Sanghyun Kim

Contact Information

Kyung Hee University
School of Mechanical Engineering
1732, Deogyeong-daero, Giheung-gu
Yongin-si, Gyeonggi-do, Korea, 17104

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Research Interests

Humanoid robotics, Physical AI, Whole-body control, Task and motion planning, Optimal control, System identification, Human-robot interaction.

Education

Ph.D. in Transdisciplinary Studies, Seoul National University, Seoul, Korea — Feb 2020

- Thesis: Continuous Task Transition Approach Based on Hierarchical Quadratic Programming
- Advisor: Prof. Jaeheung Park

B.S. in Mechanical Engineering, Seoul National University, Seoul, Korea — Feb 2012

Employment

Assistant Professor — Mar 2023 – Present
School of Mechanical Engineering, Kyung Hee University, Yongin, Korea

Chief Technology Officer (CTO) — Nov 2025 – Present
MetaMotionX, Inc., Pangyo, Korea (Digital Twin & Physical AI)

Adjunct Researcher — Jan 2024 – Present
Advanced Institute of Convergence Technology, Suwon, Korea

Senior Researcher — Oct 2020 – Feb 2023
AI Robot Research Division, Korea Institute of Machinery & Materials (KIMM), Daejeon, Korea

Postdoctoral Fellow — Apr 2020 – Sep 2020
Statistical Machine Learning and Motor Control Group, University of Edinburgh, U.K.

Visiting Scholar — Aug 2018 – Jun 2019
Gepetto Team, LAAS-CNRS, Toulouse, France

Research Experience

Lab Director — Mar 2023 – Present
Robot Control and Intelligence Lab (http://rcilab.khu.ac.kr), Kyung Hee University

- Whole-body control and Physical AI for high-performance humanoids
- Manipulation algorithms from optimal control to RL, imitation learning, and foundation models (VLM/VLN)
- Sampling-based optimal control (MPPI) and task and motion planning
- Autonomous navigation in unstructured environments and digital twin-based Sim2Real
- Hardware infrastructure: two full-size humanoids (Unitree H1-2, ROBROS IGRIS-c) and various mobile manipulators

Chief Technology Officer (CTO) — Nov 2025 – Present
MetaMotionX, Inc., Pangyo, Korea

- Developing Digital Twin technologies for off-road autonomous navigation.
- Implementing Sim2Real frameworks using ROS2 and Unreal Engine 5.
- Researching traversability analysis and path planning in unstructured environments.

Postdoctoral Fellow — Apr 2020 – Sep 2020
Statistical Machine Learning and Motor Control Group, University of Edinburgh, U.K.

- Developed multi-contact receding horizon planning for humanoid locomotion.
- Implemented optimization-based manipulation strategies for complex tasks.

Visiting Scholar — Aug 2018 – Jun 2019
Gepetto Team, LAAS-CNRS, Toulouse, France

- Researched whole-body motion generation using Differential Dynamic Programming (DDP).
- Implemented centroidal dynamics-based planning for humanoid robots.

Ph.D. Candidate and Graduate Research Assistant Mar 2012 – Feb 2020
Dynamic Robotic System Lab (DYROS), Seoul National University

- Developed continuous task transition algorithms based on Hierarchical Quadratic Programming.
- Led Team SNU for the DARPA Robotics Challenge Finals 2015 (No-falling record).
- Implemented real-time whole-body controllers for torque-controlled humanoids.

Teaching Experience

Kyung Hee University, Yongin, Korea

- *Consistently maintained top-tier teaching evaluations.*

Selected Graduate Courses

- **Advanced Robotics** (ME777) Spring 2024, 2025, 2026
- **Mobile Robotics** (ME776) Fall 2025
- **Special Topics in Mech. Eng.** (ME7130) Spring 2025

Selected Undergraduate Courses

- **Engineering Mathematics II** (ME202) Spring 2023, 2025, 2026
- **Robot Programming** (ME387) Fall 2024, 2025
- **Mechanism Design** (ME272) Fall 2023
- **System Dynamics** (ME380) Spring 2024
- **Engineering Mathematics I** (ME113) Fall 2024

