INKYU JANG (장인규)

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Research Interests	Robot Safety, Safety-Critical Control, Stochastic Control, Reinforcement Learning

Education

Ph.D. Student, Aerospace Engineering   September 2020 – present
Seoul National University, Seoul, Korea
Laboratory for Autonomous Robotics Research (LARR)
Advisor: Prof. H. Jin Kim

B.S., Mechanical Engineering   March 2014 – February 2020
Seoul National University, Seoul, Korea
summa cum laude

Experiences

Visiting Researcher   August-October 2024
University of California, Berkeley, CA, USA   July-September 2025
Hybrid Systems Laboratory (HSL)
Advisor: Prof. Claire J. Tomlin

Publications
* equal contribution

Under Review / In Preparation

[U1] Continuously parametrized high-order control barrier functions for invariance guarantees in complex domains
      I. Jang, and H. J. Kim
      Under review

[U2] Demonstration of space robot teleoperation over a lossy and delayed network using ATMOS
      I. Jang*, G. Marchesini*, N. De Carli, B. Kim, S. Hwang, D. Kim, E. Krantz, Y. Kong, F. J. Jiang, A. Wong, P. Roque,
      P. W. L. Sanjaya, N. Bastianello, M. H. Dhullipalla, K. H. Johansson, H. Shim, D. V. Dimarogonas, and H. J. Kim
      Under review

[U3] EigenSafe: A spectral framework for learning-based probabilistic safety assessment
      I. Jang*, J. Park*, S. Cho, C. E. Mballo, C. J. Tomlin, and H. J. Kim
      Under review

[U4] A spectral perspective on stochastic control barrier functions
      I. Jang, C. E. Mballo, C. J. Tomlin, and H. J. Kim
      Under review

[P1] Safe multi-agent control using set inclusion games
      I. Jang*, B. Kim*, J. Park, J. Li, C. J. Tomlin, D. V. Dimarogonas, and H. J. Kim
      In preparation

[P2] Emergency landing flight envelope computation under soft safety constraints
      C. E. Mballo, B. L. Ferguson, **I. Jang**, D. Lee, and C. J. Tomlin
      In preparation

Journal Articles

[J1] Upper bound on escape probability for stochastic control barrier functions
      I. Jang, and H. J. Kim
      IEEE Transactions on Automatic Control (TAC), 2025.

[J2] Decentralized trajectory planning for quadrotor swarm in cluttered environments with goal convergence
      guarantee
      J. Park, Y. Lee, **I. Jang**, and H. J. Kim
      The International Journal of Robotics Research (IJRR), vol. 44, no. 8, pp. 1336-1359, July 2025.

[J3] Safe motion planning and control for mobile robots: A survey
S. Hwang, **I. Jang**, D. Kim, and H. J. Kim
International Journal of Control, Automation, and Systems (IJCAS), vol. 22, no. 10, pp. 2955-2969, October 2024.

[J4] Towards fully integrated autonomous excavation: Autonomous excavator for precise earthcutting and onboard landscape inspection
I. Jang*, J. Kim*, D. Lee*, C. Kim*, C. Oh, Y. Kim, S. Woo, H. Sung, and H. J. Kim
IEEE Robotics and Automation Magazine (RAM), vol. 32, no. 3, pp. 88-102, September 2025.

[J5] Safe control for navigation in cluttered space using multiple Lyapunov-based control barrier functions
I. Jang, and H. J. Kim
IEEE Robotics and Automation Letters (RA-L), vol. 9, no. 3, pp. 2056-2063, March 2024.

[J6] DLSC: Distributed multi-agent trajectory planning in maze-like dynamic environments using linear safe corridor
J. Park, Y. Lee, **I. Jang**, and H. J. Kim
IEEE Transactions on Robotics (T-RO), vol. 39, no. 5, pp. 3739-3758, October 2023.

[J7] A hybrid controller enhancing transient performance for an aerial manipulator extracting a wedged object
J. Byun, **I. Jang**, D. Lee, and H. J. Kim
IEEE Transactions on Automation Science and Engineering (T-ASE), vol. 21, no. 3, pp. 3264-3273, July 2024.

[J8] Real-time robust receding horizon planning using Hamilton-Jacobi reachability analysis
H. Seo, D. Lee, C. Y. Son, **I. Jang**, C. J. Tomlin, and H. J. Kim
IEEE Transactions on Robotics (T-RO), vol. 39, no. 1, pp. 90-109, February 2023.

