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EDUCATION

Ph.D. student (2017-) in Aerospace Engineering Sciences, *expected graduation: Fall 2020*

Colorado Center for Astrodynamics Research (CCAR), **University of Colorado Boulder**, USA

Advisor: Prof. Jay W. McMahon

Ph.D. thesis (draft): “Risk-aware Mission Design around Small Celestial Bodies”

M.S. (2017) & B.S. (2015) in Aeronautics and Astronautics

Intelligent Space Systems Lab (ISSL), **the University of Tokyo**, Japan

Advisor: Prof. Shin-ichi Nakasuka and Prof. Ryu Funase

PROFESSIONAL EXPERIENCE

NASA JPL visiting student researcher (2018, 2019), outer planet mission analysis (mentor: Dr. G. Lantoine & Dr. J. Sims)

- “SRP-based Orbit Control for Solar Sailing missions”: mission design for the NEA Scout solar sailing mission (2019)
- “Investigating non-Keplerian dynamics around Psyche”: science orbit design for the Psyche mission (2018)

CCAR graduate research assistant (2017-present), CCAR, University of Colorado Boulder

- Stochastic optimal control for space applications; Mission design around asteroids; SRP-based orbit control; NIAC 2017 project

JSPS DC1 research fellow (2017), Japan Society for the Promotion of Science (JSPS)

- Attitude-orbit coupled dynamics modeling & control of realistic solar sails

JAXA ISAS assistant researcher (2015-2017), Institute of Space and Astronautical Science, JAXA

- Mission design of small-sat deep-space exploration projects (PROCYON and EQUULEUS projects)

UTokyo graduate teaching assistant (2016), Department of Aero&Astro, The University of Tokyo

- “Exercise in Space Engineering” (junior-level class on space mission design)

PROJECTS

Academic research projects

Stochastic optimal control for space applications (2017-present)

- contribution: development of stochastic optimal control framework for robust space mission design under uncertainty
- related publications: (CF1), (CF2), (CF3), (CF4)

Non-Keplerian dynamics around small celestial bodies (2017-present)

- contribution: analysis of complex dynamics around small celestial bodies & science orbit design
- related publications: (J1), (CF6)

Solar Radiation Pressure–based orbit control (2017-present)

- contribution: development of optimal orbit control law for SRP-based orbit control & solar sailing
- related publications: (J2), (CF5), (CF7), (CF8)

Attitude-orbit coupled dynamics modeling & control of realistic solar sails (2014-2017)

- role: JSPS researcher (in collaboration with ISAS/JAXA solar sail working group)
- contribution: development of guidance & control laws for attitude-orbit coupled dynamics of solar sails with sail deformation
- related publications: (CF10), (CF11), (CF12), (CC3)

*NASA projects***NEA Scout mission (Fall 2019)** [URL],

- NASA's CubeSat solar sailing mission to explore Near-Earth Asteroids (NEAs)
- role: visiting student researcher
- contribution: development of solar sailing trajectory indirect optimization techniques & solar sailing missed-thrust analysis SW
- related publications: to appear

Psyche mission (Summer 2018) [URL], PI: Dr. L. Elkins-Tanton (ASU)

- NASA discovery mission program (*Psyche: Journey to a Metal World*)
- role: visiting student researcher
- contribution: analytical development of a new class of frozen orbits around asteroids based on averaged Lagrange planetary eqs
- related publications: (J1), (CF6)

NIAC 2017: Dismantling Rubble Pile Asteroids with AoES (2017-present) [URL], PI: Dr. J. McMahon (CU Boulder)

- funded by NASA Innovative Advanced Concepts (NIAC) program (Phase I & II)
- role: graduate research assistant
- contribution: development of an analytical optimal orbit control algorithm for SRP-based landing on asteroids
- related publications: (J2), (CF8), (CC1)

*JAXA projects***EQUULEUS¹ (2016-present)** [URL], PI: Dr. T. Hashimoto & Dr. R. Funase (JAXA/UTokyo)

