Alexandra (Alli) Nilles
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https://alli.nilles.info

EDUCATION

University of Illinois at Urbana-Champaign (UIUC) **2015 - 2020**

Degree: Ph.D. Candidate in Department of Computer Science. GPA 3.73/4.0
Thesis Title: *Designing Boundary Interactions for Simple Mobile Robots*
Advisor: Advisor: Dr. Steven M. LaValle

Colorado School of Mines (CSM) **2011 - 2015**

Degree: B.S. in Engineering Physics. GPA 3.93/4.0
Minor in Computational and Applied Mathematics
Minor in Public Affairs, from McBride Honors Program

PEER REVIEWED CONFERENCE PAPERS

- **A. Nilles**, A. Pervan, T. Berrueta, T. Murphey, S. M. LaValle. "Information Requirements of Collision-Based Micromanipulation," in the *14th Workshop on the Algorithmic Foundations of Robotics*, accepted, pending publication.
- M. Suomalainen, **A. Nilles**, S. M. LaValle. "Virtual Reality for Robots," in *IEEE Conference on Intelligent Robots and Systems (IROS)*, 2020.
- **A. Nilles**, J. Wasserman, A. Born, C. Horn, J. Born, S. M. LaValle. "A Hardware and Software Testbed for Underactuated Self-Assembling Robots," in the *IEEE International Symposium on Multi-Robot and Multi-Agent Systems,* 2019.
- **A. Nilles**, Y. Ren, I. Becerra, S. M. LaValle. "A Visibility-Based Approach to Computing Nondeterministic Bouncing Strategies," in the *13th Annual Workshop on the Algorithmic Foundations of Robotics*, 2018.
- **A. Nilles**, C. Gladish, M. Beckman, and A. LaViers. "Improv: Live Coding for Robot Motion Design," in *Proceedings of the 5th International Conference on Movement Computing*, ACM. 2018.
- **A. Nilles**, I. Becerra, and S. M. LaValle. "Periodic Trajectories of Mobile Robots," in *IEEE Conference on Intelligent Robots and Systems (IROS)*, 2017.

JOURNAL ARTICLES

- L. Bobadilla, **A. Nilles**, O. Sanchez, J. Czarnowski, K. Gossman, S. M. LaValle. "Controlling Wild Bodies Using Discrete Transition Systems," in progress submission to *MDPI Sensors Special Issue on Robot and Sensor Networks for Environmental Monitoring*, 2020.
- **A. Nilles**, Y. Ren, I. Becerra, S. M. LaValle. "A Visibility-Based Approach to Computing Nondeterministic Bouncing Strategies," in *The International Journal of Robotics Research*, expected 2020.
- A. LaViers, C. Cuan, C. Maguire, K. Bradley, K. B. Mata, **A. Nilles**, I. Vidrin, N. Chakraborty, M. Heimerdinger, U. Huzaifa, R. McNish, I. Pakrasi, and A. Zurawski. "Choreographic and Somatic Approaches for the Development of Expressive Robotic Systems," in *MDPI – Arts*, 2018.

INVITED TALKS

- "Towards Self-Assembly and Collective Manipulation with Extremely Underactuated Robots," NxR Group Meeting, Northwestern University. 1 March 2019.
- "Interesting Trajectories of Mobile Robots in Polygons," 2017 Midwest Robotics Workshop (MWRW). May 18 2017.
- "New Developments in Combinatorial Data Structures and Algorithms for Robotic Planning, Filtering and Design," UIUC Theory Seminar, October 3 2016.
- "Case Studies in Robotics Toolchains," UIUC Robotics Seminar, September 9 2016.

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OTHER PUBLICATIONS

- A. Q. Nilles, S. M. LaValle. "Robust Combinatorial Planning over Simple Boundary Interactions," in *Workshop on Robust Task & Motion Planning* at RSS 2019.
- A. Q. Nilles, D. A. Shell, J. M. O'Kane. "Robot Design: Formalisms, Representations, and the Role of the Designer," in *Workshop on the Autonomous Design of Robots* at ICRA 2018.
- A. Q. Nilles, I. Becerra, and S. M. LaValle. "Controllable Billiards: Characterizing the Paths of Simple Mobile Robots," poster in *Dynamics Days*, 2018.
- A. Q. Nilles, "Partially Coherent Transport: Computational Analysis and Overcoming Anderson Localization," 2014 CSM Physics poster session.
- A. Q. Nilles, "Teaching the Smart Grid: Why Data Management is Essential to the Future of Electricity," WISE Journal of Engineering and Public Policy.

AWARDS AND HONORS

- Mentor Stipend ($800), Illinois Scholars Undergraduate Research Program 2019
- Leung Student Venture Fund Award ($1000), UIUC ECE Department 2019
- IEEE MRS (Multi-Robot Systems) Travel Grant 2019
- Workshop on Algorithmic Foundations of Robotics (WAFR) Robot Guru Travel Grant 2018
- Saburo Muroga Endowed Fellowship ($5740), UIUC CS Department 2015-2016
- Physics Faculty Distinguished Graduate Award, CSM May 2015
- Leo Borasio Outstanding Junior Award, McBride Honors Program, CSM May 2014
- President's Undergraduate Scholarship, CSM 2011-2015

TEACHING EXPERIENCE

Teaching Assistant for Introduction to Robotics **Fall 2019**

- I was one of five teaching assistants for ECE 470: Introduction to Robotics, an upper level 90-student class with lecture and lab components, covering topics such as state estimation and filtering, forward and inverse kinematics, motion planning and controls.
- Supervised a 15-student lab section and gave two guest lectures for the full class.
- Developed homework and test problems using the online learning platform PrairieLearn.