Advising and Mentoring

Ph.D. Students

- **Hyungjun You** (Kyung Hee U.), Bipedal Walking Sep 2026 – Present
- **Jinhwan Lim** (Kyung Hee U.), Vision-Language-Action (VLA) Sep 2026 – Present
- **Kangmin Lee** (Kyung Hee U.), Reinforcement Learning based Control Sep 2025 – Present
- **Daum Park** (Kyung Hee U.), Task and Motion Planning Sep 2025 – Present
- **Seulchan Lee** (Kyung Hee U.), Dual-arm Manipulation Mar 2025 – Present
- **Leesai Park** (Kyung Hee U.), Model Predictive Path Integral Mar 2025 – Present
- **Minhyeong Kang** (Kyung Hee U.), Task and Motion Planning Mar 2025 – Present
- **Suhwan Park** (Kyung Hee U.), System Identification Mar 2024 – Present

M.S. Students

- **Sung San Park** (Kyung Hee U.), Vision Language Navigation (VLN) Mar 2026 – Present
- **Minjae Jo** (Kyung Hee U.), Autonomous Vehicle Mar 2026 – Present
- **Taehyun Jung** (Kyung Hee U.), Digital Twin-based Control Mar 2026 – Present
- **Chanjin Park** (Kyung Hee U.), Augmented Reality Mar 2026 – Present
- **Bohyeong Pak** (Kyung Hee U.), AI-based Control Mar 2026 – Present
- **Hyunho Cho** (Kyung Hee U.), AI-based Control Mar 2026 – Present
- **Eunbin Jung** (Kyung Hee U.), Mobile Manipulator & HRI Sep 2025 – Present
- **Jiho Hong** (Kyung Hee U.), Imitation Learning Mar 2025 – Present
- **Jaerak Son** (Kyung Hee U.), Digital Twin & Multi-Robot Systems Mar 2025 – Present
- **Eunae Kang**, Current: **Bluerobin** Sep 2024 – Aug 2026
- **Jiwon Yoon**, Current: **Geobot** Sep 2024 – Aug 2026
- **Hakjun Kim**, Current: **Doosan Robotics** Mar 2023 – Aug 2025
- **Joonyeol Yang**, Current: **HL Robotics** Mar 2023 – Aug 2025
- **Seunghyun Lee**, Current: **FunctionBay** Mar 2023 – Aug 2025

Researchers & Interns

- **Jiyong Park** (Kyung Hee U.), Research Intern, AI-based Control Mar 2026 – Present
- **Jihwan Lee** (Kyung Hee U.), Research Intern, Motion Planning Mar 2026 – Present
- **Chanmin Youn** (KIMM), Traversability Estimation Jan 2021 – Mar 2023

Selected Publications

(*: Corresponding author, †: Co-first authors)

Journal Articles

[J21] T. T. Nguyen and **S. Kim***, "High-Performance Fixed-Time Active Fault-Tolerant Control of Robotic Manipulators via Sparse Physics-Informed Dynamics Learning," *Information Sciences*, 2026.

[J20] J. Hong, E. Kang, **S. Kim***, and Y. Shin*, "Instance-Enriched Semantic Maps for Visual Language Navigation," *Engineering Applications of Artificial Intelligence*, 2026. (*: Co-corresponding authors)

[J19] J. Yang†, M. Kang†, S. Lee, and **S. Kim**, "Hybrid A*-guided Model Predictive Path Integral Control for Robust Navigation in Rough Terrains," *Mathematics*, 2025. (†: Co-first authors)

[J18] H. Kim, **S. Kim***, and J. Park*, "Enhanced Online Parameter Estimation of Unknown Objects via Sparse Identification of Unmodeled Dynamics," *Journal of Mechanical Science and Technology*, 2025.

