GAURAV MISRA

CONTACT INFORMATION

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TECHNICAL INTERESTS

Aerospace systems, Robotics, Nonlinear control, Constrained optimization, Machine learning

COMPUTER SKILLS

MATLAB, Simulink, C++, Python, Yalmip, AMPL, NumPy, SciPy, Scikit-learn

EDUCATION

Rutgers, The State University of New Jersey, New Brunswick, NJ, USA

Doctor of Philosophy, Mechanical and Aerospace Engineering, October 2019

- Thesis Topic: *Tractable optimization based control and learning for space-robotic systems.*
- Advisor: Prof. Xiaoli Bai

New Mexico State University, Las Cruces, NM, USA

Master of Science, Aerospace Engineering, May 2015

- Thesis Topic: *Dynamics and control of rigid body spacecraft near small solar system bodies*
- Advisor: Prof. Amit Sanyal

Birla Institute of Technology and Science, Pilani, India

Bachelor of Engineering (Honors), Electronics and Instrumentation, July 2013

RESEARCH EXPERIENCE

Graduate Research Assistant Aug 2016 to Present
Dept. of Mechanical and Aerospace Engineering, Rutgers University

- Convex optimization based trajectory planning technique for free-floating space robots.
- State-feedback and output-feedback stochastic model predictive control (MPC) based controllers for flight control in turbulence.
- Sum-of-squares programming based framework for synthesis of disturbance observer based controllers.

Graduate Research Assistant Jan 2014 to May 2015
Dept. of Mechanical and Aerospace Engineering, New Mexico State University

- Coupled orbit-attitude dynamics and controllability of spacecraft near small solar system bodies, and its implications on spacecraft proximity operations.

Research Intern Jan 2013 to June 2013
IMCCE, Observatoire de Paris, France
Topic: Trajectory optimization and control of aerospace vehicles
Supervisor: Florent Deleflie

Bachelor Thesis Student July 2012 to Dec 2012
French Space Agency (CNES), Toulouse, France
Topic : Modeling of Yarkovsky effect for numerical propagation of orbital trajectories.
Supervisor: Jean-Yves Prado

Summer Research Intern May 2011 to July 2011
German Aerospace Center (DLR), Bremen, Germany
Topic : Computational analysis for spacecraft missions to Near Earth Asteroids
Supervisor: Dominik Quantius

Publications under review

1. **Misra, G.**, Bai, X. "Disturbance Estimation and Rejection for Aircraft Glideslope Regulation in Turbulence : A Matrix SOS Approach", *IEEE American Control Conference (ACC), Denver, 2020.*
2. **Misra, G.**, Bai, X. "Robust Disturbance Observer based Control for Relative Attitude Tracking using Sum-of-squares Programming", *Journal of Guidance, Control, and Dynamics*

Journal Publications

1. Wang, L., **Misra, G.**, and Bai, X. "A K Nearest Neighborhood Based Wind Estimation for Rotary-Wing VTOL UAVs." *Drones*, 3, 31 (2019).
2. **Misra, G.**, Bai, X. "Output-feedback Stochastic Model Predictive Control for Glideslope Control during Aircraft Carrier Landing." *Journal of Guidance, Control, and Dynamics*, Vol. 42, No. 9, (2019).
3. **Misra, G.**, Bai, X. "Task-Constrained Trajectory Planning of Space-Robotic Systems using Convex Optimization." *Journal of Guidance, Control, and Dynamics*, Vol. 40, No. 11 (2017), pp. 2857-2870.
4. **Misra, G.**, Bai, X. "Optimal Path Planning of Free-flying Space Manipulators using Sequential Convex Programming", *Journal of Guidance, Control, and Dynamics*, Vol. 40, No. 11 (2017), pp. 3026-3033..
5. **Misra, G.**, Izadi, M., Sanyal, A. K., and Scheeres, D. J. "Coupled orbit-attitude dynamics and relative state estimation of spacecraft near small bodies." *Advances in Space Research*, Vol. 57, No. 8 (2016), pp 1747-1761.

