Himani Sinhmar

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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

• I love to work on the unsolved problems in the domain of autonomous vehicles, minimal field robotics, motion planning, and learning. Currently, I am developing provable control algorithms for simple, robust, and reliable swarm robots that achieve task completion with minimal information and restricted individual capabilities.
• In addition to this, I am collaborating with Cohen Group, Apsel Lab and Laboratory for Molecular engineering to synthesize autonomous micron-scale morphing robots for encapsulating biological systems. These tiny robots would have the ability to be injected into the patient and stop the tumors in their tracks when surgery is not an option.

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]
  5^{th} 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]
  IEEE Robotics and Automation Letters, October 2021

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
- Recipient of INSPIRE scholarship for being in the top 1% in Senior Secondary Examination

Research Experience

- **Simultaneous Localization and Motion Planning (SLAM)** (Jan'20-May'20)
  Short term Project with Prof. Hadas Kress-Gazit, Cornell University
  Executed SLAM algorithm on iRobot's Roomba robot to navigate 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 relative position 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.
- **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.

Responsibilities

- Graduate Teaching Assistant: **Autonomous Mobile Robots**, at Cornell University (Spring 2021)
- Graduate Teaching Assistant: Dynamics and Control, Spaceflight Mechanics, at IIT Bombay (2018-19)
- Chief Editor for department newsletter Lift-Off (2016-17)

Skills and Coursework

- **Control & Robotics**: Autonomous Mobile Robots, Machine learning, Non-linear & Applied Dynamics, State Estimation: Theory & Applications, Multivariable Control, Adaptive Control, Optimal Control, Flight Dynamics, Navigation and Guidance, Data Analysis and Interpretation, Linear Algebra
- **Programming Languages**: C++, Python, C#, MATLAB, Maple, Mathematica, R, LaTeX
- **Softwares**: Unity Game engine, Robot Operating System (ROS), ANSYS, SolidWorks, AutoCAD