

HIMANI SINHMAR

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EDUCATION

Ph.D. Advisor: Prof. [Hadas Kress-Gazit](#), Mechanical and Aerospace Engineering, Cornell University (2019 - 2024)
Specialization in Dynamics, Controls and Robotics, Minor in Computer Science CPGA: 3.9/4.0

Bachelor and Master of Technology Indian Institute of Technology Bombay (2014 - 2019)
Specialization in System and Controls, Major in Aerospace Engineering, Minor in Physics CPGA: 8.7/10

RESEARCH FOCUS AND SKILLS

My research focuses on developing verifiable-safe motion planners and controllers for robotic systems with resource-efficient hardware to tackle the practical limitations inherent in the real world. I achieve real-time execution by co-designing the onboard hardware requirements and the control algorithm for a robotic system. I have implemented these strategies on physical platforms such as mobile manipulator [Stretch Robot](#), UAV [Crazyflie 2.1](#), mobile robots [iRobot Create](#), and [Vectors](#).

Research Interests: Motion Planning, Robot Manipulation, Dynamics and Control, Autonomous Mobile Robots
Programming Languages & Tools: C++, Python, MATLAB, C#, Unity Game engine, ROS, ANSYS, SolidWorks

PEER-REVIEWED PUBLICATIONS

6. **Himani Sinhmar**, Hadas Kress-Gazit, *Decentralized Control of Minimalistic Robotic Swarms For Guaranteed Encapsulation Behavior*, [\[Paper\]](#) International Conference on Intelligent Robots and Systems (IROS 2022)
5. **Himani Sinhmar**, Hadas Kress-Gazit, *Guaranteed Encapsulation of Targets with Unknown Motion by a Minimalist Robotic Swarm*, [\[Paper\]](#) under revised review for Transactions on Robotics, (TRO 2023)
4. **Himani Sinhmar**, Marcus Greiff, Stefano Di Cairano *Practical and Safe Navigation Function Based Motion Planning of UAVs*, under review in International Conference on Robotics and Automation, (ICRA 2024)
3. **Himani Sinhmar**, Srikant Sukumar, *Distributed model independent algorithm for spacecraft synchronization under relative measurement bias* [\[Paper\]](#), 5th CEAS Conference on Guidance, Navigation and Control, (EuroGNC 19)
2. **Himani Sinhmar**, Vinod Kumar, *Relative Autonomous Navigation Without Communication Between Spacecraft Using Line of Sight Measurements* [\[Paper\]](#) IEEE/CSAA Guidance, Navigation and Control Conference, August 2018
1. Pallavi Sinha, Srikant Sukumar, **Himani Sinhmar**, *Consensus of networked double integrator systems under sensor bias*, [\[Paper\]](#) International Journal of Adaptive Control and Signal Processing

PROFESSIONAL AND RESEARCH EXPERIENCE

Practical and Safe Motion Planning of UAVs (May'23 - Aug'23)

Research Intern with [Dr. Marcus Greiff](#), Mitsubishi Electric Research Labs (MERL)

Developed safe motion planners for real-time navigation of [constrained UAVs](#) in cluttered polyhedral environments

Learning for Task Allocation and Motion Planning [\[github\]](#) (Jan'23 - May'23)

Project with Prof. [Sanjiban Choudhury](#), Cornell University

Developed imitation learning policies for automated task allocation and execution in heterogeneous multi-robot teams

Task and Motion Planner for Robot Manipulation [\[github\]](#) (Jan'22 - May'22)

Project with Prof. [Tapomayukh Bhattacharjee](#), Cornell University

Developed & implemented a reactive planner to satisfy a high level task in a dynamic environment on **Stretch Robot**

Motion Planning, Localization, and Mapping for iRobot Create [\[github\]](#) (Jan'20 - May'20)

Project with Prof. [Hadas Kress-Gazit](#), Cornell University

Implemented SLAM, and planning algorithms on **iRobot Create** for goal-navigation with collision avoidance

Cooperative Control Under Bias in Measurements (May'18 - May'19)

Thesis with Prof. [Srikant Sukumar](#), IIT Bombay, Received **Institute Undergraduate Research Award**

Created a provable controller for a multi-agent system to track a time-varying trajectory under unknown sensor bias

Control and Simulation Design for a Morphing Robot (Aug'19 - Aug'21)

Advisor Prof. [Hadas Kress-Gazit](#), Cornell University

Created a physics-based simulator in *Unity* for synthesis of optimal locomotion gaits for shape-shifting origami robot