- JAXA's CubeSat mission to explore cislunar space with low energy transfer, one of 13 CubeSat payloads of NASA's Artemis 1
- role: project engineer lead; mission designer
- contribution: high-level mission concept & spacecraft system design; transfer trajectory & science orbit design in cislunar space
- related publications: (J3), (J5), (CF9)

PROCYON² (2014-2017) [URL], PI: Dr. R. Funase & Dr. Y. Kawakatsu (UTokyo/JAXA)

- JAXA's small-sat mission, the world-first 50kg-class deep-space explorer, successfully launched and operated
- role: spacecraft Guidance, Navigation & Control (GNC) engineer
- contribution: GNC flight data analysis & GNC flight software development
- related publications: (J4), (J6), (CC4)

AWARDS*Individual awards*

AAS GNC conference student paper competition 2nd place (2020) [URL], from American Astronautical Society Rocky Mountain Section. Paper title: *Autonomous Guidance for Robust Achievement of Science Observations around Small Bodies*

CCAR Bahls Endowed Funds – Travel Award (2019) [URL], from Colorado Center for Astrodynamics Research. Paper title: *Science Orbit Design with Frozen Beta angle: Theory and Application to Psyche mission*

AAS John V. Breakwell student award (2018) [URL], from Space Flight Mechanics committee, American Astronautical Society. Paper title: *“SRP-based Orbit Control with Application to Small Body Landing”*

UTokyo tuition fee half exemption for outstanding students (2017), from the University of Tokyo.

JSASS outstanding Student Presentation Award (2016), from Japan Society for Aeronautical and Space Sciences. Paper title: *“Time-optimal Attitude Control with Application to Orbit Control of Spinning Solar Sail Driven by Reflectivity Control”*

Travel awards for international conference attendance (2016), from Tokyo electric power company holdings memorial foundation, Japan (200,000 JPY); from Murata science foundation, Japan (150,000 JPY); from Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan (400,000 JPY)

JSASS Young Researcher Award (2015), from Japan Society for Aeronautical and Space Sciences, as the third author. Paper title: *“Preliminary Study of Angular Momentum Control by Solar Radiation Pressure for 50 kg-class Spacecraft PROCYON”*

Group awards

Japanese Government MEXT Commendation for Science and Technology (2017) for PROCYON project, from Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan.

UTokyo University President's Award (2015) for PROCYON project, from the University of Tokyo.

¹EQUULEUS: Equilibrium Lunar-Earth point 6U Spacecraft

²PROCYON: Proximate Object Close Flyby with Optical Navigation

Fellowships

Masason foundation fellowship (FY2017-2021), from Masason foundation, Japan [URL]. Tuition, monthly stipend, & research grant for five years; selection ratio ~8.7%.

Study abroad fellowship (FY2017-2018), from Nakajima science foundation, Japan [URL; Japanese]. Tuition & monthly stipend for two years; selection ratio ~14%

CU Boulder Aerospace Departmental fellowship (2017), from University of Colorado Boulder.

JSPS DC1 research fellowship for young scientist (FY2017-2019*), from Japan Society for the Promotion of Science [URL]. *Most prestigious fellowship for Ph.D. students in Japan.* Monthly stipend & research grant for three years (*terminated when leaving the position at UTokyo to start study abroad); selection ratio ~20%

Japanese Government MEXT fellowship (FY2015-2016), from Ministry of Education, Culture, Sports, Science and Technology, Japan [URL]. Monthly stipend for two years.

