

# CURRICULUM VITAE

NIKOLAUS CORRELL, PHD

## CONTACT INFORMATION

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## EDUCATION

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- 10/03–10/07 Dr. ès science, Computer and Communication Sciences, École Polytechnique Fédérale Lausanne (EPFL), Switzerland.  
Ph.D. Thesis: “Coordination Schemes for Distributed Boundary Coverage with a Swarm of Miniature Robots: Synthesis, Analysis and Experimental Validation”.
- 07/2005 EURON/GEOPLEX Summer School on Modeling and Control of Complex Dynamical Systems at the University of Bologna, Italy.
- 10/00–04/03 Dipl. Ing. ETH, Electrical Engineering, Eidgenössische Technische Hochschule Zürich (ETHZ), Switzerland.  
Master’s Thesis: “Collaborative Exploration and Coverage”, Collective Robotics Group, California Institute of Technology, Pasadena, CA, USA.
- 03/02–07/02 *Exchange Student*, Lund Tekniska Hogsköla (LTH), Lund, Sweden.  
Thesis: “6-DOF Visual Servoing Using the Lie group of Affine Transformations”, Institute of Automatic Control, LTH.
- 11/98–09/00 *Vordiplom*, Electrical Engineering, Technische Universität München (TUM), Munich, Germany.

## PROFESSIONAL EXPERIENCE (ACADEMIC INSTITUTIONS)

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- from 01/10 *Assistant Professor*, Department of Electrical and Computer Engineering, University of Colorado at Boulder (by courtesy).
- from 08/09 *Assistant Professor*, Computer Science Department, University of Colorado at Boulder.
- 11/08–08/09 *Post-doctoral associate*, Computer Science and Artificial Intelligence Laboratory, MIT.
- 11/07–10/08 *Post-doctoral fellow*, MIT CSAIL.

10/03–10/07	<i>Research assistant and PhD student</i> , Swarm-Intelligent Systems Group, EPFL.
05/03–09/03	<i>Research assistant</i> , Collective Robotics Group, Caltech.
07/01–08/01	<i>Undergraduate student assistant</i> , University Hospital Zurich, Clinic of Neonatology and Institute of Biomedical Engineering, ETHZ.
11/00–04/01	<i>Undergraduate student assistant</i> , Institute of Robotics, ETHZ.
06/99–10/00	<i>Undergraduate student assistant</i> , Laboratory of Electrical Physics, TUM.

## HONORS AND AWARDS

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*Finalist for NTF Best Paper Award* at the Int. Conf. on Intelligent Robots and Systems (IROS), St. Louis, MO, USA, 2009 (1698 papers).

*Best Paper Award* at the 10th Int. Conf. on Simulation of Adaptive Behavior (SAB), Osaka, Japan, 2008.

2nd place, ICRA 2008 Robot Contingency Challenge.

Post-doctoral fellowship for prospective researchers from the Swiss National Science Foundation.

Nominated for the 2008 EPFL best PhD-thesis award.

Gratification of the Dean, I&C School, EPFL for exceptional performance in 2007.

*Best Paper Award* at the 8th International Symposium on Distributed Autonomous Robotic Systems, Minneapolis, Minnesota, USA, 2006.

International Federation of Robotics Research *Student Travel Fellowship Award* at the 10th International Symposium on Experimental Robotics, Rio de Janeiro, Brazil, 2006, for the quality of the contribution and the presentation.

## SERVICE

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### EDITING

Guest Editor, Neural Computing and Applications, Springer Verlag. Special issue on Swarm Robotics (with Roderich Gross), to appear 2010.

Associate Editor, International Conference on Robotics and Automation, 2010.

### TECHNICAL PROGRAM CO-CHAIR

International Conference on Nano-Networks (NANO-NETS), Boston, 2008, 2009.

### SESSION CHAIR

Micro/Nano Robotic Applications track at the International Conference on Robotics and Automation (ICRA), 2008.

Poster Spotlight Session on “Evolution” and “Cognition, Emotion and Behaviour” at the International Conference on Simulation of Adaptive Behavior (SAB), 2008.

## PROGRAM COMMITTEE

Autonomous Agents and Multi-Agent Systems (AAMAS), 2010. Distributed Autonomous Robotic Systems (DARS), 2008. Simulation of Adaptive Behavior (SAB), 2008, 2010. IEEE Swarm-Intelligence Symposium (SIS), 2005.

## REVIEW

Swiss National Science Foundation, French Research Commission.