[J9] Learning and generalizing cooperative manipulation skills using parametric dynamic movement primitives
H. Kim, C. Oh, **I. Jang**, S. Park, H. Seo, and H. J. Kim
IEEE Transactions on Automation Science and Engineering (T-ASE), vol. 19, no. 4, pp. 3968-3979, October 2022.

[J10] Fast computation of tight funnels for piecewise polynomial systems
I. Jang, H. Seo, and H. J. Kim
IEEE Control Systems Letters (L-CSS), vol. 6, pp. 2234-2239, 2022.

[J11] Aerial manipulator pushing a movable structure using a DOB-based robust controller
D. Lee, H. Seo, **I. Jang**, S. J. Lee, and H. J. Kim
IEEE Robotics and Automation Letters (RA-L), vol. 6, no. 2, pp. 723-730, April 2021.
ICRA 2021 Best Paper Award on Unmanned Aerial Vehicles

[J12] Fail-safe flight of a fully-actuated quadrotor in a single motor failure
S. J. Lee, **I. Jang**, and H. J. Kim
IEEE Robotics and Automation Letters (RA-L), vol. 5, no. 4, pp. 6403-6410, October 2020.

[J13] Fully actuated autonomous flight of thruster-tilting multirotor
S. J. Lee, D. Lee, J. Kim, D. Kim, **I. Jang**, and H. J. Kim
IEEE/ASME Transactions on Mechatronics (T-MECH), vol. 26, no. 2, pp. 765-776, April 2021.

[J14] Learning transformable and plannable se(3) features for scene imitation of a mobile service robot
J. H. Park, J. Kim, Y. Jang, **I. Jang**, and H. J. Kim
IEEE Robotics and Automation Letters (RA-L), vol. 5, no. 2, pp. 1664-1671, April 2020.

Peer-Reviewed Conference Papers

[C1] Periodic skill discovery
J. Park, D. Cho, J. Lee, D. Shim, **I. Jang**, and H. J Kim
2025 39th Conference on Neural Information Processing Systems (NeurIPS)

[C2] Necessary and sufficient conditions for data-driven identification of nonlinear systems with linear embedding
Y. Kong, **I. Jang**, and H. J. Kim
2025 25th International Conference on Control, Automation and Systems (ICCAS)

[C3] Iterative residual dynamic mode decomposition for prediction and control of dynamical systems
Y. Kong*, **I. Jang***, and H. J. Kim
2025 64th IEEE Conference on Decision and Control (CDC)

[C4] Enhancing feature tracking reliability for visual navigation using real-time safety filter
D. Kim*, **I. Jang***, Y. Han, S. Hwang, and H. J. Kim
2025 IEEE International Conference on Robotics and Automation (ICRA)

[C5]   Leakage rate as a measure of continuous-time stochastic set invariance
        I. Jang, M. Yoon, and H. J. Kim
        2024 63rd IEEE Conference on Decision and Control (CDC)

[C6]   Safe receding horizon motion planning with infinitesimal update interval
        I. Jang, S. Hwang, J. Byun, and H. J. Kim
        2024 IEEE International Conference on Robotics and Automation (ICRA)

[C7]   Invariance guarantees using continuously parametrized control barrier functions
        I. Jang, and H. J. Kim
        2023 23rd International Conference on Control, Automation and Systems (ICCAS)
        ICCAS 2023 Best Student Paper Award

[C8]   Safe and distributed multi-agent motion planning under minimum speed constraints
        I. Jang, J. Park, and H. J. Kim
        2023 IEEE International Conference on Robotics and Automation (ICRA)

[C9]   Decentralized deadlock-free trajectory planning for quadrotor swarm in obstacle-rich environments
        J. Park, **I. Jang**, and H. J. Kim
        2023 IEEE International Conference on Robotics and Automation (ICRA)

[C10]   DHRL: A graph-based approach for long-horizon and sparse hierarchical reinforcement learning
        S. Lee, J. Kim, **I. Jang**, and H. J. Kim
        2022 36th Conference on Neural Information Processing Systems (NeurIPS)
        Oral Presentation

[C11]   Robust and recursively feasible real-time trajectory planning in unknown environments
        I. Jang, D. Lee, S. Lee, and H. J. Kim
        2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

[C12]   Real-time motion planning of a hydraulic excavator using trajectory optimization and model predictive control
        D. Lee*, **I. Jang***, J. Byun, H. Seo, and H. J. Kim
        2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