Research grants

Research grant for foundation members (FY2017-2019), from Masason foundation, Japan. FY2017 300,000 JPY; FY2018 500,000 JPY; FY2019 550,000 JPY (maximum 5,000,000 JPY/year)

JSPS Grants-in-Aid for Scientific Research <KAKENHI> (FY2017-2019*), from Japan Society for the Promotion of Science. Total budget up to 3,000,000 JPY/3year (*terminated when leaving the position at UTokyo to start study abroad)

JOURNAL PUBLICATIONS

- (J1) **K. Oguri**, G. Lantoine, W. Hart, and J. McMahon. Science orbit design with a quasi-frozen beta angle: Effects of body obliquity on J2-perturbed dynamics. *Celestial Mechanics and Dynamical Astronomy, under review*
- (J2) **K. Oguri** and J. W. McMahon. Solar Radiation Pressure–Based Orbit Control with Application to Small-Body Landing. *Journal of Guidance, Control, and Dynamics*, 43(2):195–211, Feb. 2020. doi: 10.2514/1.G004489
- (J3) **K. Oguri**, K. Oshima, S. Campagnola, K. Kakihara, N. Ozaki, N. Baresi, Y. Kawakatsu, and R. Funase. EQUULEUS Trajectory Design. *The Journal of the Astronautical Sciences*, Jan. 2020. doi: 10.1007/s40295-019-00206-y
- (J4) S. Ikari, T. Ito, **K. Oguri**, T. Inamori, S. Sakai, Y. Kawakatsu, A. Tomiki, and R. Funase. In Orbit Demonstration of a FDIR Algorithm for the Attitude Control System of Micro Interplanetary Spacecraft PROCYON. *Journal of the Japan Society for Aeronautical and Space Sciences*, 68(2):89–95, 2020. doi: 10.2322/jjsass.68.89 (in Japanese)
- (J5) S. Campagnola, J. Hernando-ayuso, K. Kakihara, Y. Kawabata, T. Chikazawa, R. Funase, N. Ozaki, N. Baresi, T. Hashimoto, Y. Kawakatsu, T. Ikenaga, **K. Oguri**, and K. Oshima. Mission Analysis for the EM-1 CubeSats EQUULEUS and OMOTENASHI. *IEEE Aerospace and Electronic Systems Magazine*, 34(4):38–44, Apr. 2019. doi: 10.1109/MAES.2019.2916291
- (J6) S. Ikari, T. Inamori, T. Ito, K. Ariu, **K. Oguri**, M. Fujimoto, S. Sakai, Y. Kawakatsu, and R. Funase. Attitude Determination and Control System for the PROCYON Micro-Spacecraft. *Transactions of the Japan Society for Aeronautical and Space Sciences*, 60(3):181–191, 2017. doi: 10.2322/tjsass.60.181

CONFERENCE PROCEEDINGS

First author (selected)

- (CF1) **K. Oguri** and J. W. McMahon. Autonomous Guidance for Robust Achievement of Science Observations around Small Bodies. In *AAS Guidance, Navigation, and Control conference*, Breckenridge, Colorado, Feb. 2020, **2nd place in AAS GNC conference student paper competition**
- (CF2) **K. Oguri**, M. Ono, and J. W. McMahon. Convex Optimization over Sequential Linear Feedback Policies with Continuous-time Chance Constraints. In *2019 IEEE 58th Conference on Decision and Control (CDC)*, pages 6325–6331, Nice, France, Dec. 2019. IEEE. doi: 10.1109/CDC40024.2019.9029604
- (CF3) **K. Oguri** and J. W. McMahon. Risk-aware Trajectory Design with Impulsive Maneuvers: Convex Optimization Approach. In *AAS/AIAA Astrodynamics Specialist Conference*, Portland, ME, 2019
- (CF4) **K. Oguri** and J. W. McMahon. Risk-aware Trajectory Design with Continuous Thrust: Primer Vector Theory Approach. In *AAS/AIAA Astrodynamics Specialist Conference*, Portland, ME, 2019
- (CF5) **K. Oguri** and J. W. McMahon. SRP-based Orbit Control for Asteroid Exploration. In *32nd International Symposium on Space Technology and Science*, Fukui, Japan, 2019
- (CF6) **K. Oguri**, G. Lantoine, B. Hart, and J. W. McMahon. Science Orbit Design with Frozen Beta angle: Theory and Application to Psyche mission. In *AAS/AIAA Space Flight Mechanics Meeting*, Ka’anapali, HI, 2019, **Bahls Endowed Funds Travel Award**

