Jaewoo Kim

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RESEARCH INTERESTS

Design Optimization of Space Systems

- Mathematical modeling of various space systems
- System design considering the lifecycle, from inception to retirement
- Considering various stakeholders and deriving solutions from a holistic viewpoint
- Exploring potentials of emerging technologies

Decision-Making Under Uncertainties

- Defining real-world problems related to highly uncertain nature and identifying key factors
- Developing decision-making framework based on fundamentals of mathematical reasoning

EDUCATION

Korea Advanced Institute of Science & Technology (KAIST) Daejeon, Korea

Ph.D. in Aerospace Engineering *Feb. 2024 – Present*

- Advisor: Prof. Jaemyung Ahn

M.S. in Aerospace Engineering *Feb. 2024*

- Thesis Title: Optimal Satellite System Architecting Considering On-Orbit Refueling (Advisor: Prof. Jaemyung Ahn)

Seoul National University (SNU) Seoul, Korea

B.S. in Mechanical and Aerospace Engineering *Feb. 2022*

- Thesis Title: Celestial Navigation Using Stars and Planets on Lunar Exploration Orbit (Advisor: Prof. Changdon Kee)

RESEARCH EXPERIENCE

Strategic Aerospace Initiative, KAIST | *Research Assistance* *Feb. 2022 – Present*

1. Spare Strategy for Satellite Mega-Constellation
   - Developed an inventory management model of spare strategy for a satellite mega-constellation with an auxiliary launch option [J1]
   - Developed an inventory management model of joint spare strategy for multiple satellite mega-constellations [C1]
2. A Study on the Principle of Modular Architecture Engineering to Improve Level of Completion for Vehicle Architecture
   - Developed an integer programming approach to design structure matrix-based system modularization with various constraints [J3]
   - Performed several case studies of automobile subsystems and obtained improved design solutions
3. Research on ADR/OOS Applications for National Security Space Assets
   - Reviewed on-orbit servicing technologies and related projects [C5]
4. Development of Launch Vehicle Mission & Conceptual Design Software
   - Developed analysis tools for the propulsion module and the staging module
   - Contributed to developing all-at-once design optimization framework of launch vehicles [J4][C2, C3]
5. Optimal Satellite System Architecting Considering On-Orbit Servicing
   - Developed an optimal satellite system architecting framework based on a lifecycle simulation [J2][C4]

GNSS Laboratory, SNU | *Undergraduate Researcher* *Mar. 2021 – Aug. 2021*

1. Deep Space Navigation with Optical Sensor Data

- Reviewed some non-inertial deep space navigation algorithms
- Analyzed the performance of the selected algorithm based on the basic linear algebra and Monte-Carlo simulation

PUBLICATIONS

Journal Articles

[J1] Sung, T., **Kim, J.** and & Ahn, J. Optimal spare strategy for satellite mega-constellation with auxiliary launch option. In preparation (target journal: Journal of Spacecraft and Rockets).

[J2] **Kim, J.** and & Ahn, J. Optimal satellite system architecting considering on-orbit refueling. In preparation (target journal: Journal of Spacecraft and Rockets).

[J3] **Kim, J.**, Choi, E., & Ahn, J. A Mixed Binary Linear Programming Approach to Design Structure Matrix-Based System Modularization. In preparation (target journal: IEEE Transactions on Engineering Management).

[J4] Ko, J., **Kim, J.**, Choi, J., & Ahn, J. (2024). Simultaneous Optimization of Launch Vehicle Stage and Trajectory Considering Flight-Requirement Constraints. *International Journal of Aeronautical and Space Sciences* (Accepted).

Conference Proceedings

[C1] **Kim, J.**, Ahn, J. An Integrated Inventory Management Model for Maintenance of Multiple Satellite Constellations. In 2024 *Proceedings of the Korean Society for Aeronautical and Space Sciences, Space Conference*, Changwon, Korea.

[C2] **Kim, J.**, Ko, J., Choi, J., Ahn, J., Yoon, N., Kim, H. Conceptual Design of Launch Vehicle Considering Axial Acceleration Constraints. In 2024 *Proceedings of the Korean Society for Aeronautical and Space Sciences, Space Conference*, Changwon, Korea.

[C3] Ko, J., **Kim, J.**, Choi, J., Ahn, J., Yoon, N., Kim, H. Development of Conceptual Design Software for Space Launch Vehicle. In 2024 *Proceedings of the Korean Society for Aeronautical and Space Sciences, Spring Conference*, Jeju, Korea.

[C4] **Kim, J.**, & Ahn, J. Multiobjective Design Optimization of Commercial Satellite Considering On-Orbit Refueling Policy. In 2023 *Proceedings of the Korean Society for Aeronautical and Space Sciences, Spring Conference*, Jeju, Korea.

[C5] **Kim, J.**, Lee. D. U., & Ahn, J. Research on the Overseas On-Orbit Servicing Trends and Implications. In 2022 *Proceedings of the Korean Society for Aeronautical and Space Sciences, Fall Conference*, Jeju, Korea.

AWARDS & HONORS

Hanhwa-KAIST Space Hub Space Grand Challenge | *Bronze* *Nov. 2023*

- Team Name: LETA (Lunar Exploration Trajectory Analytics)
- Topic: Lunar exploration trajectory design with low-thrust propulsion and multiple gravity assist

TEACHING EXPERIENCE

Teaching Assistant | *KAIST* *Fall 2023 - Present*

- AE401 Aerospace System Design II, Fall 2023
- AE210 Aerospace Thermodynamics, Spring 2024

EXTRACURRICULAR EXPERIENCES

Part-Time Lecturer | *Data Diving co.* *Aug. 2022 – Present*

- Provided lectures about basic concepts and programming tools for data science
- Institutions: Busan City Government, Korea Education & Research Information Service (KERIS), Statistics Korea (KOSTAT), Ewha Womans University, Sookmyung Women's University, Seoul Digital Foundation

Military Service | *Defense Security Command (DSC)* *Apr. 2018 – Nov. 2019*

- Supported educational programs in DSC
- Squad leader
- Commendation from Brigadier General

Interviewer | *Humans of SNU* *Jul. 2017 – Dec. 2017*

- Inverviewed diverse members in SNU and discovered impactful stories from them

President of SNU Chapter and Univ. Union | *People to People International* *Mar. 2016 – Feb. 2018*

- Supported underprivileged members of the urban community and abandoned pets
- Supported conferences for the promotion of international friendship

OTHER SKILLS

Programming

- Python, MATLAB, Julia, C, C++ for various quantitative analysis techniques including optimization, simulation, and machine learning

Language

- Korean (first), English (second, professional working proficiency)

Problem Solving

- Identifying problematic situations and key components to tackle them
- Dividing complex tasks into solvable subtasks and designing the overall workflow
- Designing a viable timeline for task completion
- Leading and encouraging with passion and commitment in teamwork situations