

GAURAV MISRA

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TECHNICAL INTERESTS

- Autonomous mobile robotics
- Nonlinear, geometric, and optimal control
- Nonlinear and robust optimization
- Machine learning
- Aerospace systems

COMPUTER SKILLS MATLAB, Simulink, C, Python, Yalmip, GAMS, AMPL, NumPy, SciPy, matplotlib, linux

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

Doctor of Philosophy, Mechanical and Aerospace Engineering, *Expected* October 2019

- Thesis Topic: *Tractable optimization based control and learning for aerospace robotic applications.*
- 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.
- Machine learning model development for estimating wind speed profiles using unmanned aerial vehicle flight data.
- 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 of spacecraft near small solar system bodies, and its implications on spacecraft proximity operations.
- Nonlinear controllability analysis of underactuated spacecraft near small solar system bodies using differential geometry tools.

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

JOURNAL PUBLICATIONS

1. **Misra, G.**, Bai, X. "Output-feedback Stochastic Model Predictive Control for Glideslope Control during Aircraft Carrier Landing." *Journal of Guidance, Control, and Dynamics*, under review.
2. Wang, L., **Misra, G.**, and Bai, X. "A K Nearest Neighborhood Based Wind Estimation for Rotary-Wing VTOL UAVs." *Journal of Intelligent and Robotic Systems*, under review.
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. "Nonlinear Disturbance Observer based Control for Polynomial Systems with Mismatched Uncertainties using Sum-of-Squares Programming", *IEEE American Control Conference (ACC), Philadelphia, 2019. under review*
2. **Misra, G.**, Gao, T., and Bai, X. "Modeling and Simulation of UAV Carrier Landings", *AIAA Modeling and Simulation Technologies Conference, San Diego, 2019. Accepted*
3. **Misra, G.**, Bai, X. "Stochastic Model Predictive Control for Gust Alleviation during Aircraft Carrier Landing", *IEEE American Control Conference (ACC), Milwaukee, 2018.*
4. **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.*
5. **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.
6. **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.
7. **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.
8. **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	<ul style="list-style-type: none"> • IEEE American Control Conference (ACC) • AIAA Guidance, Navigation, and Control Conference (GNC) • IEEE Conference on Advanced Intelligent Mechatronics (AIM) • IEEE Transactions on Aerospace and Electronic Systems • Celestial Mechanics and Dynamical Astronomy
AWARDS/ HONORS	<ul style="list-style-type: none"> • American Control Conference Travel Award, 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	<ul style="list-style-type: none"> • First American Model Predictive Control Summer School, UW Madison, Wisconsin, 2017. • Sokendai Asian Winter School, Japanese Aerospace Exploration Agency (JAXA), 2015.
COURSEWORK	<ul style="list-style-type: none"> • Robotics, Convex Optimization, Advanced Control, Machine Learning, Stochastic Programming, Dynamic Programming, Calculus of Variations, Advanced Dynamics, Satellite Design, Nonlinear and Optimal Control
REFERENCES	<p>Xiaoli Bai Assistant Professor Mechanical and Aerospace Engineering Rutgers University, United States E-mail: xiaoli.bai@rutgers.edu Phone: 848-445-4760</p> <p>Amit K. Sanyal Associate Professor Mechanical and Aerospace Engineering Syracuse University, United States E-mail: aksanyal@syr.edu</p> <p>Nadipuram Prasad Associate Professor Electrical and Computer Engineering New Mexico State University, United States E-mail: naprasad@nmsu.edu</p>