[J17] J. Park, Y. Shin*, and **S. Kim***, "Object-Aware Impedance Control for Human-Robot Collaborative Task with Online Object Parameter Estimation," *IEEE Transactions on Automation Science and Engineering*, Vol. 22, pp. 8081–8094, 2024. (*: Co-corresponding authors)

[J16] S. Park†, L. Park†, S. Lee†, and **S. Kim**, "Whole-body Control of Redundant Hybrid Cable-Driven Robot with Manipulator: Hierarchical Quadratic Programming Approach," *Nonlinear Dynamics*, Vol. 112, pp. 20047–20062, 2024. (†: Co-first authors)

[J15] J. Wang, **S. Kim**, T. S. Lembono, W. Du, J. Shim, S. Samadi, K. Wang, V. Ivan, S. Calinon, S. Vijayakumar, and S. Tonneau, "Online Multi-Contact Receding Horizon Planning via Value Function Approximation," *IEEE Transactions on Robotics*, Vol. 24, 2024.

[J14] R. Ranjan, D. Shin, Y. Jung, **S. Kim**, J-H. Yun, C-H. Kim, S. Lee, and J. Kye, "Comparative Analysis of Integrated Filtering Method Using UWB Localization in Indoor Environments," *Sensors*, 2024.

[J13] T. Choi, J. Park, J. Bak, D. Park, H. Seo, and **S. Kim**, "The Development of Software to Automate the Laser Welding of a Liquefied Natural Gas Cargo Tank Using a Mobile Manipulator," *Applied Sciences*, Vol. 14, No. 1, 2024.

[J12] J. Kim, J-G. Kim, J. Park, B-K. Han, **S. Kim***, and D. Park*, "Dual-Arm Path-Planning Algorithm for Wiring Harness Assembly Using Redundantly Actuated Robotic Systems," *IEEE Access*, 2023. (*: Co-corresponding authors)

[J11] K. Jang, **S. Kim***, and J. Park*, "Motion Planning of Mobile Manipulator for Navigation Including Door Traversal," *IEEE Robotics and Automation Letters*, Vol. 8, No. 7, pp. 4147–4152, 2023. (*: Co-corresponding authors)

[J10] K. Jang, **S. Kim***, S. Park, J. Kim, and J. Park, "Weighted Hierarchical Quadratic Programming: Assigning Individual Joint Weights for Each Task Priority," *Intelligent Service Robotics*, 2022. (**Best Journal Paper Award**)

[J9] S. Hong, K. Jang, **S. Kim**, and J. Park, "Regularized Hierarchical Quadratic Program for Real-Time Whole-Body Motion Generation," *IEEE/ASME Transactions on Mechatronics*, Vol. 26, No. 4, Aug. 2021.

[J8] J. Sim, S. Kim, S. Park, **S. Kim**, M. Kim, and J. Park, "Design of JET Humanoid Robot with Compliant Modular Actuators for Industrial and Service Applications," *Applied Sciences*, Vol. 11, No. 13, Jul. 2021.

[J7] Y. Lee, **S. Kim**, J. Park, N. Tsagarakis, and J. Lee, "Whole-body Control Framework based on the Operational Space Formulation under Inequality Constraints via Task-oriented Optimisation," *IEEE Access*, Vol. 9, pp. 39813–39826, Mar. 2021.

[J6] K. Jang, **S. Kim**, and J. Park, "Reactive Self-Collision Avoidance for a Differentially Driven Mobile Manipulator," *Sensors*, Vol. 21, No. 3, Feb. 2021.

[J5] **S. Kim**, M. Kim, J. Kim, S. Kim, and J. Park, "Grasping Force Prediction by EMG Signals and Arm Posture: Tensor Decomposition Based Approach," *Journal of Bionic Engineering*, Vol. 16, No. 3, pp. 455–467, May 2019.

[J4] **S. Kim**, K. Jang, S. Park, Y. Lee, S. Y. Lee, and J. Park, "Continuous Task Transition

Approach for Robot Controller based on Hierarchical Quadratic Programming," *IEEE Robotics and Automation Letters* (with ICRA 2019), Vol. 4, No. 2, pp. 1603–1610, May 2019.

[J3] **S. Kim**, M. Kim, J. Lee, S. Hwang, J. Chae, B. Park, H. Cho, J. Sim, J. Jung, H. Lee, S. Shin, M. Kim, W. Choi, Y. Lee, S. Park, J. Oh, Y. Lee, S. Lee, M. Lee, S. Yi, K. Chang, N. Kwak, and J. Park, "Team SNU's Control Strategies to Enhancing Robot's Capability: Lessons from the DARPA Robotics Challenge Finals 2015," *The DARPA Robotics Challenge Finals: Humanoid Robots to the Rescue*, Springer, pp. 347–379, Apr. 2018.

