

Dr. Ruth Jennifer Schulz

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Cognitive scientist and robot enthusiast who believes that technology should work intuitively for people in the real world. Passionate about exploring the links between robotics, computer science, artificial intelligence, psychology, and neuroscience. Expertise in developing robot systems, and running interaction and navigation studies on real robots with the results published in international journals and conferences. Teaching roles have included robotics, artificial intelligence, and programming. Research interests include robot language, navigation, artificial intelligence, social robots, and human-robot interactions.

Professional Experience

- **Research Fellow**, Stuttgart University, *December 2016 – Present*
Explored human-robot interaction through the development of a robot system for performing collaborative table-top tasks with the results published in 2 papers presented at The 5th International Conference on Human-Agent Interaction (HAI 2017).
Co-lectured the university course “*Practical Course Robotics*” (2017 and 2018) and tutored the university course “*Introduction to Robotics*” (2017).
Supervised 4 Master's students.
- **Research Fellow**, Queensland University of Technology, *January 2014 – June 2016*
Post-doc on the Australian Research Council Discovery Project “*Human Cues for Robot Navigation*”.
Coordinated with Chief Investigators and PhD students to develop a system for robots to navigate through built environments using cues that humans use with the results published in 8 conference papers at national and international conferences.
Presented papers at The International Conference on Robotics and Automation (ICRA 2015) and the 28th Australasian Joint Conference on Artificial Intelligence (AI 2015).
Co-lectured the university course “*Microprocessors and Digital Systems*” (2015).
Supervised 1 PhD and 3 final year engineering students.
- **Lecturer**, Queensland University of Technology, *July 2013 – December 2013*
Organised the QUT SEF Showcases for final year students completing capstone projects in Engineering, IT, and Games.
Co-lectured the university course “*Introduction to Robotics*” (2013).
- **Research Scientist**, CSIRO, *January 2013 – June 2013*
Produced quality research and technical input for the “*Mobile Telepresence for Museums*” project as evidenced by CSIRO ICT Centre Teamwork Award 2013.
Presented a poster describing the mobile telepresence system at the HRI workshop at ICRA 2013.
- **Research Fellow**, The University of Queensland, *July 2008 – December 2012*
Post-doc in the “*Lingodroids*” project, which has the big picture goal of developing robots that can understand human language, with the results presented in 4 journal papers and 7 conference papers. [video](#) (over 88,000 views) [video](#) (over 14,000 views)
Lectured the university course “*Artificial Intelligence*” (2008-2012).
Supervised 4 honours and 3 summer research students.
Presented papers at ICRA 2011, ACRA 2010, and ALife 2010.
- **Robotics Tutor**, The University of Queensland, *February 2005 – December 2005*
Tutored introductory robotics to school students (year 5 to year 12).

- **Design Engineer**, EDM I Limited, *February 2004 – February 2005*
Provided usability recommendations for metering software.
Developed embedded software for a wireless metering device.
- **Research Assistant**, The University of Queensland, *December 2000 – January 2004*
Assisted with cognitive science projects, including investigations into evolutionary algorithms and the Baldwin effect (the result of interactions between learning and evolution), resulting in 2 conference papers.
Presented a poster at CogSci 2001.
- **Instructor**, Bai Rui Taekwon-Do, *February 2009 – July 2015*
Achieved 4th Degree Black Belt.
Awarded Black Belt of the Year in 2008 and Hajime Isomura Award for Self Control in 2011.

Education

- **Doctor of Philosophy in Computer Science**, The University of Queensland, *Completed 27/11/2008*
Thesis: *Spatial Language for Mobile Robots: The Formation and Generative Grounding of Toponyms*
- **Bachelor of Engineering (Electrical) with Honours Class I and Bachelor of Science (Computer Science)**, The University of Queensland, *Completed 8/12/2003*
Thesis: *Interface for an Automated Cocktail Maker*

Awards and Achievements

- Best Student Paper Award ACRA 2015: Talbot, B., Schulz, R., Upcroft, B., & Wyeth, G. (2015). Reasoning about natural language phrases for semantic goal driven exploration. *ACRA 2015, Australasian Conference on Robotics and Automation*, Australian National University, Canberra, A.C.T, 2-4 December 2015.
- CSIRO ICT Centre Teamwork Award 2013 as part of the Mobile Telepresence for Museums Project
- COSNet Overseas Travel Grant to attend Evolang, March 2008
- Valedictorian for the Faculty of Engineering, Physical Sciences and Architecture, School of Information Technology and Electrical Engineering, 2003

Skills

- Platforms – Windows, Linux, embedded (Atmel)
- Coding Languages – C, MATLAB, C++, Java
- Artificial Intelligence – Neural Networks, Search, Bayesian Networks, Decision Trees
- Interaction Design – Usability evaluation
- Middleware – Robot Operating System (OS), GLUT
- Robots – Pioneer 3 DX, Guiabot, PR2, Baxter
- Languages – English (Native), Norwegian (conversational), German (conversational)
- Techniques – Computer vision, localisation, SLAM

Publications

According to [Google Scholar](#) on 7/4/18: 31 publications, 215 citations, h-index = 8, i10-index = 7

- *Book Chapter*

Wyeth, G., Milford, M., Schulz, R., and Wiles, J. (2011). The RatSLAM project: Robot spatial navigation. In Jeffrey L. Krichmar and Hiroaki Wagatsuma (Ed.), *Neuromorphic and brain-based robots* (pp. 87-108) Cambridge, United Kingdom: Cambridge University Press.