- (CF7) **K. Oguri** and J. W. McMahon. SRP-based Orbit Control with Application to Orbit Stationkeeping at Small Bodies. In *AAS/AIAA Space Flight Mechanics Meetings Space Flight*, Ka'anapali, HI, 2019,
- (CF8) **K. Oguri** and J. W. McMahon. SRP-based Orbit Control with Application to Small Body Landing. In *AAS/AIAA Astrodynamics Specialist Conference*, Snowbird, UT, 2018, **John V. Breakwell student award**
- (CF9) **K. Oguri**, K. Kakihara, S. Campagnola, N. Ozaki, K. Oshima, T. Yamaguchi, and R. Funase. EQUULEUS Mission Analysis: Design of the Science Orbit Phase. In *International Symposium on Space Flight Dynamics*, Ehime, Japan, June 2017
- (CF10) **K. Oguri**, A. Ishikawa, S. Ikari, T. Kudo, and R. Funase. Precision Evaluation of Reduced Dynamics Model for Non-uniform Spinning Solar Sail Driven by Reflectivity Control. In *4th International Symposium on Solar Sailing, 17045*, Kyoto, Japan, 2017
- (CF11) **K. Oguri** and R. Funase. Time-optimal Attitude Control Law with a Strategy of Applying to Orbital Control for Spinning Solar Sail Driven by Reflectivity Control. *Advances in the Astronautical Sciences*, 158:933–951, 2016
- (CF12) **K. Oguri**, T. Kudo, and R. Funase. Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control. In *60th Space Sciences and Technology Conference, 2016-P34*, Hokkaido, Japan, 2016, **Outstanding student presentation award**

Co-author (selected)

- (CC1) J. McMahon, S. K. Mitchell, **K. Oguri**, N. Kellaris, D. Kuettel, C. Keplinger, and B. Bercovici. Area-of-Effect Softbots (AoES) for Asteroid Proximity Operations. In *2019 IEEE Aerospace Conference*, pages 1–16, Big Sky, Montana, Mar. 2019. IEEE. doi: 10.1109/AERO.2019.8741680
- (CC2) S. Campagnola, J. Hernando-ayuso, N. Ozaki, N. Baresi, T. Hashimoto, Y. Kawakatsu, K. Kakihara, Y. Kawabata, T. Chikazawa, R. Funase, T. Ikenaga, **K. Oguri**, and K. Oshima. Mission analysis for the EM-1 CubeSats EQUULEUS and OMOTENASHI. In *69th International Astronautical Congress*, 2018
- (CC3) A. Ishikawa, **K. Oguri**, S. Ikari, R. Funase, and S. Nakasuka. Estimation of Shape and Optical Parameters of Spinning Solar Sail Equipped with Reflectivity Control Devices. In *26th International Symposium on Space Flight Dynamics*, pages 1–6, 2017
- (CC4) T. Ito, S. Ikari, **K. Oguri**, M. Fujimoto, K. Ariu, Y. Kawabata, T. Inamori, S. Sakai, Y. Kawakatsu, and R. Funase. Preliminary Study of Angular Momentum Control by Solar Radiation Pressure for 50 kg-class Spacecraft PROCYON. In *59th Space Sciences and Technology Conference, 2015-3J08*, pages 1–6, Kagoshima, Japan, 2015, **Young researcher award**

