HEEKUN ROH

hroh@satreci.com / heekunroh@gmail.com
Associate GNC Systems Engineer at Satrec Initiative Co., Ltd., Republic of Korea

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) Mar 2017 - Feb 2019
M. S. in Aerospace Engineering

Thesis: *Impact Time and Angle Control Guidance for Homing Missiles Using Sequential Convex Programming*
Advisor : Prof. Min-Jea Tahk (Flight Dynamics and Control Laboratory)
GPA : 4.17/4.3

Korea Advanced Institute of Science and Technology (KAIST) Mar 2013 - Feb 2017
B.S. in Aerospace Engineering
B.S. in Electrical Engineering (Double Major)

Summa Cum Laude, KAIST Presidential Fellow, Honor Student, Dean's List
GPA : 4.13/4.3

Korea Science Academy of KAIST Mar 2010 - Feb 2013
Specialized secondary education institute for gifted students in mathematics and science

PROFESSIONAL EXPERIENCE

Satrec Initiative Feb 2019 - Present
Associate Systems Engineer (Satellite Attitude Determination and Control)

- Development and Early Operation of SpaceEye-X System

  Served as a primary developer of Flight Control Software(FCS) for SpaceEye-X EO Satellite. Experienced the end-to-end system engineering process starting from PDR. Developed and implemented several novel attitude control and determination algorithms. Developed and refactored the onboard software in C. Introduced Test-Driven Development / Continuous Integration scheme to the legacy FCS. Participated in the Launch and Early Operations (LEOP), successfully commissioned to customers in Aug. 2022.

- Preliminary Design of Satellite Constellation Systems

  Served as a primary Attitude Determination and Control System(ADCS) performance analyst for multiple constellation satellite systems, including a sub-100kg small satellites system to $>$ 300kg medium satellites system, both in EO and SAR. Delivered several ADCS performance measures corresponding to multiple design iterations.

- Development of Satellite Simulator

  Served as a primary developer of a highly-versatile in-house satellite ADCS simulator in Python. The developed simulator supplied several satellite attitude profiles and performance measures for official design documents.

- Image Collection Performance Analysis

  Served as an analyst for orbit and image collection analysis. Developed a novel optimal image collection scheduling method for minimum-time landmass coverage.

RESEARCH EXPERIENCE

KAIST, Flight Dynamics and Control Lab (FDCL) Dec 2016 - Feb 2019
Department of Aerospace Engineering, Master's Student

- Trajectory Optimization of Aerodynamically Controlled Objects
- Fast Trajectory Optimization using Sequential Convex Methods
- Optimal allocation of assets using mixed integer linear programming
- Target Tracking Filter using angle-only measurements
- Published 3 first-authored journal papers, and 9 first-authored conference papers

PUBLICATIONS

Journal Papers

[1] H. Roh, Y.J. Oh, M.J. Tahk, K.J. Kwon, and H.H. Kwon, "L1 Penalized Sequential Convex Programming for Fast Trajectory Optimization: With Application to Optimal Missile Guidance," *International Journal of Aeronautical and Space Sciences(IJASS)*, Vol. 21, pp. 493-503, Jun. 2020.

[2] H. Roh, Y.J. Oh, M.J.Tahk, and Y.R. Jung "Optimal Weapon-Target Assignment of Multiple Dissimilar Closed-In Weapon Systems Using Mixed Integer Linear Programming", Journal of Korean Society for Aeronautical and Space Sciences, Vol. 47, No. 11, pp.787-794, Nov. 2019.

[3] H. Roh, S.W. Shim, and M.J. Tahk, "Maneuver Algorithm for Bearings-Only Target Tracking with Acceleration and Field of View Constraints," *International Journal of Aeronautical and Space Sciences(IJASS)*, Vol. 19, No. 2, pp. 423-432, Jun. 2018.

[4] S.Y. Han, J.H. Bai, S.M. Hong, H. Roh, M.J. Tahk, J.S. Yun, S.H. Park, "Control law for agile turn of air-to- air missile during boost phase," *International Journal of Aeronautical and Space Sciences(IJASS)*, Vol.18, No.4, Dec. 2017

International Conference Papers

[1] Y.J. Oh, H. Roh, and M.J. Tahk, "Fast Trajectory Optimization using Sequential Convex Programming with No-Fly Zone Constraints", 21st IFAC Symposium on Automatic Control in Aerospace (ACA), Cranfield, United Kingdom, Aug. 2019.

[2] H. Roh, Y.J. Oh, M.J. Tahk, and C.H. Lee, "Fast Trajectory Optimization Using Sequential Convex Method for Guided Missiles," *The 5th CEAS Conference on Guidance, Navigation and Control (EuroGNC)*, Milano, Italy, Apr. 2019.

[3] Y.J. Oh, H. Roh, M.J. Tahk, "A Lattice Path Following Algorithm for Guided Missiles," *2018 Asia-Pacific International Symposium on Aerospace Technology (APISAT)*, Chengdu, China, Oct. 2018.

