Annalisa Taylor

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Education

Northwestern University, Ph.D. in Mechanical Engineering, expected 2025
Advisor: Todd D. Murphey

Northwestern University, M.S. in Mechanical Engineering, 2022
Thesis: Ergodic specifications for exploration in robotic swarms
Advisor: Todd D. Murphey

Stanford University, B.S. in Mechanical Engineering, 2017

Experience

Center for Robotics and Biosystems

Ph.D. Candidate, Northwestern University

Skills: Python, Robot Operating System (ROS)

***NSF Future Manufacturing,* Micropatterning with Mobile Robots** **2022-2025**

- Algorithm: Developed a density-based control algorithm enabling a palm-sized mobile robot to convert target images into high-resolution micro-patterns by specifying feature density rather than precise feature placement.
- Experiments: Conducted automated surface patterning trials demonstrating sub-millimeter precision over meter-scale surfaces; validated control over surface friction via spatial indentation density.
- Responsibility: Led system integration and implementation of robot control pipeline, contributing to novel, low-cost manufacturing strategies for functional surface engineering.

Safe Coverage for Heterogeneous Multi-Robot Systems **2020-2025**

- Safe Coverage Algorithm: Developed a decentralized control algorithm for heterogeneous multi-robot systems with formal safety guarantees, enabling up to 100 agents to collaboratively navigate dynamic environments without requiring persistent connectivity.
- Communication Analysis: Demonstrated empirically that performance with sparse, dynamic communication networks rivals that of fully connected systems, showing that connectivity constraints can be relaxed through control design.

***DARPA OFFset Swarm-enabled Tactics,* Safe Coverage for Multi-robot Systems** **2018-2023**

- Field Test: Validated user-responsive swarm control using ergodic coverage and real-time reallocation in DARPA OFFSET field experiments, integrating ground robot
- Communication Analysis, activity, or quantified result #3

The Boeing Company

Structures Design Engineer **2017-2018**

- Factory Liaison
- Outboard Trailing Edge Flap Design

Publications

- **Taylor, Annalisa T.**, Thomas A. Berrueta, Allison Pinosky, Todd D. Murphey. 'Safe Coverage for Heterogeneous Systems With Limited Connectivity'. IEEE Robotics and Automation Letters, IEEE, 2024.
- **Taylor, Annalisa T.**, Thomas A. Berrueta, and Todd D. Murphey. 'Active Learning in Robotics: A Review of Control Principles'. Mechatronics, vol. 77, Pergamon, 2021, p. 102576.
- **Taylor, Annalisa T.**, Malachi Landis, Yaoke Wang, Ping Guo, Todd D. Murphey. 'Image to Patterning: Density-Specified Patterning of Micro-Structured Surfaces with a Mobile Robot'. 2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE, 2024, pp. 2264–2270.
- Ahalya Prabhakar, Ian Abraham, **Annalisa T. Taylor**, Millicent Schlafly, Katarina Popovic, Giovani Diniz, Brendan Teich, Borislava Simidchieva, Shane Clark, Todd D. Murphey, 'Ergodic Specifications for Flexible Swarm Control: From User Commands to Persistent Adaptation'. Robotics: Science and Systems, 2020.
- Melisa Orta Martinez, Tania K. Morimoto, **Annalisa T. Taylor**, Aaron C. Barron, J.D. Akzl Pultorak, Jeanny Wang, Agnes Calasanz-Kaiser, Richard Lee Davis, Paulo Blikstein, Allison M. Okamura, '3-D Printed Haptic Devices for Educational Applications'. 2016 IEEE Haptics Symposium (HAPTICS), pp. 126–133.
- Malachi Landis, Muye Jia, **Annalisa T. Taylor**, Todd D. Murphey, Ping Guo, 'Large-Scale Functional Patterning Using Mobile Robot Swarms and Ergodic Control'. CIRP Annals, Elsevier, 2025.