PRESENTATIONS

Oral

- (PO1) “Autonomous Guidance for Robust Achievement of Science Observations around Small Bodies,” at *AAS Guidance, Navigation, and Control conference*, Breckenridge, Colorado, 2020.
- (PO2) “Convex Optimization over Sequential Linear Feedback Policies with Continuous-time Chance Constraints,” at *2019 IEEE Conference on Decision and Control*, Nice, France, 2019.
- (PO3) “Risk-aware Trajectory Design with Continuous Thrust: Primer Vector Theory Approach,” at *AAS/AIAA Astrodynamics Specialist Conference, AAS 19-912*, Portland, ME, 2019.
- (PO4) “Risk-aware Trajectory Design with Impulsive Maneuvers: Convex Optimization Approach,” at *AAS/AIAA Astrodynamics Specialist Conference, AAS 19-893*, Portland, ME, 2019.
- (PO5) “SRP-based Orbit Control for Asteroid Exploration”, at *32nd International Symposium on Space Technology and Science, ISTS 2019-d-021*, Fukui, Japan, 2019.
- (PO6) “Science Orbit Design with Frozen Beta angle: Theory and Application to Psyche mission”, at *2019 AAS/AIAA Space Flight Mechanics Meeting, AAS 19-269*, Ka'anapali, HI, 2019.
- (PO7) “SRP-based Orbit Control with Application to Orbit Stationkeeping at Small Bodies”, at *2019 AAS/AIAA Space Flight Mechanics Meeting, AAS 19-415*, Ka'anapali, HI, 2019.
- (PO8) “SRP-based Orbit Control with Application to Small body Landing”, at *2018 AAS/AIAA Astrodynamics Specialist Conference, AAS 18-375*, Snowbird, UT, 2018.
- (PO9) “EQUULEUS Mission Analysis: Design of the Science Orbit Phase”, at *26th International Symposium on Space Flight Dynamics, ISSFD-2017-072*, Ehime, Japan, 2017.
- (PO10) “Precision Evaluation of Reduced Dynamics Model for Non-uniform Spinning Solar Sail Driven by Reflectivity Control”, at *4th International Symposium on Solar Sailing, ISSS-17045*, Kyoto, Japan, 2017.
- (PO11) “Attitude Maneuverability Estimation for Preliminary Mission Design of Spinning Solar Sail Driven by Reflectivity Control” at *the AIAA/AAS Astrodynamics Specialist Conference, AIAA2016-5674*, Long Beach, California, 2016.
- (PO12) “Optimal Attitude and Orbital Control Strategy of Spinning Solar Sail Spacecraft via Reflectivity Control” at *26th AAS/AIAA Space Flight Mechanics Meeting, AAS 16-329*, Napa, California, 2016.

- (PO13) “On-Orbit Estimation of ADCS Parameters for micro-astrometry satellite ‘Nano-JASMINE’” at *59th Space Sciences and Technology Conference, 2015-3J13*, Kagoshima, Japan, 2015.
- (PO14) “Time-Optimal Attitude Control of Spinning Solar Sail by Reflectivity Control” at *25th Workshop on JAXA Astrodynamics and Flight Mechanics, 2015-C-11*, Kanagawa, Japan, 2015.
- (PO15) “Optimal Attitude Control of Spinning Solar Sail with Reflectivity Control” at *30th International Symposium on Space Technology and Science, 2015-d-26*, Kobe, Japan, 2015.

Poster

- (PP1) “Mission Concept and System Design of World-First Cis-Lunar Space Exploration CubeSat EQUULEUS”, at *17th ISAS/JAXA Space Science Symposium, 2016-P-24*, Kanagawa, Japan, 2017.
- (PP2) “Time-Optimal Attitude Control and its Application to Orbital Control of Spinning Solar Sail Driven by Reflectivity Control” at *60th Space Sciences and Technology Conference, 2016-P34*, Hokkaido, Japan, 2016. **Outstanding student presentation award**

MISCELLANEOUS

Languages: Japanese (native), English (fluent)

Academic society: AAS, AIAA, IEEE, SIAM, Japan Society for Aeronautical and Space Sciences (JSASS)

Programming: Matlab (proficient), Python (proficient), C (intermediate), C++ (intermediate)

Software, tools: CVX³, SPICE, GMAT, jTOP⁴, SBDT⁵, Microsoft Visual Studio, CAD software (SolidWorks, Autodesk inventor, PTC Creo), Subversion, GitHub

Last updated: April 28, 2020

³software dedicated for solving convex optimization [\[URL\]](#)

⁴spacecraft trajectory optimization software developed by Dr. Stefano Campagnola

⁵small body dynamics simulation software developed by Dr. Stephen Broschart