Keidai Iiyama

CONTACT INFORMATION

Graduate Student (Master Course)
Intelligent Space Systems Laboratory (ISSL)
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EDUCATION

M.E. in Aeronautics and Astronautics **Mar, 2021 (expected)**
The University of Tokyo, Japan
Department of Aeronautics and Astronautics, School of Engineering
GPA: 4.00/4.00

B.E. in Aeronautics and Astronautics **Mar, 2019**
The University of Tokyo, Japan
Department of Aeronautics and Astronautics, School of Engineering
GPA: 3.54/4.00
Thesis: Navigation Satellite Constellation and Monitoring Station Arrangement for Lunar Global Navigation Satellite System (LGNSS) (Advisor: Prof. Ryu Funase)

RESEARCH EXPERIENCE

Intelligent Space Systems Laboratory, The University of Tokyo Apr, 2018 - Present
- Role: Graduate Student
- Advisor: Prof. Ryu Funase & Prof. Shinichi Nakasuka
- Research Topic: Optimization of navigation satellite arrangement pattern and staged development strategy of Lunar Navigation Satellite System (LNSS)
  - Implemented a Multi-Objective Monte-Carlo Tree Search algorithm to obtain staged development strategy that could flexibly adjust to uncertainties and changes in area of interest
  - Implemented a user positioning simulator for LNSS. Conducted positioning performance analysis for several constellation and lunar monitoring station arrangement patterns.
  - Related Publications: (C2) (C3)

Space Systems Optimization Laboratory, Georgia Institute of Technology Jan, 2020 – Feb, 2020
- Role: Visiting Researcher
- Advisor: Prof. Koki, Ho
- Research Topic: Landing site selection and Divert Maneuver Planning with Deep Reinforcement Learning
  - Developed an deep reinforcement learning framework that selects safe landing sites and plans divert maneuvers from Lidar DEM observations during powered descent to planetary bodies.
  - Related Publications: (C1) (C4)

PUBLICATIONS and PRESENTATIONS

Journal Publications

Co-Author

(J1) Funase, R., Ikari, S., Miyoshi, K., et al., (**as 20th author**) " Mission to Earth-Moon Lagrange Point by a 6U CubeSat: EQUULEUS", IEEE Aerospace & Electro. Systems Magazine, Vol.35, No.3, pp.30-44, 2020

Conference Proceedings

First Author

(C1) **Iiyama, K,** Tomita, K., Jagatia, B.A., Nakagawa, T., and Ho, K., "Deep Reinforcement Learning for Safe

Landing Site Selection with Concurrent Consideration of Divert Maneuvers", 2020 AAS/AIAA Astrodynamics Specialist Conference, USA, August, 2020

(C2) **Iiyama, K.**, Ozaki, N., Kawabata, Y., Funase, R., and Nakasuka, S. "The Optimization of Staged Development of Lunar Navigation Satellite System", Space Sciences and Technology Conference, Tokushima, Japan, November, 2019 (Written in Japanese).

(C3) **Iiyama, K**., "Optimization of the Navigation satellite constellation and Lunar Monitoring Station for Lunar Global Navigation Satellite System", 32nd International Symposium on Space Technology and Science, Japan, j-20s, June, 2019 **Student session finalist**

Co-Author

(C4) Tomita, K., Jagatia, B.A., Nakagawa, T., **Iiyama, K.**, and Ho, K., "Real-Time Terrain Mapping and Processing for Safe Landing via Deep Neural Networks", ASCEND, Las Vegas, Nevada, The United States, November, 2020 (Accepted)

(C5) Dei Tos, D.A., Baresi, N., Chikazawa, T., Campagnola, S., Kawabata, Y., **Iiyama, K.**, Kakihara, K., Ozaki, N., Funase, R., and Kawakatsu. Y., "Challenges and Solutions for the Trajectory Design of EQUULEUS", 29th Workshop on Astrodynamics and Flight Mechanics, Kanagawa, Japan, July, 2019

(C6) Matsushita, S., Shibukawa, T., **Iiyama, K.**, and Funase, R. "Thermal Design and Validation for a 6U Cubesat EQUULEUS under Constraints Tightly Coupled with Orbital Design and Water Propulsion System", 49th International Conference on Environmental Systems, USA, July, 2019.

(C7) Shibukawa, T., Matsushita, S., **Iiyama, K.**, and Funase, R., "Reflection and Verification of Thermal Design under Tightly-Coupled Constraints to the 6U Deep Space CubeSat EQUULEUS", 32nd International Symposium on Space Technology and Science, Fukui, Japan, June, 2019.

FELLOWSHIPS and AWARDS

- **WINGS CFS Fellowship** Sep, 2019 - Present
  From the University of Tokyo WINGS CFS Program
- **32nd ISTS conference student paper competition finalist** Jun, 2019
  For the paper "Optimization of the Navigation satellite constellation and Lunar Monitoring Station for Lunar Global Navigation Satellite System"
- **ARLISS 2017 Overall Winner and Accuracy Award** Sep, 2017

RESEACH INTERESTS

- Applying reinforcement learning algorithms to spacecraft guidance, navigation, and control problems
- Optimization of space systems under uncertainty
- Spacecraft trajectory design

PROFESSIONAL EXPERIENCE

- **Assistant researcher at ISAS/JAXA** Apr, 2019 - Present
  JAXA Institute of Space and Astronautical Science (ISAS), worked on EQUULEUS project
- **Graduate Teaching Assistant** – to Assoc.Prof Ryu Funase in "Astrodynamics" Sep, 2019 – Feb, 2020

PROJECTS

ARLISS (A Rocket Launch for International Student Satellites) Apr 2018 – Sep 2020

- ARLISS is a cansat competition in Black Rock, Nevada. Cansats developed by the participants are launched by rockets, going up high to 4km. In the comeback competition, the participating teams integrate autonomous system (including cases, parachutes and rovers) to direct the cansat to designated location.
- Our team won the overall winner and best accuracy award (0 m), which is given to the team that successfully navigated the rover closest to the goal. I contributed in on-board software development.

EQUULEUS: Equilibrium Lunar-Earth point 6U Spacecraft Sep 2018 - Present

- EQUULEUS is a 6U cubesat lunar mission jointly proposed by JAXA and the University of Tokyo to NASA. It was selected as the secondary payload of the EM-1 Mission (First flight of the NASA's new rocket, SLS).
- I contributed in thermal analysis with MATLAB and thermal desktops, FDIR design, flight software development and implementation with C, simulator design with C++, and trajectory analysis with jTOP

and MATLAB.
- Related Publications: (J1) (C5) (C6) (C7)

MISCELLANEOUS

- **Language:** English (Professional proficiency, TOFEL iBT 105/120), Japanese (Native)
- **Programming:** MATLAB, Python, C, C++, Javascript
- **Software, Frameworks, Tools:** SPICE Toolbox (celestial body ephemeris), jTOP (spacecraft trajectory design software), Thermal Desktop, React, Pytorch, OpenAI Gym, Subversion, Git
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Last Updated: September 17, 2020