Autonomous Agents and Multi-Agent Systems (Springer), Intelligent Service Robotics (Springer), Interaction Studies (John Benjamins Publishing Company), Swarm-Intelligence (Springer Verlag), Robotica (Cambridge University Press), IEEE Robotics and Automation Magazine, IEEE Transactions on Robotics (IEEE press), Robotics and Autonomous Systems (Elsevier).

American Control Conference (ACC), International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS), IEEE Conference on Automation Science and Engineering (CASE), IEEE Conference on Decision and Control (CDC), IFRR Int. Conf. on Field and Service Robotics (FSR), IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE International Symposium on Industrial Electronics (ISIE).

## COMMUNITY SOFTWARE

Open-Source robotic platform “PrairieDog” for research and education.

Developer of *SwisTrack*, a tracking tool for multi-unit robotic and biological research. The software is platform independent and is currently being used by various researchers from the robotics and biology community, and continuously improved by researchers at DISAL EPFL. More information on <http://swistrack.sourceforge.net>.

## RESEARCH SUPERVISION

### PHD STUDENTS

Michael Otte (expected graduation 2011)

### MASTER’S THESIS SUPERVISION

Monish Sunku Prakhbar (Spring 2010 -), Patrick Amstutz (SS 2006-2007), Samuel Rutishauser (SS 2006-2007), Gregory Mermoud (WS 2005-2006), Amanda Prorok (WS 2005-2006).

### UNDERGRADUATE RESEARCH SUPERVISION / UROP

Brian McDonald (Fall 2009-), Joseph Maniaci (Fall 2009), Daniel Sutton (Senior thesis, 2009-2010), Nikos Arechiga (Summer 2009), Daniel Soltero (Summer 2009), Timothy Robertson (Summer 2009), Anna Derbakova (SS/Summer 2009), Justin Myers (Summer 2008), Jennifer French (Summer 2008), Adnan Zolj (Summer 2008), Anandh Swaminathan (Summer 2008), Samuel Rutishauser (WS 2005-2006), Amanda Prorok (SS 2004-2005), Daniel Calico Cañals (SS 2004-2005), Jonas Fritschy (WS 2004-2005), Sean Bronée (WS 2004-2005), Anne-Elisabeth Tran Qui (WS 2004-2005), Jonas Habegger (WS 2004-2005).

## TEACHING

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### CLASSES

- ST 2010 “Introduction to robotics”, Special topics in CS course (Boulder).
- WT 2009 “Multi-Robot Systems”, Special topics in CS course (Boulder).
- WT 2008 “The Distributed Robotics Garden”, undergraduate and graduate credits in MIT’s course 6 (EECS) with Prof. Daniela Rus.

### TEACHING ASSISTANT

- SS 2006–2007 *Teaching Assistant*, “Autonomous Robots” (doctoral school), EPFL, Prof. Dario Floreano, Prof. Aude Billard, Prof. Auke Jan Ijspeert, Prof. Alcherio Martinoli, and Prof. Roland Siegwart.
- WS 2006–2007 *Teaching Assistant*, “Swarm Intelligence” (master’s level), EPFL, Prof. Alcherio Martinoli.
- SS 2005–2006 *Teaching Assistant*, “Informatique II” (undergraduate level), EPFL, Dr. Djamila Sam-Haroud.
- WS 2004–2005 *Head Teaching Assistant*, “Swarm Intelligence” (master’s level), EPFL, Prof. Alcherio Martinoli.
- WS 2001–2002 *Teaching Assistant*, “Technische Informatik I” (undergraduate level), ETHZ, Prof. Bernhard Plattner.

## PUBLICATIONS

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### UNDER SUBMISSION

1. N. Correll, N. Arechiga, A. Bolger, M. Bollini, B. Charrow, A. Clayton, F. Dominguez, K. Donahue, S. Dyar, L. Johnson, H. Liu, A. Patrikalakis, T. Robertson, J. Smith, D. Soltero, M. Tanner, L. White, D. Rus. Indoor Robot Gardening: Design and Implementation. Submitted to *Intelligent Service Robotics*, Special Issue on Robotics in Agriculture.
2. N. Correll and A. Martinoli. Modeling Self-Organized Aggregation Dynamics. Submitted to *International Journal of Robotics Research*, Special Issue on Stochasticity in Robotics and Biological Systems.
3. A. Prorok, N. Correll and A. Martinoli. Multi-level Spatial Modeling for Swarm-Robotic Systems. Submitted to *International Journal of Robotics Research*, Special Issue on Stochasticity in Robotics and Biological Systems.
4. M. Otte and N. Correll. Any-Com Multi-Robot Navigation. Submitted to *Robotics: Science and Systems*, Zaragoza, Spain.

