researcher**, AASS Research Center, Örebro University.

## Education

- 2009–2014 **PhD in Control Theory**, AASS Research Center, Örebro University.  
*Thesis topic:* “Optimization-based Robot Grasp Synthesis and Motion Control”.  
*Supervisors:* Prof. Achim J. Lilienthal and Dr. Dimitar N. Dimitrov.
- 2001–2009 **MSc in Mechatronics in Mechanical Engineering**, Graz University of Technology.  
*Thesis topic:* “Dev. of a Flexible Handling- and Assemblysystem for Short Cycle Times”.  
*Supervisor:* Prof. Michael Hofbauer.

## Teaching

- 2016 **Robot Control**<sup>1</sup>, Masters level course, Örebro University.  
Instructor
- 2011 **Sensors and Sensing**, Masters level course, Örebro University.  
TA for Dr. Boyko Iliev
- 2010–2011 **Artificial Intelligence in Mobile Robots**, Masters level course, Örebro University.  
TA for Prof. Alessandro Saffiotti
- 2005–2007 **Principles of Dynamics**, Undergraduate course, Graz University of Technology.  
TA for Prof. Andrés Kecskeméthy & Prof. Walter Sestro
- 2005–2007 **Principles of Statics**, Undergraduate course, Graz University of Technology.  
TA for Prof. Andrés Kecskeméthy & Prof. Walter Sestro

## Mentoring

**Jens Lundell, João Salvado**, PhD Co-Advisor, Örebro University.  
**Marcus A. Johansson, Chittaranjan Swaminathan**, Masters Advisor, Örebro University.

## Research Grants and Projects

- 2017–2020 **ILIAD**, *Intra-Logistics with Integrated Automatic Deployment*, EU H2020 project, Örebro University.  
*Role:* Involved in proposal writing; co-advising PhD students.

<sup>1</sup>Lecture notes available at: [http://www.aass.oru.se/Research/Learning/rkg\\_dir/course\\_rc\\_2016.html](http://www.aass.oru.se/Research/Learning/rkg_dir/course_rc_2016.html)

- 2017–2020 **AMICI**, *Augmented Interaction for Human-Robot Collaborative Tasks in Industrial Environments*, KKS HÖG project, Örebro University.  
*Role:* Involved in proposal writing; development of a whole-body controller for shared autonomy in telemanipulation.
- 2016–2017 **Re-LOAD**, *Robot-aided Long-term Autonomous Drilling*, Vinnova pre-study grant, Örebro University.  
*Role:* Involved in proposal writing; Overseeing the implementation and testing of force control schemes.
- 2015–2019 **AIR**, *Action and Intention Recognition in Human Interaction with Autonomous Systems*, KKS SIDUS project, Örebro University.  
*Role:* Contributing to robot intention communication via projection on shared floor space.
- 2015–2018 **SmokeBot**, *Mobile Robots with Novel Environmental Sensors for Inspection of Disaster Sites with Low Visibility*, EU H2020 project, Örebro University.  
*Role:* Integration of an optimization-based motion planning and control framework.
- 2014–2015 **APPLE**, *Autonomous Picking and Palletizing*, Concept study project supported by KUKA, Örebro University.  
*Role:* Involved in proposal writing; designing whole-body control schemes for simultaneous grasp planning and execution.
- 2011–2015 **RobLog**, *Cognitive Robot for Automation of Logistic Processes*, EU FP7 project, Örebro University.  
*Role:* Responsible for grasp planning; development of compliant low-level grasp controllers.
- 2009–2013 **HANDLE**, *Developmental Pathway towards Autonomy and Dexterity in Robot In-Hand Manipulation*, EU FP7 project, Örebro University.  
*Role:* Learning of primitive grasp controllers; synthesis of grasp families from demonstrations.

## Awards

- 2015 **KUKA Innovation Award Finalist.**  
 Leading member of team APPLE - Autonomous Picking and Palletizing
- 2013 **Best Paper Finalist, ICAR.**  
 “Representing Movement Primitives as Implicit Dynamical Systems learned from Multiple Demonstrations”

## Invited Talks

- 2017 **Integrated Perception and Control for Autonomous Manipulation**, MPI Tübingen.
- 2017 **A Control Perspective on Robot Motion Behavior Generation**, KTH Stockholm.
- 2015 **Grasp Envelopes for Constraint-based Robot Motion Planning and Control**, RSS – Workshop on Bridging the Gap between Data-driven and Analytical Physics-based Grasping and Manipulation.
- 2012 **Transfer of Grasp Families**, KTH Stockholm.

## Professional Activities

**Reviewer**, ICRA, IROS, Humanoids, CASE, SAC, RAM, T-RO, AURO, RAS.

**Workshop Organizer**, *Closed-loop Grasping and Manipulation: Challenges and Progress*, IROS 2016.

**Program Committee**, SAC 2017, SAC 2016.

**PhD Thesis Defense Committee**, *Yuquan Wang*, KTH Stockholm, 2016.

## Publications

Co-author of 4 journal articles and 18 peer reviewed conference/workshop publications. An up-to-date publication list is available on Google Scholar<sup>2</sup>.