[J2] **S. Kim**, M. Kim, J. Lee, S. Hwang, J. Chae, B. Park, H. Cho, J. Sim, J. Jung, H. Lee, S. Shin, M. Kim, W. Choi, Y. Lee, S. Park, J. Oh, Y. Lee, S. Lee, M. Lee, S. Yi, K. Chang, N. Kwak, and J. Park, "Team SNU's Control Strategies to Enhancing Robot's Capability: Lessons from the 2015 DARPA Robotics Challenge Finals," *Journal of Field Robotics*, Vol. 34, No. 2, pp. 359–380, Mar. 2017.

[J1] **S. Kim**, M. Kim, J. Lee, and J. Park, "Robot Hand Synergy Mapping Using Multi-factor Model and EMG signal," *International Symposium on Experimental Robotics 2014*, Springer, pp. 671–683, Nov. 2015.

Conference Articles

[C22] M. Park, T. Jung, **S. Kim**, and Y. Cho, "Seek, Don't Avoid: Radiation-Guided Exploration for Early Contamination Discovery," *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)*, 2026.

[C21] S. Lee and **S. Kim**, "Manifold-Constrained MPPI: Real-Time Sampling-Based Control Under Hard Equality Constraints," *The 26th International Conference on Control, Automation, and Systems (ICCAS)*, 2026.

[C20] L. Park, J. Hong, and **S. Kim**, "GRACE: Gradient-Free Robot Action Generation via Combined Diffusion-MPPI Posterior Estimation," *IEEE International Conference on Automation Science and Engineering (CASE)*, Work-in-Progress, 2026.

[C19] D. Park, B. Pak, and **S. Kim**, "Wrench-Feasible Whole-Body Planning via Time-Layered DAG Optimization for Omnidirectional Aerial Manipulation," *IEEE International Conference on Robotics and Automation (ICRA)*, Late Breaking Results, 2026.

[C18] H. Cho, B. Pak, and **S. Kim**, "Tool-Aware Task and Motion Planning with Dynamic Tool Changing for Automated Chemistry," *The 3rd Emerging Technologies in Mechanical Engineering*, 2025.

[C17] M. Park, D. Cho, **S. Kim**, and Y. Cho, "CUTE-Planner: Confidence-aware Uneven Terrain Exploration Planner," *International Conference on Space Robotics (iSpaRo)*, 2025.

[C16] L. Park, K. Jang*, and **S. Kim***, "CSC-MPPI: A Constrained MPPI Framework with DBSCAN for Reliable Obstacle Avoidance," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2025. (*: Co-corresponding authors)

[C15] S. Lee, **S. Kim**, and K. Jang, "Inverse Kinematics Solution to Mobile Manipulator Considering Stability Constraint and Force Manipulability," *The 11th Asian Conference on Multibody Dynamics (ACMD)*, 2024.

[C14] H. Kim, **S. Kim***, and J. Park*, "Enhanced Online Parameter Estimation of Unknown Objects via Sparse Identification of Unmodeled Dynamics," *The 11th Asian Conference on Multibody Dynamics (ACMD)*, 2024. (**Best Poster Award**)

[C13] H. Kim, **S. Kim**, and J. Park, "Nonlinear Identification of Unknown Object Dynamics for Human-Robot Collaborative Tasks," *The 21st International Conference on Ubiquitous Robots (UR)*, 2024.

[C12] R. Rahul, Y. Jung, D. Shin, **S. Kim**, C. Kim, S. Lee, and J. Kye, "Improving Indoor Positioning Systems with UWB and Filtering Techniques: A Comparative Analysis," *The 23rd International Conference on Control, Automation and Systems (ICCAS)*, 2023.

[C11] C. Youn, W. Youn, **S. Kim**, J. Park, and Y. Shin, "Efficient Traversability Mapping Based on Single Camera and 3D LiDAR," *The 18th International Conference on Intelligent Autonomous Systems (IAS)*, 2023.