### PEER-REVIEWED JOURNAL ARTICLES

1. S. Rutishauser, N. Correll, and A. Martinoli. Collaborative Coverage using a Swarm of Networked Miniature Robots. *Robotics & Autonomous Systems*. 57(5):517-525, 2009.

2. P. Amstutz, N. Correll, and A. Martinoli. Distributed Boundary Coverage with a Team of Networked Miniature Robots using a Robust Market-Based Algorithm. *Annals of Mathematics and Artificial Intelligence*. Special Issue on Coverage, Exploration, and Search, Gal Kaminka and Amir Shapiro, editors, 52(2-4):307-333, 2009.
3. N. Correll and A. Martinoli. Towards Multi-Robot Inspection of Industrial Machinery — From Distributed Coverage Algorithms to Experiments with Miniature Robotic Swarms. *IEEE Robotics & Automation Magazine*. 16(1):103-112, 2008.
4. J. Halloy, G. Sempo, G. Caprari, C. Rivault, M. Asadpour, F. Tâche, I. Saïd, V. Durier, S. Canonge, J.M. Amé, C. Detrain, N. Correll, A. Martinoli, F. Mondada, R. Siegwart, and J.L. Deneubourg. Social integration of robots in groups of cockroaches to control self-organized choice. *Science*, Vol. 318, no. 5853, pp. 1155-1158, 2007.

#### EDITOR-REVIEWED JOURNAL ARTICLES

5. N. Correll and A. Martinoli. A Challenging Application in Swarm Robotics: The Autonomous Inspection of Complex Engineered Structures. *Swiss Society of Automatic Control Bulletin*, Peter Gruber, editor, Number 46, 2007. Invited paper.

#### BOOK REVIEWS

6. N. Correll. Invited book review for D. Milutinović and P. Lima, "Cells and Robots: Modeling and Control of Large-Size Agent Populations", Springer Tracts on Advanced Robotics 2007. *IEEE Control Systems Magazine*, Volume 28, Number 5, pages 140–141, October 2008.

#### PEER-REVIEWED CONFERENCE PAPERS

7. N. Correll, N. Arechiga, A. Bolger, M. Bollini, B. Charrow, A. Clayton, F. Dominguez, K. Donahue, S. Dyar, L. Johnson, H. Liu, A. Patrikalakis, T. Robertson, J. Smith, D. Soltero, M. Tanner, L. White, D. Rus. Building a Distributed Robot Garden. In IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), St. Louis, MO. To appear. *Nominated for Best Paper Award*.
8. J. Beal, N. Correll, L. Urbina and J. Bachrach. Behavior Modes for Randomized Robotic Coverage. In *Proceedings of the 2nd Int. Conf. on Robot Communication and Coordination (ROBOCOM)*, Odense, Denmark, 2009. To appear.
9. N. Correll, D. Rus, J. Bachrach and D. Vickery. Ad-hoc Wireless Network Coverage with Networked Robots that Cannot Localize. In *IEEE Int. Conf. on Robotics and Automation (ICRA)*, Kobe, Japan, to appear May 2009.
10. T. Lochmatter, P. Roudit, C. Cianci, N. Correll, J. Jacot and A. Martinoli. SwisTrack — A Flexible Open Source Tracking Software for Multi-Agent Systems. *International Conference on Intelligent Robots and Systems*, Nice, France, 2008.
11. N. Correll, M. Schwager and D. Rus. Social Control of Herd Animals by Integration of Artificially Controlled Congeners. *Proceedings of the Int. Conference on Simulation of Adaptive Behavior (SAB)*, Osaka, Japan, 2008. Springer Lecture Notes in Artificial Intelligence (LNAI) 5040, pages 437-447. *Best Paper Award*.
12. N. Correll. Parameter Estimation and Optimal Control of Swarm-Robotic Systems: A Case Study in Distributed Task Allocation. *IEEE Int. Conf. on Robotics and Automation (ICRA) 2008*.
13. N. Correll and A. Martinoli. Robust Distributed Coverage using a Swarm of Miniature Robots. *IEEE Int. Conf. on Robotics and Automation (ICRA)*, pp. 379–384, Rome, Italy, April 2007.

