HIMANI SINHMAR

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525 Upson Hall, Cornell University, Ithaca, NY, 14850

EDUCATION

PhD Mechanical and Aerospace Engineering, Cornell University, Ithaca, NY, USA   (2019-Present)
- Advisor: Prof. Hadas Kress-Gazit
- Major in Robotics and Minor in Computer Science

Bachelor & Master of Technology, Indian Institute of Technology Bombay, India   (2014-2019)
- Major in Aerospace Engineering and Minor in Physics • CGPA: 8.7/10

RESEARCH INTERESTS

Autonomy, Task and Motion planning, Dynamics and Control, Swarm Robotics

PEER-REVIEWED PUBLICATIONS

- **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
- **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)
- **Himani Sinhmar**, Hadas Kress-Gazit, *Decentralized Control of Minimalistic Robotic Swarms For Guaranteed Encapsulation Behavior* [Under Review]
  International Conference on Intelligent Robots and Systems (IROS 2022)

TECHNICAL SKILLS

- **Programming Languages**: C++, Python, C#, MATLAB, Mathematica
- **Softwares**: Unity Game engine, Robot Operating System (ROS), ANSYS, SolidWorks, AutoCAD

RESEARCH EXPERIENCE

- **Decentralized Control for Swarm of Minimalistic Robots**   (Mar'21 - present)
  Thesis Project with Prof. Hadas Kress-Gazit, Cornell University
  Developed a decentralized control algorithm that guarantees the emergence of the complex desired swarm behavior in the presence of sensor noise for robots which have no memory, no localization ability, and no knowledge of the relative locations of their neighbors.
- **Micron-scale Morphing Soft Robots for Encapsulating Biological Systems**   (Nov'19 - present)
  Thesis Project with Prof. Hadas Kress-Gazit, Cornell University
  Created a physics-based simulator using Unity game engine for control synthesis of optimal gaits for a micrometer-sized metamaterial-based sheet robots (MetaBots) that could form 3D surfaces from 2D actuation patterns, cycle among different shapes, and locomote
- **Tool- and Skill- Based Robot Manipulation Task and Motion Planner**   (Jan'22 - May'22)
  Short term Project with Prof. Tapomayukh Bhattacharjee, Cornell University
  Developed a reactive planner that, given a high-level task specification and object affordances, automatically generates a sequence of motion primitives to satisfy the task in a dynamic environment.
- **Simultaneous Localization and Motion Planning (SLAM) for iRobot Create**   (Jan'20 - May'20)
  Short term Project with Prof. Hadas Kress-Gazit, Cornell University
  Executed SLAM algorithm capable of navigating to the given goal point while avoiding collisions with both dynamic and static obstacles.
- **Cooperative Control Under Bias in Measurements**   (May'18-May'19)
  Master's thesis with Prof. Srikant Sukumar, IIT Bombay
  Developed a Lyapunov based decentralized control algorithm that ensures a multi-agent system tracks a time-varying trajectory in presence of an unknown sensor bias in measurements.
- **Autonomous Navigation for Spacecraft Rendezvous**   (May'17 - Dec'17)
  Research Co-op with Control Dynamics & Simulations Group, ISRO
  Developed a novel algorithm for relative autonomous navigation without communication between spacecraft in the event of gyro failures or communication eruption using only line of sight measurements.
- **In-flight IMU Alignment of a Store Dropped from Aircraft**   (May'18 - Aug'18)
  Research Intern with Prof. Aditya Paranjape, Imperial College of London
  Formulated, developed, and tested a real-time algorithm for in-flight store IMU alignment capable of working with limited and near-minimal sensor information.

NOTABLE ACHIEVEMENTS

- Chaired a session on Navigation Technology in 2018 IEEE/CSAA GNC conference held in Xiamen, China
- Awarded the Institute Undergraduate Research Award for exemplary Bachelor's thesis
- Graduate Teaching Assistant for **Autonomous Mobile Robots** at Cornell University