- *Journal Papers*

Milford, M. & Schulz, R., (2014). Principles of goal-directed spatial robot navigation in biomimetic models. *Philosophical Transactions of the Royal Society B : Biological Sciences*, 369(1655), pp. 1-13.

Schulz, R., Wyeth, G., and Wiles, J., (2012). Beyond here-and-now: Extending shared physical experiences to shared conceptual experiences, *Adaptive Behavior*. 20(5), 360-387.

Heath, S., Schulz, R., Ball, D., and Wiles, J. (2012). Long summer days: Grounded learning of words for the uneven cycles of real world events, *IEEE Transactions on Autonomous Mental Development*. 4(3), 192-203.

Schulz, R., Wyeth, G., and Wiles, J. (2011). Lingodroids: Socially grounding place names in privately grounded cognitive maps. *Adaptive Behavior*, 19 6: 409-424.

Schulz, R., Wyeth, G., & Wiles, J. (2011). Are We There Yet? Grounding Temporal Concepts in Shared Journeys. *IEEE Transactions on Autonomous Mental Development*, 3(2), 163-175.

Milford, M., Schulz, R., Prasser, D., Wyeth, G., & Wiles, J. (2007). Learning spatial concepts from RatSLAM representations. *Robotics and Autonomous Systems - From Sensors to Human Spatial Concepts*, 55(5).

- *Conference Papers*

Schulz, R., Kratzer, P., & Toussaint, M. (2017) Building a bridge with a robot: A system for collaborative on-table task execution. *HAI 2017, 5th International Conference on Human Agent Interaction*. Bielefeld, Germany, October 2017.

Schulz, R. (2017) Collaborative robots learning spatial language for picking and placing objects on a table. *HAI 2017, 5th International Conference on Human Agent Interaction*. Bielefeld, Germany, October 2017.

Talbot, B., Lam, O., Schulz, R., Dayoub, F., Upcroft, B., & Wyeth, G. (2016) Find my office: Navigating real space from semantic descriptions. *ICRA 2016, International Conference on Robotics and Automation*, Stockholm, Sweden, May 2016.

Sunderhauf, N., Dayoub, F., McMahon, S., Talbot, B., Schulz, R., Corke, P., Wyeth, G., Upcroft, B., & Milford, M. (2016) Place categorization and semantic mapping on a mobile robot. *ICRA 2016, International Conference on Robotics and Automation*, Stockholm, Sweden, May 2016.

Lam, O., Dayoub, F., Schulz, R., & Corke, P. (2015) Automated topometric graph generation from floor plan analysis. *ACRA 2015, Australasian Conference on Robotics and Automation*, Australian National University, Canberra, A.C.T, December 2015.

Talbot, B., Schulz, R., Upcroft, B., & Wyeth, G. (2015). Reasoning about natural language phrases for semantic goal driven exploration. *ACRA 2015, Australasian Conference on Robotics and Automation*, Australian National University, Canberra, A.C.T, December 2015.

Hou, J., Schulz, R., Wyeth, G., & Nayak, R. (2015). Finding within-organisation spatial information on the web. In Maher, Michael & Thiebaut, Sylvie (Eds.) *28th Australasian Joint Conference on Artificial Intelligence (AI 2015)*, December 2015, Canberra, A.C.T.

Schulz, R., Talbot, B., Upcroft, B., & Wyeth, G. (2015). Constructing abstract maps from spatial descriptions for goal-directed exploration. *Robotics: Science and Systems 2015 Workshop on Model Learning for Human-Robot Communication*, Rome, Italy, July 2015.

Schulz, R., Talbot, B., Lam, O., Dayoub, F., Corke, P., Upcroft, B., & Wyeth, G., (2015). Robot navigation using human cues: A robot navigation system for symbolic goal-directed exploration, *ICRA 2015, International Conference on Robotics and Automation*, Seattle, USA, May 2015.

