GAURAV MISRA

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Research Interests Space Systems, Robotics, Control, Optimization, and Machine Learning

Technical Skills

- Model Predictive Control- Linear, Nonlinear, Stochastic.
- Optimization- Convex, Non-convex, Polynomial, Stochastic.
- Optimal and optimization based control
- Machine Learning
- Robot motion planning and control

Computer Skills Matlab, Simulink, Python, CVX, YALMIP, LaTeX, modeFRONTIER, Satellite Toolkit (STK)

Education

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

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

- Thesis Topic: *Tractable Convex Optimization based Planning and Control Methods for Space-robotic Applications.*
- Advisor: Prof. Xiaoli Bai
- GPA: 3.76/4

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
- GPA: 3.83/4

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

- Research on real-time trajectory planning, control, and optimization for aerial and space robots in uncertain environments.

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

- Research on coupled orbit-attitude dynamics of spacecraft near small bodies, and its implications on spacecraft proximity operations including hovering, and landing trajectories.

Research Intern Jan 2013 to June 2013
IMCCE, Observatoire de Paris, France
Topic: Solar sail dynamics near asteroids with applications to asteroid hazard mitigation
Supervisor: Florent Deleflie

Bachelor Thesis Student July 2012 to Dec 2012
French Space Agency (CNES), Toulouse, France
Topic : Asteroid hazard mitigation via Yarkovsky effect modification
Supervisor: Jean-Yves Prado

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

Journal Publications

1. **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.
2. **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..
3. **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. **Wang, L.**, Misra, G., Bai, X. "A KNN based Wind Estimation for Rotary-Wing VTOL UAVs ", *AIAA Scitech/Modeling and Simulation Technologies Conference, San Diego, 2019. under review*
2. **Gao, T.**, Misra, G., Bai, X. "Modeling and Simulation of UAV Carrier Landings ", *AIAA Scitech/Modeling and Simulation Technologies Conference, San Diego, 2019. under review*
3. **Misra, G.**, Bai, X. "Stochastic Model Predictive Control for Gust Alleviation during Aircraft Carrier Landing", *IEEE American Control Conference, 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

- 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

- American Control Conference Travel Award, 2018.
- Rutgers School of Graduate Studies (SGS) Conference Travel Award, 2017.
- New Mexico State University, MAE Department Conference Travel Award, 2016.
- 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.

References

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Jean-Yves Prado
CNES Heliophysics Programme Manager
Division of Space Science and Micro-gravity
French Space Agency (CNES), Toulouse, France
E-mail: jean-yves.prado@cnes.fr