[C10] J. Wang, T. S. Lembono, **S. Kim**, S. Calinon, S. Vijayakumar, and S. Tonneau,

"Learning to Guide Online Multi-Contact Receding Horizon Planning," *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Kyoto, Japan, 2022.

[C9] J. Wang, **S. Kim**, S. Vijayakumar, and S. Tonneau, "Multi-Fidelity Receding Horizon Planning for Multi-Contact Locomotion," *IEEE-RAS International Conference on Humanoid Robots (Humanoids)*, Munich, Germany, 2021.

[C8] **S. Kim**, K. Jang, S. Park, Y. Lee, S. Y. Lee, and J. Park, "Whole-body Control of Nonholonomic Mobile Manipulator Based on Hierarchical Quadratic Programming and Continuous Task Transition," *IEEE International Conference on Advanced Robotics and Mechatronics (ARM)*, Osaka, Japan, 2019. (**Best Conference Paper Award**)

[C7] **S. Kim**, J. Kim, and J. Park, "Real-time Inverse Kinematics Technique for Controlling Humanoid Avatar with Redundant Arm," *Ubiquitous Robots (UR)*, Hawaii, USA, 2018.

[C6] M. Kim, J. Kim, **S. Kim**, J. Sim, and J. Park, "Disturbance Observer based Linear Feedback Controller for Compliant Motion of Humanoid Robot," *IEEE International Conference on Robotics and Automation (ICRA)*, Australia, 2018.

[C5] M. Kim, **S. Kim**, and J. Park, "Human Motion Imitation for Humanoid by Recurrent Neural Network," *The 13th International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, Xian, China, 2017.

[C4] J. Jung, J. Kim, **S. Kim**, W. Kwon, S. Na, K. Kim, J. Lee, G. Suh, and J. Park, "Application of Robot Manipulator for Cardiopulmonary Resuscitation," *International Symposium on Experimental Robotics (ISER) 2016*, Springer, 2017.

[C3] **S. Kim**, M. Kim, J. Lee, S. Hwang, J. Chae, B. Park, H. Cho, J. Sim, J. Jung, H. Lee, S. Shin, M. Kim, N. Kwak, Y. Lee, S. Lee, M. Lee, S. Yi, K. Chang, and J. Park, "Approach of Team SNU to the DARPA Robotics Challenge Finals," *IEEE-RAS International Conference on Humanoid Robots (Humanoids)*, Seoul, Korea, 2015.

[C2] M. Schwartz, S. Hwang, Y. Lee, J. Won, **S. Kim**, and J. Park, "Aesthetic Design and Development of Humanoid Legged Robot," *IEEE-RAS International Conference on Humanoid Robots (Humanoids)*, Madrid, Spain, 2014.

[C1] **S. Kim**, C. Lee, and J. Ryu, "Data-driven Haptic Rendering of Friction between Surgical Device and Trocar for Laparoscopic Surgery Simulator," *ACCAS*, Busan, Korea, 2010.

Funded Projects

Total Research Funding: Over 8 Billion KRW (approx. 5.8M USD)

- *Since joining Kyung Hee University in March 2023, secured over 7 Billion KRW in government grants and 1.2 Billion KRW in industry projects and technology transfers.*

Government Grants

[G29] **MSS Scale-up TIPS Grant**, "Whole-body control of semi-humanoid dual-arm robots for heavy-object transport," Co-PI (2026–2029).

[G28] **Gyeonggi RISE Center**, "Behavior-tree-based fault-responsive off-road autonomous driving software," PI (2026).

[G27] **KRISO Grant**, "Physical AI-based integrated control for maritime multi-DOF robots," PI (2026).

[G26] **RDA Grant**, "Fruit-farming behavior-mimicking learning control and agricultural robot standardization," Co-PI (2026–2030).

[G25] **NRF Promising Researcher Grant**, "Hybrid Physical AI framework combining generative policies and MPC: from manipulator control to whole-body humanoid control," PI (2026–2030).

[G24] **BK21 Grant**, "Problem-solving innovative talent cultivation for person-centered elderly service-tech based on super-aged society platform," Participating Researcher (2026–2027).