[C13]   Stability and robustness analysis of plug-pulling using an aerial manipulator
        J. Byun, D. Lee, H. Seo, **I. Jang**, J. Choi, and H. J. Kim
        2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

[C14]   Provably safe real-time receding horizon trajectory planning for linear time-invariant systems
        I. Jang, D. Lee, and H. J. Kim
        2020 20th International Conference on Control, Automation and Systems (ICCAS)
        ICCAS 2020 Outstanding Paper Award

[C15]   Efficient multi-agent trajectory planning with feasibility guarantee using relative Bernstein polynomial
        J. Park, J. Kim, **I. Jang**, and H. J. Kim
        2020 IEEE International Conference on Robotics and Automation (ICRA)
        ICRA 2020 Multi-Robot Systems Award Finalist

Workshop Papers

[W1]   EigenSafe: A spectral framework for learning-based stochastic safety filtering
        I. Jang, J. Park, C. E. Mballo, S. Cho, C. J. Tomlin, and H. J. Kim
        2nd Workshop on Safe and Robust Robot Learning for Operation in the Real World (SAFE-ROL)
        at Conference on Robot Learning (CoRL) 2025
        Oral Presentation

Honors	**Scholarships and Grants**	
	Brain Korea 21 (BK21) Grant for International Visiting Research	2025
	Research Grant for Doctorate Research (박사과정생 연구장려금), NRF Korea	2024 – 2026
	Brain Korea 21 (BK21) Research Fellowship	2021 – 2022
	The National Scholarship for Science and Engineering, Korea Student Aid Foundation	2018 – 2020
	Awards	
	ICCAS 2023 Best Student Paper Award	2023
	Top Prize, Korea Aerospace Industries (KAI) Aerospace Paper Award	2022
	ICRA 2021 Best Paper Award on Unmanned Aerial Vehicles	2021
	ICRA 2020 Multi-Robot Systems Award Finalist	2020
	ICCAS 2020 Outstanding Paper Award	2020
	Outstanding B.S. Thesis Presentation Award, Department of Mechanical Engineering, SNU	2019
	Silver Medal, 6th International Olympiad on Astronomy and Astrophysics (IOAA)	2012

Invited Talks

An operator-theoretic perspective on safety-critical control for stochastic systems — August-September 2025
Hybrid Systems Laboratory Meeting, UC Berkeley
Cyber-Physical Systems Laboratory, UCLA
Safe and Autonomous Systems Lab Meeting, UC San Diego
Safe and Intelligent Autonomy Lab Meeting, Stanford University

Set Invariance and safe control for mobile robots — February 2025
KIAS Winter Workshop on AI and Robotics, Korea Institute for Advanced Study, Seoul, Korea

Safety filter in complex environments using continuously parametrized invariant sets — August 2024
Semiautonomous Seminar, UC Berkeley

Invariance guarantees using continuously parametrized control barrier functions — July 2024
2024 ICROS Conference (제어로봇시스템학회 학술대회), Daejeon, Korea

Academic Services

Journal Reviewer
IEEE Transactions on Automatic Control (TAC), IEEE Transactions on Robotics (T-RO), IEEE Control Systems Letters (L-CSS), IEEE Robotics and Automation Letters (RA-L), International Journal of Control, Automation, and Systems (IJCAS)

Conference Reviewer
IEEE International Conference on Robotics and Automation (ICRA), IEEE Conference on Decision and Control (CDC), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), IEEE Conference on Control Technology and Applications (CCTA), International Conference on Control, Automation, and Systems (ICCAS), IFAC Symposium on Mechatronic Systems and Robotics

Conference Session Chair
64th IEEE Conference on Decision and Control (CDC)

Projects

Resilient Cooperative Manipulation: Safety Filters, Event-Based Plug-and-Play Communication and Physics-Informed Learning and Control — 2024 – present
National Research Foundation Korea (NRF) and Swedish Science Foundation (SSF)

Safety Filter Design for Real-Time Safety Assurance of Autonomous Mobile Robots — 2024 – present
National Research Foundation Korea (NRF)

Motion Planning and Environment Perception for Autonomous Wheel Loader System — 2022 – 2025
HD Hyundai Construction Equipment and HD Hyundai XiteSolution, Korea

Online Path Planning Algorithms for Multi-Robot System — 2022 – 2023
Hyundai Motor Company, Korea

Motion Planning and Landscape Inspection Algorithms for Autonomous Excavator System — 2020 – 2022
HD Hyundai Construction Equipment, Korea