Last update: February 27, 2017

- [1] R. Krug, Y. Bekiroglu, and M. A. Roa, "Grasp quality evaluation done right: How assumed contact force bounds affect wrench-based quality metrics," in *Proc. IEEE ICRA*, 2017, p. to appear.
- [2] R. Krug, A. J. Lilienthal, D. Kragic, and Y. Bekiroglu, "Analytic grasp success prediction with tactile feedback," in *Proc. IEEE ICRA*, 2016, pp. 165–171.
- [3] T. Stoyanov, R. Krug, R. Muthusamy, and V. Kyrki, "Grasp envelopes: Extracting constraints on gripper postures from online reconstructed 3D models," in *Proc. IEEE/RSJ IROS*, 2016, pp. 885–892.
- [4] T. Stoyanov, N. Vaskevicius, C. A. Mueller, T. Fromm, R. Krug, V. Tincani, R. Mojtahezadeh, S. Kunaschk, R. M. Ernits, D. R. Canelhas, M. Bonilla, S. Schwertfeger, M. Bonini, H. Halfar, K. Pathak, M. Rohde, G. Fantoni, A. Bicchi, A. Birk, A. J. Lilienthal, and W. Echelmeyer, "No more heavy lifting: Robotic solutions to the container unloading problem," *IEEE RAM*, vol. 23, no. 4, pp. 94–106, 2016.
- [5] R. Krug, T. Stoyanov, V. Tincani, H. Andreasson, R. Mosberger, G. Fantoni, and A. J. Lilienthal, "The next step in robot commissioning: Autonomous picking and palletizing," *IEEE RA-L*, vol. 1, no. 1, pp. 546–553, 2016.
- [6] R. T. Chadalavada, H. Andreasson, R. Krug, and A. J. Lilienthal, "Empirical evaluation of human trust in an expressive mobile robot," in *RSS – Workshop on Social Trust in Autonomous Robots*, 2016.
- [7] —, "That's on my mind! robot to human intention communication through on-board projection on shared floor space," in *Proc. ECMR*, 2015, pp. 1–6.
- [8] R. Krug, T. Stoyanov, and A. J. Lilienthal, "Grasp envelopes for constraint-based robot motion planning and control," in *RSS – Workshop on Bridging the Gap between Data-driven and Analytical Physics-based Grasping and Manipulation*, 2015.
- [9] V. Tincani, T. Stoyanov, R. Krug, M. Catalano, G. Grioli, A. J. Lilienthal, G. Fantoni, and A. Bicchi, "The grasp acquisition strategy of the Velvet II," in *IEEE ICRA – Workshop on Robotic Hands, Grasping, and Manipulation*, 2015.

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<sup>2</sup><https://scholar.google.se/citations?user=0ZNzz9gAAAAJ&hl=en>

- [10] V. Tincani, M. Catalano, G. Grioli, T. Stoyanov, R. Krug, A. J. Lilienthal, G. Fantoni, and A. Bicchi, "Sensitive active surfaces on the Velvet II dexterous gripper," in *IEEE ICRA – Workshop "Get in Touch!" Tactile & Force Sensing for Autonomous, Compliant, Intelligent Robots*, 2015.
- [11] R. Krug, T. Stoyanov, V. Tincani, H. Andreasson, R. Mosberger, G. Fantoni, A. Bicchi, and A. J. Lilienthal, "On using optimization-based control instead of path-planning for robot grasp motion generation," in *IEEE ICRA – Workshop on Robotic Hands, Grasping, and Manipulation*, 2015.
- [12] R. Krug, T. Stoyanov, M. Bonilla, V. Tincani, N. Vaskevicius, G. Fantoni, A. Birk, A. J. Lilienthal, and A. Bicchi, "Improving grasp robustness via in-hand manipulation with active surfaces," in *IEEE ICRA – Workshop on Autonomous Grasping and Manipulation: An Open Challenge*, 2015.
- [13] ———, "Velvet Fingers: Grasp planning and execution for an underactuated gripper with active surfaces," in *Proc. IEEE ICRA*, 2014, pp. 3669–3675.
- [14] R. Krug and D. N. Dimitrov, "Model predictive motion control based on generalized dynamical movement primitives," *JINT*, vol. 77, no. 1, pp. 17–35, 2014.
- [15] ———, "Representing movement primitives as implicit dynamical systems learned from multiple demonstrations," in *Proc. ICAR*, 2013, pp. 1–8.
- [16] K. Charusta, R. Krug, D. N. Dimitrov, and B. Iliev, "Independent contact regions based on a patch contact model," in *Proc. IEEE ICRA*, 2012, pp. 4162–4169.
- [17] K. Charusta, R. Krug, T. Stoyanov, D. N. Dimitrov, and B. Iliev, "Generation of independent contact regions on objects reconstructed from noisy real-world range data," in *Proc. IEEE ICRA*, 2012, pp. 1338–1344.
- [18] E. Berglund, B. Iliev, R. Palm, R. Krug, K. Charusta, and D. N. Dimitrov, "Mapping between different kinematic structures without absolute positioning during operation," *Electronics Letters*, vol. 48, no. 18, pp. 1110–1112, 2012.
- [19] R. Krug, D. N. Dimitrov, K. Charusta, and B. Iliev, "Prioritized independent contact regions for form closure grasps," in *Proc. IEEE/RSJ IROS*, 2011, pp. 1797–1803.
- [20] E. Berglund, B. Iliev, R. Palm, R. Krug, K. Charusta, and D. N. Dimitrov, "Mapping between different kinematic structures without absolute positioning," in *IEEE ICRA – Workshop on Autonomous Grasping*, 2011.
- [21] R. Krug, D. N. Dimitrov, K. Charusta, and B. Iliev, "On the efficient computation of independent contact regions for force closure grasps," in *Proc. IEEE/RSJ IROS*, 2010, pp. 586–591.