[G23] **Gyeonggi RISE Center**, "SW development of off-road navigation algorithms for autonomous vehicles," PI (2025–2026).

[G22] **MOTIE Grant**, "Development of high-DOF lightweight humanoid hands for high-precision manipulation equipped with ultra-compact 3D proximity sensors," Co-PI (2025–2028).

[G21] **KIRIA Grant**, "Early demonstration and commercialization feasibility of AI bipedal humanoids," PI (2025).

[G20] **Kyung Hee Univ.**, "2.5D autonomous navigation via RGB and LiDAR sensor fusion," PI (2025).

[G19] **MSIT Global TOP Strategy Grant**, "Self-growing AI Humanoids Strategy Research Group," Sub-project PI (2025–2030).

[G18] **MOTIE Grant**, "Virtualization device demonstration technology for Digital Twin (National Robot Test Field)," Co-PI (2025–2028).

[G17] **WISET Grant**, "AI-based multi-modal interface for robot teleoperation for users with physical constraints," Advisor (2025).

[G16] **KBSI Grant**, "Humanoid robot-based research infrastructure for future technology exploration," PI (2025–2026).

[G15] **TIPA Grant**, "AI technology for autonomous material discovery systems for next-gen material innovation," Co-PI (2024–2027).

[G14] **NRF STEAM Grant**, "Humanoid avatar robots with human-level multi-modal sensing and remote manipulation interfaces," Co-PI (2024–2028).

[G13] **NRF Global BRL Grant**, "Job innovation in aging society: Shared control for elder-customized robots via multi-modal interfaces," Co-PI (2024–2026).

[G12] **KARA Grant**, "Development of 2.5D autonomous navigation technology," PI (2024).

[G11] **Kyung Hee Univ.**, "AGV SW for commercial EV battery swapping service demonstration," PI (2024).

[G10] **MOTIE Grant**, "Virtual environment platform for robots reflecting real-world parameters for precision assembly," Co-PI (2024–2027).

[G9] **NRF STEAM Grant**, "Humanoid avatar robots with human-level multi-modal sensing (Pre-planning)," Co-PI (2024).

[G8] **MSS Grant**, "Autonomous Mobile Robot (AMR) for commercial EV battery swapping subscription service," Sub-project PI (2024–2025).

[G7] **Kyung Hee Univ.**, "HCDR controller development using MPPI," PI (2024).

[G6] **KNCPC Grant**, "Subscription service demonstration for remanufactured batteries using swapping technology," Co-PI (2023).

[G5] **Kyung Hee Univ.**, "Humanoid robot gripper for multi-object grasping (LINC 3.0)," PI (2023).

[G4] **NRF STEAM Pioneer Grant**, "Self-growing heterogeneous swarm robots for continuous autonomous planetary exploration," Co-PI (2023–2025).

[G3] **NRF Grant**, "Human-robot and robot-robot collaboration for transporting objects of various sizes," PI (2023–2025).

[G2] **TIPA Grant**, "Unmanned robot cafe solution for 100 million beverage recipes," PI (2022–2023).

[G1] **MOTIE Grant**, "Human-robot collaborative disassembly for recycling multi-type EV battery packs," PI (2022–2023).

Industry & Research Institute Grants

[GI24] **KIMM**, "Motion-control software for mobile humanoids," PI (2026).

[GI23] **PIE Robotics**, "Motion planning for autonomous manufacturing processes," PI (2026).

[GI22] **Roboe Technologies**, "Motion-planning algorithms for cargo handling," PI (2026).

[GI21] **KairosLab**, "VLM-based control for chemical laboratory automation," PI (2026).

[GI20] **ENOZ**, "Consulting on humanoid education," PI (2026).

[GI19] **MetaMotionX**, "Autonomous path-generation software," PI (2026).

[GI18] **KIST**, "Motion and optimal path planning/control for autonomous smart farm harvest manipulators," PI (2026).

[GI17] **KIMM**, "Humanoid simulation for complex locomotion," PI (2025).

[GI16] **T-Robotics**, "Autonomous control SW for Dual Steering AGV," PI (2025–2026).

[GI15] **Ponylink**, "Core autonomous navigation technologies for quadruped robots," PI (2025–2026).