Conference proceedings

1. **Misra, G.**, Bai, X. "Iteratively Feasible Optimal Spacecraft Guidance using Convex Optimization", *AIAA Guidance, Navigation, and Control Conference, Florida, 2020.*
2. **Misra, G.**, Bai, X. "Updated Simulation Results of UAV Carrier Landings", *AIAA Modeling and Simulation Technologies Conference, Florida, 2020.*
3. **Misra, G.**, Bai, X. "Nonlinear Disturbance Observer based Control for Polynomial Systems with Mismatched Uncertainties using Sum-of-Squares Programming", *IEEE American Control Conference (ACC), Philadelphia, 2019.*
4. **Misra, G.**, Gao, T., and Bai, X. "Modeling and Simulation of UAV Carrier Landings", *AIAA Modeling and Simulation Technologies Conference, San Diego, 2019.*
5. **Misra, G.**, Bai, X. "Stochastic Model Predictive Control for Gust Alleviation during Aircraft Carrier Landing", *IEEE American Control Conference (ACC), Milwaukee, 2018.*
6. **Misra, G.**, Peng, H, and Bai, X. "Halo Orbit Station-keeping using Nonlinear MPC and Polynomial Optimization", *28th AIAA/AAS Spaceflight Mechanics Meeting, Kissimmee, FL, 2018.*
7. **Vishawanathan S. P.**, Sanyal, A. K., and Misra, G. "Controllability analysis of spacecraft with only attitude actuation near small solar system bodies", *10th IFAC Symposium on Nonlinear Control Systems (NOLCOS)*, Monterey, CA, 2016.
8. **Misra, G.**, Samiei, E., and Sanyal, A. K. "Asteroid landing guidance design in the framework of coupled orbit-attitude spacecraft dynamics." *25th AAS/AIAA Spaceflight Mechanics Meeting*, Williamsburg, VA, 2015.
9. **Misra, G.**, and Sanyal, A. K. "Analysis of orbit-attitude coupling of spacecraft near small solar system bodies." *AIAA Guidance, Navigation and Control Conference*, Kissimmee, FL, 2015.
10. **Sanyal, A. K.**, Izadi, M., Misra, G., Samiei, E., and Scheeres, D. J. "Estimation of dynamics of space objects from visual feedback during proximity operations." *AIAA Astrodynamics Specialist Conference*, San Diego, CA, 2014.

Conference Presentations (without proceedings)

1. **Quantius, D.**, Misra, G., Löscher, M., and Maiwald, V. "List of potential target Near Earth Objects (NEOs) for human missions." *64th International Astronautical Congress*, Beijing, China 2013.
2. **Misra, G.** "Asteroid hazard mitigation via Yarkovsky effect reduction." *IAA Planetary Defense Conference*, Flagstaff, Arizona 2013.

Reviewer Activities

- IEEE American Control Conference (ACC)
- AIAA Modeling and Simulation Technologies Conference
- AIAA Guidance, Navigation, and Control Conference (GNC)
- AIAA Journal of Guidance, Control and Dynamics
- IEEE Conference on Advanced Intelligent Mechatronics (AIM)
- IEEE Transactions on Aerospace and Electronic Systems
- Celestial Mechanics and Dynamical Astronomy
- Journal of Robotics

Awards/ Honors

- American Control Conference Travel Award, 2019.
- American Control Conference Travel Award, 2018.
- Rutgers TA/GA Professional Development Fund, 2016, 2017, 2018.
- Rutgers School of Graduate Studies (SGS) Conference Travel Award, 2017.
- BITS Alumni Association (BITSAA) Conference Travel Award, 2010.
- NASA/NSS Space Settlement Award, 2008.

Workshops/ Summer Schools

- First American Model Predictive Control Summer School, UW Madison, Wisconsin, 2017.
- Sokendai Asian Winter School, Japanese Aerospace Exploration Agency (JAXA), 2015.

Coursework

- Robotics, Convex Optimization, Advanced Control, Machine Learning, Stochastic Programming, Dynamic Programming, Calculus of Variations, Advanced Dynamics, Satellite Design, Nonlinear and Optimal Control

References

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