Aditya Bidwai

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Education

University of Minnesota Twin Cities — *Minneapolis, MN*
Master of Science, Robotics — *Sept '24 – May '26 (expected)*

Birla Institute of Technology and Science, Pilani (BITS-Pilani) — *Goa, India*
Bachelor of Engineering, Electronics and Communication — *Aug '18 – May '22*

Experience

Komatsu — *Milwaukee, WI*
Automation Engineering Intern — *June '25 – Aug '25*

- Added automatic calibration to a model shovel using limit switches and a microcontroller; made demo fully autonomous and removed need for manual setup in the public display area
- Interfaced gas pedal and steering wheel with a Pixhawk-controlled model truck using DACs; replaced RC input with more intuitive human controls (gas pedals and steering wheel) for demos

OptimalX Group, University of Minnesota Twin Cities — *Minneapolis, MN*
Graduate Research Assistant. **Advisor:** Prof. Yue Yu — *Jan '25 – May '25*

- Designing uncertainty-aware motion planning algorithms for active sensing in a multi-agent scenario using POMDPs
- Developing multi-agent trajectory optimization algorithms for UAV-UGV collaboration in large environment exploration

MARMot Lab, National University of Singapore — *Singapore*
Research Engineer (full-time). **Advisor:** Prof. Guillaume Sartoretti — *Dec '22 – Aug '24*

- Developed active perception algorithms for autonomous exploration (and efficient SLAM) in GPS-denied, resource-constrained environments, focusing on omnidirectional legged robots for single-pass inspection settings **(paper)**
- Contributed to a solution of Multi-Robot Task Allocation problem by dynamic coalition formations using reinforcement learning, yielding 100x faster solutions than exact solvers. Published at **ICRA '24 (paper)**

Research Intern — *Jan '22 – Sept '22*

- Designed and conducted real-robot experiments for stable online real-time gait transitions using a keyframe-based central pattern generator (CPG) algorithm for legged mobile manipulation. Published at **CDC '22 (video)**
- Implemented bio-inspired workspace-CPG locomotion controller on a hexapod resulting in stable and directed vision **(video)**
- Conducted an in-depth review analysis on object manipulation techniques by legged robots. Published in **Frontiers (paper)**

Technical Skills

Programming	*Advanced* {C, C++, Python}, *Intermediate* {MATLAB, Bash}
Tools & Frameworks	Git, Docker, **Deep Learning** (PyTorch, OpenCV, Open3D), **Robotics** (ROS, ROS2, MoveIt!, PX4)
Simulators	NVIDIA Isaac Sim, Gazebo, PyBullet, Gym, Softgym, PyFlex, Simulink

Selected Projects

Clothbot - Cloth Manipulation using Self Supervised Value Network (poster, web) — *Sept '24 – Dec '24*

- Implementation of paper 'FlingBot: The Unreasonable Effectiveness of Dynamic Manipulations for Cloth Unfolding'
- Developed a self-supervised value network policy using spatial action maps for dynamic cloth unfolding on a dual UR5
- Achieved 95% coverage on rectangular cloths and 87.68% on unseen garments (T-shirts) with zero-shot sim-to-real transfer

Workspace CPG controller for stable direction vision in legged locomotion — *Jan '22 – Sept '22*

- Bio-inspired locomotion controller for legged robots based on central pattern generators (CPG)
- Developed a heading control system for stable vision during omnidirectional locomotion (gaze tracking)
- Validated the approach on an 18 degree-of-freedom Hebi Daisy hexapod robot **(video)**

Flying Ad-hoc Network Simulator for multi-UAV exploration (code) — *Aug '20 – Aug '22*

- Developed a co-simulation platform integrating NS3 and Gazebo through ROS for testing multi-UAV swarm tasks
- Implemented UAV swarm motion planning and analyzed network metrics like PDR, hop-by-hop, and end-to-end delay
- Simulated a wildfire rescue UAV swarm (PX4 SITL and ROS) for surveillance application. Published in **ACM LANC '22**

Kratos: Mars Rover for University Rover Challenge (code) — *Aug '19 – Apr '21*

- Integrated electronics (actuators, sensors, microcontrollers) with software control algorithms to control the rover
- Designed trajectory generation and tracking (PID) controllers for the manipulation and locomotion systems
- Managed and mentored a team of 10 undergraduate students as the lead of arm/drive control subsystem
- Secured an international rank of 19 in the URC 2022 competition held in Utah (in the first attempt)

Publications

- Dai, W., **Bidwai, A.**, & Sartoretti, G. (2024). *Dynamic Coalition Formation and Routing for Multirobot Task Allocation via Reinforcement Learning*. Published at **IEEE ICRA 2024**. **(paper)**
- Gong, Y., Sun, G., Nair, A., **Bidwai, A.**, Cs, R., Grezmak, J., ... Daltorio, K. A. (2023). *Legged robots for object manipulation: A review*. Published in **Frontiers in Mechanical Engineering**. **(paper)**
- Dhongdi, S., Tahiliani, M., Mehta, O., Dharmadhikari, M., Agrawal, V., & **Bidwai, A.** (2022). *FANS: flying ad-hoc network simulator*. Published at **2022 ACM LANC** (Latin America Networking Conference). **(paper)**