[GI14] **T-Robotics**, "Control functionality for mobile-based humanoids," PI (2025–2026).

[GI13] **KairosLab**, "LLM-based task generator for autonomous experiments," PI (2025).

[GI12] **KICT**, "Calculator simulator for bridge inspection robot position control," PI (2025).

[GI11] **FunctionBay**, "Autonomous path generation software development," PI (2025).

[GI10] **KHNP**, "Radiation-hardened design and emergency response for nuclear power plant robots," Sub-project PI (2024–2027).

[GI9] **HL Mando**, "Local Path Planning for outdoor mobile robots," PI (2024).

[GI8] **HL Mando**, "Traversability Estimation for outdoor patrol robots," PI (2024).

[GI7] **Hanwha Aerospace**, "[Confidential Project Title]," Co-PI (2024).

[GI6] **KIMM**, "Robot torque control modeling for intelligent connector assembly/disassembly," PI (2024).

[GI5] **KICT**, "Modification and modularization of bridge inspection robot position control calculator," PI (2024).

[GI4] **KRRI**, "Core technologies of mobile robots for railway integration," PI (2023).

[GI3] **KIMM**, "Topology-based task sequence generation SW for LNG cargo tanks," PI (2023).

[GI2] **KIMM**, "HRI-based safety collision software," PI (2023).

[GI1] **KIMM**, "Master controller for ROS integration of flexible cable systems," PI (2023).

Technology Transfers

[GT9] **PIT-IN**, "LiDAR-based mobile robot docking technology," PI (2026).

[GT8] **MetaMotionX**, "MPPI and RPP autonomous navigation algorithms for off-road driving," PI (2025).

[GT7] **MetaMotionX**, "RGB-LiDAR based segmentation algorithm SW," PI (2025).

[GT6] **PIT-IN**, "ROS2-based Traversability Estimation and autonomous driving technology," PI (2024).

[GT5] **Robros**, "Humanoid robot gripper manipulation via Deep Reinforcement Learning," PI (2023–2024).

[GT4] **Wonik Robotics**, "ROS1-based automatic precision parking algorithms," PI (2023).

[GT3] **ROTAL**, "ROS2-based autonomous mobile robot operation technology," PI (2023–2024).

[GT2] **Wonik Robotics**, "Autonomous navigation for Mecanum-wheel robots via ROS1," PI (2023).

[GT1] **ROAS**, "Manufacturing process solutions based on mobile manipulation," PI (2022).

Patents

International

[IP1] **S. Kim** et al., "Automatic Cardiopulmonary Resuscitation Device and Control Method Therefor," US Patent 20190029919A1, CN Patent 108697572A, EU Patent 3409258A1, 2019.

Korea — Registered Patents

[PR5] **S. Kim**, J. Yang, and M. Kang, "Docking System and Method for LiDAR-based Mobile Robot," Korea Patent Registration No. 10-2924819, Feb. 04, 2026.

[PR4] **S. Kim** et al., "Track Wheel for Mobile Robot and Mobile Robot Including the Same," Korea Patent Registration No. 10-2603028, Nov. 13, 2023.

[PR3] **S. Kim** et al., "Modular Robot and Control Method Thereof," Korea Patent Registration No. 10-2459965, Oct. 24, 2022.

[PR2] **S. Kim** et al., "Apparatus for Automatic Cardiovascular Pulmonary Resuscitation," Korea Patent Registration No. 10-2016-0172286, 2016.

[PR1] **S. Kim**, J. Park, M. Kim, J. Lee, J. Kwon, and B. You, "Apparatus for Estimating Grasping Posture and Grasping Force," Korea Patent Registration No. 10-2016-0075150, 2016.

Korea — Patent Applications (Pending)

[PA6] **S. Kim** and M. Kang, "Riemannian Barrier Metric-based Motion Planning System and Method," Korea Patent Application No. 10-2026-0113538, Jun. 22, 2026.

[PA5] **S. Kim**, J. Hong, E. Kang, and Y. S. Shin, "Instance-level Semantic Map-based Natural Language Navigation Device and Method," Korea Patent Application No. 10-2026-0075610, Apr. 27, 2026.