[4] H. Roh, M.H. Cho and M.J.Tahk, "Trajectory Optimization Using Cramer-Rao Lower Bound for Bearings-Only Target Tracking," *AIAA Scitech Forum 2018*, Kissimmee, Florida, USA, Jan. 2018.

[5] H. Roh, B.Y. Lee, and M.J. Tahk, "Automatic Maneuver Generation for Suppression of Enemy Air Defense Using Scoring Function Matrix," *Asia-Pacific International Symposium on Aerospace Technology (APISAT)*, pp.1087-1093, Seoul, Korea, Oct. 2017.

[6] J.M. Park, S.M. Hong, H. Roh, M.J. Tahk, Y.Y. Kim, J.S. Yun, "Optimal control of roll-pitch seeker with singularity avoidance," *The 26th Mediterranean Conference on Control and Automation (MED)*, Zadar, Croatia, Jun. 2018.

[7] J.M. Park, H. Roh, M.J. Tahk, "Co-evolutionary Method For Dynamic Weapon-Target Assignment," *Advances in Control and Optimization of Dynamic Systems(ACODS)*, Hyderabad, India, Feb. 2018.

[8] S.Y. Han, J.H. Bai, H. Roh, S.M. Hong, M.J. Tahk, J.S. Yun, S.H. Park, "Three-Dimensional Velocity Maximizing Agile Turn of Air-to-Air Missile with Collision Triangle Constraint," *25th Mediterranean Conference on Control and Automation (MED)*, Valletta, Malta, Jul. 2017.

Domestic Conference Papers

[1] H. Roh, M.J. Tahk, K.B. Kim, and H.H. Kwon, "Trajectory Optimization for Missile Impact Time Control Problem Using L1 Penalty Method and Sequential Convex Programming," *The Korean Society for Aeronautical and Space Sciences(KSAS): 2018 Fall Conference*, Jeju, Korea, Nov. 2018.

[2] H. Roh, and M.J. Tahk, "Comparison Study on Bearings-Only Target Tracking Filters," *The Society for Aerospace System Engineering(SASE): 2018 Fall Conference*, Gyeongju, Korea, Nov. 2018.

[3] H. Roh, S.M. Hong, M.J. Tahk, K.B. Kim, K.J. Kwon, and H.H. Kwon, "Optimal Impact Time Control Guidance Using Convex Optimization ," *Korean Institute of Military Science and Technology(KIMST): 2018 General Conference*, Jeju, Korea, Jun. 2018.

[4] H. Roh, and M.J. Tahk, "Optimization of Closed-In Weapon System Target Assignment Using Mixed Integer Linear Programming," *The Korean Society for Aeronautical and Space Sciences(KSAS): 2018 Spring Conference*, Goseong, Korea, Apr. 2018.

[5] H. Roh, B.Y. Lee, and M.J. Tahk, "Maneuver Generation for Moving Obstacle Avoidance Using Scoring Function Matrix," *The Korean Society for Aeronautical and Space Sciences(KSAS): 2017 Fall Conference*, Jeju, Korea, pp. 561-562, Nov. 2017.

[6] H. Roh, J.M. Park, and M.J. Tahk, "Modeling and Formulation for Return-to-Launch-Site Trajectory Optimization of Reusable Launch Vehicle," *The 17th Symposium on Space Launch Vehicle Technology*, Goheung, Korea, Aug. 2017

[7] K. Kim, H. Kim, H. Roh, and H.L. Choi, "Flying BioLab : A CanSat platform for sampling and monitoring air bacteria in bio-hazardous area" *The Korean Society for Aeronautical and Space Sciences(KSAS): 2014 Fall Conference*, Jeju, Korea, Nov. 2014.

HONOR & AWARDS

Graduation with Highest Honors, Summa Cum Laude Feb 2017

Dean's List, College of Engineering Mar 2015

The World Embedded Software Contest 2014, 1st Place Dec 2014
in 'Medical Services' section
Organized by Ministry of Trade, Industry and Energy

Samsung SDS Software Club Championship 2014, 1st Place Nov 2014
Organized by Samsung SDS

Cansat Competition Korea 2014, 2nd Place Aug 2014
Organized by KAIST Satellite Technology Research Center (SATREC)

Cansat Competition Korea 2012, 1st Place Aug 2012
Organized by KAIST Satellite Technology Research Center (SATREC)

Boeing Scholarship Mar 2014 - Dec 2016
Selected students in Department of Aerospace Engineering, KAIST

KAIST Presidential Fellowship Mar 2013 - Feb 2017
Selected 20 students who show academic excellence and leadership

LANGUAGE PROFICIENCY

Korean
Native

English
Full Professional Proficiency
TOEFL: (110, R30/L30/S25/W25, 2022)
GRE: (V165/Q170/AW 5.0, 2022)

French
Limited Working Proficiency
DELF B2 (2016)

TECHNICAL SKILLS

Programming Languages	Fluent in C, Python, MATLAB
	Experiences with Java, Julia, and many others
Optimization Softwares	Fluent in MOSEK, GPOPS II, Gurobi
Miscellaneous	LaTeX, Git, STK, Simulink, Linux Applications