Keidai IIYAMA

PhD Student · Stanford Aeronautics and Astronautics

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Education

Stanford University *Stanford, CA*

PhD Student - Aeronautics and Astronautics *2021.9 - present*

- Advisor: TBD

The University of Tokyo *Tokyo, Japan*

ME - Aeronautics and Astronautics *2019.4 - 2021.3*

- Advisor: Prof.Funase
- Thesis: System Design and Autonomous Orbit Determination Strategy for Lunar Navigation Satellite System

The University of Tokyo *Tokyo, Japan*

BE - Aeronautics and Astronautics *2015.4 - 2019.3*

- Advisor: Prof.Funase
- Thesis: Navigation Satellite Constellation and Monitoring Station Arrangement for Lunar Global Navigation Satellite System

Awards, Fellowships, & Grants

Awards

2022 **Student Paper Award**, 2022 ION ITM Conference

2019 **Student Paper Competition Finalist**, 32nd International Symposium on Space Technology and Science

2019 **ARLISS 2017 Cansat Competition Overall Winner and Accuracy Award**, UNISEC

Fellowships

2021.9 - 2022.8 **Ph.D. Student Fellowship**, Stanford Aero/Astro Department *$101,856*

2021.9 - 2023.8 **Nakajima Foundation Study Abroad Fellowship**, Nakajima Foundation *10,800,000 yen*

2020.1 - 2021.2 **Study Abroad Musha Shugyo Program Travel Award**, School of Engineering, The University of Tokyo *400,000 yen*

2019.9 - 2021.8 **WINGS CFS Fellowship**, WINGS CFS, The University of Tokyo *4,320,000 yen*

Research Experience

Space Rendezvous Lab, Stanford University *Stanford, CA*

Advisor: Prof. Simone D'Amico *Sep,2021 - Present*

- Developed an angles-only navigation framework for spacecraft swarms in lunar orbits.
- Related Publications: (C2)

Space Systems Optimization Group, Georgia Institute of Technology *Atlanta, GA*

Advisor: Prof.Koki Ho *Jan,2021-Feb,2021*

- Developed an autoencoder + deep reinforcement learning + feedback controller framework that autonomously selects safe landing target site and plans divert maneuver from Lidar DEM observations during powered descent to planetary bodies.
- Related Publications: (C4), (C5)

Intelligent Space Systems Laboratory, The University of Tokyo *Bunkyo-Ku, Tokyo, Japan*

Advisor: Prof. Ryu Funase *Apr,2018 - Aug,2021*

- Developed an autonomous and decentralized autonomous orbit determination and clock offset estimation strategy for LNSS navigation satellites equipped with chip-scale atomic clocks.
- Implemented a user positioning simulator for LNSS. Conducted positioning performance analysis for several constellations and lunar monitoring station arrangement patterns.
- Related Publications: (C3), (C7)

EQUULEUS Project Team

Advisor: Prof.Ryu FUnase *Oct,2017 - Present*

- EQUULEUS is a 6U cubesat lunar mission jointly proposed by JAXA and the University of Tokyo to NASA. It is selected as the secondary payload of the EM-1 Mission (First flight of the NASA's new rocket, SLS)
- Designed and Implemented flight software for heater control and FDIR of the thermal sub-system.
- Contributed on environment tests and result analysis with MATLAB and Thermal Desktop.
- Related Publications: (J1), (C6), (C8)

Publications

Journal Papers

2020 (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

2022 (C1) Bhamidipati,S., **Iiyama, K.**, Mina,T., and Gao,G., "Time-Transfer from Terrestrial GPS for Distributed Lunar Surface Communication Networks", IEEE Aerospace Conference, Big Sky, MT, March, 2022. (Accepted)

(C2) **Iiyama, K**, Kruger, J., and D'Amico, S.,"Autonomous Distributed Angles-Only Navigation and Timekeeping in Lunar Orbit", ION International Technical Meeting (ITM), Long Beach, CA, January, 2022 (Accepted), **Student Paper Award**

2021 (C3) **Iiyama, K**, and Funase, R., "Autonomous and Decentralized Orbit Determination and Clock Offset Estimation of Lunar Navigation Satellites Using GPS Signals and Inter-satellite Ranging", ION GNSS+ 2021, St.Louis, MO, USA, September, 2021)

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

(C5) **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 Maneuver", 2020 AAS/AIAA Astrodynamics Specialist Conference, Online, August, 2020

(C6) Shibukawa, T., Matsushita, S., **Iiyama, K.**, Ishikawa, A., Nishii, K., and Funase, R. "Flight Model Thermal Design and Validation for a 6U Deep Space Cubesat EQUULEUS", 50th International Conference on Environmental Systems, Lisbon, Portugal, July, 2020. (conference postponed)

2019

(C7) **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, Fukui, Japan, j-20s, June, 2019, **Student Session Finalist**

(C8) 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, Bostion, MA, The United States, July, 2019,

(C9) 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.

Teaching Experience

Fall 2019 **Astrodynamics (Undergraduate)**, Graduate Teaching Assistant, The University of Tokyo

Outreach & Professional Development

Language

English (Fluent), Japanese (Native)

Software Skills

Programming Language: C, C++, Python, MATLAB

Trajectory Design: SPICE Toolbox, jTOP (spacecraft trajectory design software)

Engineering: Thermal Desktop, Autodesk Inventor

Machine Learning: Pytorch, Open AI Gym

Web: React, Jekyll

Version Control: Git, Subversion

Professional Memberships

AIAA, ION