[PA4] **S. Kim**, H. Cho, and B. Pak, "Apparatus and Method for Autonomous Chemical Experiments," Korea Patent Application No. 10-2026-0025745, Feb. 09, 2026.

[PA3] **S. Kim**, J. Kim, and H. Kim, "Digital Twin Simulation Alignment Improvement System and Method Using Data-driven Friction Model," Korea Patent Application No. 10-2025-018032, Nov. 25, 2025.

[PA2] **S. Kim**, K. Jang, and L. Park, "Obstacle Avoidance Path Generation Apparatus and Method Using Sample Correction and Density-based Clustering," Korea Patent Application No. 10-2025-0119564, Aug. 26, 2025.

[PA1] **S. Kim**, S. Lee, L. Park, and S. Park, "Whole-body Control System and Method for Hybrid Cable-Driven Robot with Manipulator," Korea Patent Application No. 10-2024-0090023, Jul. 09, 2024.

Software Copyrights

[SW2] **S. Kim**, T. Jung, E. Song, W. Seol, Y. Seo, and S. Lee, "Autonomous Driving Simulation Program for Radiation Mapping," Korea Program Registration, 2025.

[SW1] **S. Kim** and J. Yang, "Autonomous Driving Simulation Program for Lunar Exploration," Korea Program Registration No. C-2024-026248, Jul. 29, 2024.

Honors and Awards

[A14] **Excellence Paper Award**, Dynamics, Control and Robotics Division, Korean Society of Mechanical Engineers 2026

[A13] **Best Achievement Award**, Humanoid Demonstration Challenge, Korea Institute for Robot Industry Advancement (KIRIA) 2026

[A12] **JMST Outstanding Contribution Award**, Korean Society of Mechanical Engineers 2025

[A11] **Ministerial Award** (Grand Prize), Ministry of Trade, Industry and Energy (MOTIE) 2025
(2025 Industry-Academy Project Challenge)

[A10] **JMST Outstanding Contribution Award**, Korean Society of Mechanical Engineers 2025

[A9] **Best Poster Award**, The 11th Asian Conference on Multibody Dynamics (ACMD) 2024

[A8] **Best Paper Award (2nd Place)**, Intelligent Service Robotics Journal 2023

[A7] **Young Researcher Award**, Korea Robotics Society Annual Conference (KRoC) 2023

[A6] **Top 100 National R&D Excellence**, Ministry of Science and ICT (MSIT) 2022

[A5] **Young Researcher Award**, Institute of Control, Robotics and Systems (ICROS) 2022

[A4] **Best Thesis Award**, Seoul National University 2020

[A3] **Best Conference Paper Award**, IEEE Int. Conf. on Advanced Robotics and Mechatronics 2019

[A2] **Best Journal Paper Award**, Journal of Korea Robotics Society (JKROS) 2018

[A1] **Cum Laude**, Mechanical Engineering, Seoul National University 2012

Professional Activities

- **Editorial services**
  - Journal of Mechanical Science and Technology (JMST), Associate Editor (2024–2027)
  - IEEE Int. Conf. on Robotics and Automation (ICRA), Associate Editor (2025–2026)
  - IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS), Associate Editor (2024–2026)
- **Organizers**
  - IEEE-RAS Int. Conf. on Humanoid Robots (Humanoids), Organizing Committee (2025)
  - Korea Robotics Society Annual Conference (KRoC), Organizing Committee (2025)
  - The 11th Asian Conference on Multibody Dynamics (ACMD), Organizing Committee (2024)
  - ICROS Annual Conference, Organizing Committee (2024)
- **Reviewers (selected only)**
  - Journals: T-RO, RA-L, T-ASE, TMECH, T-II, Nonlinear Dynamics, Intelligent Service Robotics, JMST
  - Conferences: ICRA, IROS, Humanoids, CASE, UR
- **Memberships**
  - Member (2023–present), Korea Robotics Society (KROS)
  - Member (2020–present), Korean Society of Mechanical Engineers (KSME)
  - Member (2020–present), Institute of Control, Robotics and Systems (ICROS)
  - Member (2012–present), IEEE and IEEE Robotics and Automation Society

References

Available upon request