Research Mentoring

- Oluwami Dosunmu-Ogunbi
  - mentored 2015-2016, worked on CAD, microcontrollers, IMU data collection and analysis
  - currently PhD student with Dr. Jessy Grizzle at University of Michigan
- Michael Zeng
  - collaborated on dynamical properties of bouncing robots in Fall 2016
  - currently software engineer at Assembled
- Samara (Yingying) Ren
  - co-author on one WAFR paper (and corresponding journal paper)
  - currently PhD student at EPFL with Dr. Mark Pauly
- Justin Wasserman
  - supervised senior thesis on "Controlling, Modeling, and Scaling Underactuated, Nondeterministic Robot Structures"
  - co-author on 2018 MRS paper
  - currently PhD student at UIUC with Dr. Girish Chowdary
- Austin Born, John Born, Chris Horn
  - From 2017-2019 I supervised this group of students on the design and control of weaselball-powered robot structures. Co-authors on 2018 MRS paper.
  - Chris and John are still at UIUC and Austin is a software developer at Omniex Holdings.

- Chase Gladish
  - supervised senior thesis on Improv, a live-coding platform for robot motion
  - co-author on 2018 MOCO paper
  - currently a Senior Software Engineer at Mastery Logistics
- Jordan Parker
  - worked with Jordan in 2018 on Improv when she was a freshman
  - connected Jordan with the RAD lab at UIUC where she continued robotics research
- Emily Hall and Max Altman
  - I supervised Emily and Max on their 2019-2020 ISUR undergraduate research project (a robotic pen) while they were sophomores

Colorado School of Mines Math Learning Center

Description: Tutored five hours a week for all classes in Math department. Primarily calculus, differential equations, and linear algebra.
Dates: Jan 2015 - May 2015

North American Network of Science Labs Online (NANSLO)

Description: Developed, monitored, and troubleshot remote-controlled robotic physics, chemistry, and biology experiments for college students in online classes. Served as a TA and equipment technician while classes were running.
Dates: Feb 2012 - May 2014

PROFESSIONAL ACTIVITIES

- President of Computer Science Graduate Students Organization (2017 - 2018).
  - Organized social events, communicated with department administration about graduate student needs, assisted in organizing annual prospective PhD student visit weekend.
- Reviewer for IROS '17, '18, '19, '20; ICRA '18, '19, '20; EAAI '17; CGTA '19
- Program Committee Member for MRS '19
- Co-organizer for 2017 Robotic Science and Systems (RSS) full day workshop, "Minimality and Trade-offs in Automated Robot Design." July 16 2017.
  - Recruited and communicated with speakers, helped develop materials (The Robot Design Game, http://robot-design.org/), facilitated workshop and discussions.
- Head of student committee organizing an internal Robotics@UIUC seminar (Fall 2016).
  - Recruited student speakers, advertised talks, maintained wiki.

OUTREACH AND DIVERSITY SERVICE

- 2019-2020: Mentor for Illinois Scholars Undergraduate Research (ISUR) Program. Supervised two URM undergraduate students building a robotic pen.
- 2019: WAFR Robot Guru Mentor - six month remote mentorship of undergraduates interested in robotics research
- 2014: Founding member of Equality Through Awareness (ETA) at CSM, a group promoting diversity in STEM through discussion, mentoring, and invited speakers.
  - facilitated weekly group discussions on articles and topics relevant to underrepresented minorities
  - In 2018, ETA was awarded the Martin Luther King Jr. Recognition Award from CSM
- 2012-2015: Society of Physics Students - participated in outreach events such as interactive physics demonstrations at local elementary and middle schools.

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OTHER EMPLOYMENT

Petronics internship: Development of small, agile mobile robot

Description: Worked closely with engineers to develop hardware and software for their mobile platform. Configured a ROS server and added a wifi module to the robot to stream data through ROS. Analyzed the resulting data using Python, to compare streaming pose estimates from the robot with a ground truth from a motion capture system (also ROS-integrated). Analyzed how the robot slipped on different surfaces to help improve low-level controllers.

Dates: May 2016 - August 2016

Complexity Sciences Center, UC Davis

Description: NSF REU with Dr. Jim Crutchfield. I successfully implemented an information-theoretic learning algorithm for exploratory robots with limited sensing capabilities. I also researched ways to include more memory in the learning algorithm.

Dates: June - Aug 2014

Institute of Electrical and Electronics Engineers (IEEE)

Description: Washington Internships for Students of Engineering (WISE) program: researched smart grid data management and policy alternatives; published an overview and policy recommendation in the *WISE Journal of Engineering and Public Policy*.

Dates: June - Aug 2013

REFERENCES

- Professor Steven M. Lavalle
  Center for Ubiquitous Computing
  University of Oulu, Oulu, Finland
  steven.lavalle@oulu.fi
  +358 294 482807
- Professor Amy LaViers
  Department of Mechanical Science and Engineering
  University of Illinois at Urbana-Champaign, USA
  alaviers@illinois.edu
- Professor Todd Murphey
  Department of Mechanical Engineering
  Center for Robotics and Biosystems
  Northwestern University, Evanston, Illinois, USA
  t-murphey@northwestern.edu
  (847) 467 1041
- Professor Nancy Amato
  Department of Computer Science
  University of Illinois at Urbana-Champaign, USA
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  (217) 333 3426
- Professor Sayan Mitra
  Department of Electrical and Computer Engineering
  Coordinated Science Laboratory
  Affiliate Professor, Department of Computer Science

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