14. N. Correll, G. Sempo, Y. Lopez de Meneses, J. Halloy, J.-L. Deneubourg, and A. Martinoli. SwisTrack: A tracking tool for multi-unit robotic and biological research. In *IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*, pp. 2185–2191, Beijing, China, Oct. 2006.
15. N. Correll and A. Martinoli. Towards optimal control of self-organized robotic inspection systems. In *8th Int. IFAC Symp. on Robot Control (SYROCO)*, Bologna, Italy, September 2006.
16. N. Correll and A. Martinoli. System identification of self-organized robotic swarms. In *Int. Symp. on Distributed Autonomous Robotic Systems (DARS)*, pages 31–40, Minneapolis, MN, USA, 2006. Springer Distributed Autonomous Systems VII, Maria Gini and Richard Voyles, editors. *Best Paper Award*.
17. N. Correll and A. Martinoli. Comparing coordination schemes for miniature robotic swarms: A case study in boundary coverage of regular structures. In *Int. Symp. on Experimental Robotics (ISER)*, Rio de Janeiro, Brazil, July 2006. Springer Tracts in Advanced Robotics (STAR) (2008), Oussama Khatib, Vijay Kumar, and Daniela Rus, editors. *Student travel fellowship award*.
18. N. Correll and A. Martinoli. Modeling and analysis of beacon-based and beaconless policies for a swarm-intelligent inspection system. In *IEEE Int. Conf. on Robotics and Automation (ICRA)*, pp. 2488–2493, Barcelona, Spain, April 2005.
19. N. Correll and A. Martinoli. Modeling and optimization of a swarm-intelligent inspection system. In *Int. Symp. on Distributed Autonomous Robotic Systems (DARS)*, pages 369–378, Toulouse, France, 2004. Springer Distributed Autonomous Systems VI, 2007, Raja Chatila and Rachid Alami, editors.
20. N. Correll and A. Martinoli. Collective inspection of regular structures using a swarm of miniature robots. In *Int. Symp. on Experimental Robotics (ISER)*, pages 375–385, Singapore, June 2004. Springer Tracts in Advanced Robotics (STAR), Vol. 21, 2006, Oussama Khatib and Marcelo Ang Jr., editors.

#### PEER-REVIEWED WORKSHOP PAPERS

21. N. Correll and A. Martinoli. Modeling Self-Organized Aggregation in a Swarm of Miniature Robots. In *IEEE International Conference on Robotics and Automation Workshop on “Collective Behaviors inspired by Biological and Biochemical Systems”*, Rome, Italy, April, 2007.
22. N. Correll, C. Cianci, X. Raemy, and A. Martinoli. Self-Organized Embedded Sensor/Actuator Networks for “smart” Turbines. In *IEEE/RSJ International Conference on Intelligent Robots and Systems Workshop “Network Robot System: Toward intelligent robotic systems integrated with environments”*, Beijing, China, October 2006.

#### PEER-REVIEWED CONFERENCE VIDEOS AND DEMOS

23. H. Balakrishnan, N. Correll, J. Eriksson, S. Lim, S. Madden and D. Rus. PCP: The Personal Commute Portal. In *6th ACM Conference on Embedded Networked Sensor Systems (SenSys '08)*, Raleigh, NC, USA, November 2008.
24. N. Correll, G. Sempo, Y. Lopez de Meneses, J. Halloy, J.-L. Deneubourg, and A. Martinoli. SwisTrack: A tracking tool for multi-unit robotic and biological research. In *Proc. of the IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS)*, page 8, Beijing, China, October 2006.

#### THESES

25. N. Correll. Coordination Schemes for Distributed Boundary Coverage with a Swarm of Miniature Robots: Synthesis, Analysis and Experimental Validation. PhD Dissertation. École Polytechnique

- Fédérale Lausanne, 2007. *Nominated for best EPFL PhD thesis.*
26. N. Correll. Collaborative Exploration and Coverage. Master's Thesis, Collective Robotics Group, California Institute of Technology/Automatic Control Laboratory, Swiss Federal Institute of Technology, Zurich, 2003.
  27. N. Correll. 6-DOF Visual Servoing Using the Lie Group of Affine Transformations. Semester Project, ISRN LUTFD2/TFRT-5690-SE, June 2002, Department of Automatic Control, Lund Institute of Technology, Lund, Sweden.
  28. N. Correll. Semester Project, Modellbasierte Segmentierung von Maeuseknochen, Semester Project, Institute for Biomedical Engineering, Swiss Federal Institute of Technology Zuerich, 2002.