- Lam, O., Dayoub, F., Schulz, R., & Corke, P., (2014). Text recognition approaches for indoor robotics: a comparison, *ACRA 2014, Australasian Conference on Robotics and Automation*, Melbourne, Australia, December 2014.
- Heath, S., Ball, D., Schulz, R., and Wiles, J., (2013). Communication between Lingodroids with Different Cognitive Capabilities, *ICRA 2013, International Conference on Robotics and Automation*, Karlsruhe, Germany, May 2013.
- Schulz, R., Ward, B., Roberts, J., (2013). Interactions with a Museum Telepresence Robot, *ICRA 2013 Workshop Human Robot Interaction (HRI) for Assistance and Industrial Robots, Scientific Knowledge, Standards and Regulatory Framework. How do I design for the real world?*, Karlsruhe, Germany, May 2013.
- Heath, S., Schulz, R., Ball, D., and Wiles, J., (2012). Lingodroids: learning terms for time, *ICRA 2012, International Conference on Robotics and Automation*, Saint Paul, Minnesota, USA, May 2012.
- Schulz, R., Whittington, M., and Wiles, J., (2012). Language change in socially structured populations, In T. C. Scott-Phillips, M. Tamariz, E. A. Cartmill, and J. R. Hurford (Eds.), *The Evolution of Language: Proceedings of the 9th International Conference (EVOLANG9)*. Singapore: World Scientific Press.
- Schulz, R., Glover, A., Milford, M., Wyeth, G., & Wiles, J. (2011) Lingodroids: Studies in Spatial Cognition and Language, *ICRA 2011, International Conference on Robotics and Automation*, Shanghai, China, May 2011
- Schulz, R., Glover, A., Wyeth, G., & Wiles, J. (2010). Robots, communication, and language: An overview of the Lingodroid Project, in G. Wyeth and B. Upcroft (Eds), *Proceedings of the 2010 Australasian Conference on Robotics & Automation*, Brisbane, Australia, 2010.
- Glover, A., Schulz, R., Wyeth, G., & Wiles, J. (2010). Grounding action in visuo-haptic space using experience networks, in G. Wyeth and B. Upcroft (Eds), *Proceedings of the 2010 Australasian Conference on Robotics & Automation*, Brisbane, Australia, 2010.
- Schulz, R., Wyeth, G., & Wiles, J. (2010), Language change across generations for robots using cognitive maps. In H. Fellersmann, M. Dörr, M. M. Hanczyc, L. L. Laursen, S. Maurer, D. Merkle, P.-A. Monnard, K. Stoy and S. Rasmussen (Eds.), *Artificial Life XII: Proceedings of the Twelfth International Conference on the Synthesis and Simulation of Living Systems*. Cambridge, Massachusetts: The MIT Press.
- Schulz, R., Prasser, D., Stockwell, P., Wyeth, G., & Wiles, J. (2008). The formation, generative power, and evolution of toponyms: Grounding a spatial vocabulary in a cognitive map. In A. D. M. Smith, K. Smith & R. Ferrer i Cancho (Eds.), *The Evolution of Language: Proceedings of the 7th International Conference (EVOLANG7)* Singapore: World Scientific Press.
- Schulz, R., Milford, M. J., Prasser, D., Wyeth, G., & Wiles, J. (2006). *Learning spatial concepts from RatSLAM representations*. Paper presented at "From sensors to human spatial concepts" at the International Conference on Intelligent Robots and Systems, Beijing, China.
- Schulz, R., Stockwell, P., Wakabayashi, M., & Wiles, J. (2006). Towards a spatial language for mobile robots. In A. Cangelosi, A. D. M. Smith & K. Smith (Eds.), *The Evolution of Language: Proceedings of the 6th International Conference on the Evolution of Language*. Singapore: World Scientific Press.
- Schulz, R., Stockwell, P., Wakabayashi, M., & Wiles, J. (2006). Generalization in languages evolved for mobile robots. In L. M. Rocha, L. S. Yaeger, M. A. Bedau, D. Floreano, R. L. Goldstone & A. Vespignani (Eds.), *ALIFE X: Proceedings of the Tenth International Conference on the Simulation and Synthesis of Living Systems*. Cambridge, Massachusetts: The MIT Press.
- Wiles, J., Schulz, R., Bolland, S., Tonkes, B., & Hallinan, J. (2001). Selection procedures for module discovery: Exploring evolutionary algorithms for cognitive science. In J. D. Moore & K. Stenning (Eds), *Proceedings of the 23rd Annual Conference of the Cognitive Science Society (CogSci 2001)*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Wiles, J., Schulz, R., Hallinan, J., Bolland, S. & Tonkes, B. (2001). Probing the persistent question marks. In L. Spector, E. Goodman, A. Wu, W. B. Langdon, H.-M. Voigt, M. Gen, S. Sen, M. Dorigo, S. Pezeshk, M. Garzon & E. Burke (Eds), *Proceedings of the Genetic and Evolutionary Computation Conference (GECCO-2001)*. San Francisco, CA: Morgan Kaufmann Publishers.