## TALKS

1. "Building a Robot Garden", Voyles Lab, University of Denver, September 24, 2009.
2. "Building a Robot Garden", HEMBI workshop, Media Laboratory, Massachusetts Institute of Technology, September 15, 2009.
3. "Networked Teams of Robots and Sensors: Theory and Practice", Media Laboratory, Massachusetts Institute of Technology, July 15, 2009.
4. "Networked Teams of Robots and Sensors: Theory and Practice", Department of Computer Science, University of Colorado at Boulder, April 9, 2009.
5. "Modeling and Design of Large-Scale Sensor-Actuator Networks", Workshop on Multi-Robot Control, Technical University Munich, Munich, Germany, February 18, 2008.
6. "Modeling and Design of Large-Scale Sensor-Actuator Networks", Fraunhofer Institute for Production Automation, Stuttgart, Germany, February 16, 2008.
7. "PolyHeal: Active Polymer Sutures for Emergency Response to Lacerations with Condition Monitoring", DARPA Conference on InfoChemistry: The Fusion of Information and Materials, Cambridge, October 16, 2008. *Runner-up from the Student/Post-Doc competition on the future of Polymers (with Ara Knaian).*
8. "Towards Inspection of Industrial Machinery with Miniature Robotic Swarms", Workshop on Nanosensors: Self-Organization and Swarm Robotics Third International Conference on Nano-Networks (Nano-Net 2008), Boston, September 14, 2008.
9. "Coordination Schemes for Distributed Boundary Coverage with a Swarm of Miniature Robots: Synthesis, Analysis and Experimental Validation", Self-Organizing Systems Research Group (Radhika Nagpal), Harvard University, Cambridge, MA, July 30, 2008.
10. "Distributed Robotics: From Science to Systems", Willow Garage, Menlo Park, CA, May 28, 2008.
11. "Comparing Coordination Schemes for Distributed Boundary Coverage: Synthesis, Analysis, and Experimental Validation", Informatik VI: Robotics and Embedded Systems, Technical University of Munich, Munich, Germany, October 16, 2007.
12. "Comparing Coordination Schemes for Distributed Boundary Coverage: Synthesis, Analysis, and Experimental Validation", Abteilung Bildverstehen, Institut für Parallele und Verteilte Systeme, Stuttgart University, Stuttgart, Germany, October 15, 2007.
13. "Distributed Boundary Coverage using a Swarm of Miniature Robots", Workshop on Autonomous Computing in Smart Environments, University of Fribourg, Switzerland, November 24, 2006.

14. “System Identification and Optimal Control of Swarm Robotic Systems”, Distributed Robotics Laboratory, Massachusetts Institute of Technology, Cambridge, MA, USA, July 19, 2006.
15. “SwisTrack: Measuring Individual Behaviour of Robots and Insects”, Université Libre de Bruxelles, Belgium, February 12, 2004.

## MEDIA COVERAGE AND PUBLIC APPEARANCE (SELECTION)

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### PRESS

1. “3 New Farm Bots Programmed to Pick, Plant, and Drive” by Erik Sofge, *Popular Mechanics*, September, 2009.
2. “Robogardner” by MIT News Staff, *MIT Technology Review*, May/June, 2009.
3. “I, robot - and gardener: MIT droid tend plants”, by Melissa Trujillo, Associated Press (worldwide syndication), April 10, 2009.
4. “In an Age of Robots, One to Clean the House? Still but a Dream” by Natalie Angier. *New York Times*, November 24, 2008.
5. “Swarm Theory”, by Peter Miller. *National Geographic*, July 2007, National Geographic Society, Washington, DC, USA.
6. “New SWIS Army - Developing collective intelligence”, by Bill Weaver. *Scientific Computing*, July 2006, Advantage Business Media, Rockaway, NJ, USA.
7. “L’intelligence collective des robots”, *Sciensationnel - Cerveau et Conscience*, No. 5. EPFL outreaching magazine for young scientists.

### FILM AND TELEVISION

1. “Robots are taking over the garden” by L. Clarizio, The American Institute of Physics and Ivanhoe Productions, broadcasted as a segment of “Discoveries and Breakthroughs Inside Science” on TV stations throughout the US.
2. “Super-Cockroach”, by Pascal Cuissot and Benjamin Turquet, 52min. International broadcast in various broad-public scientific programmings.
3. “Les robots cherchent la petite bte”, by Emmanuelle Jacquet, 2006. 5min, Tele Suisse Romande/Nuovo. Public broadcast in Switzerland and Belgium (TV5).
4. “Alice au pays des cafards / Wenn Kakerlaken Freunde werden”, by Jean-Pierre Gibrat, 2006. 52min, Trans Europe Film, ARTE France/Germany, CNRS Images/Media. Public broadcast in France and Germany.

### EXHIBITION

1. The inspection experiment was featured 10 days long running 20 robots for 10 hours a day at an exhibition “Consciences l’oeuvre” taking place in a museum in Lausanne during the Swiss wide festival “Science et Cite” 2005, organized every four years.