JEONGHYEON KIM

M.S. Student, Mechanical Engineering, Korea University

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Robotics researcher focused on **control-oriented dynamics modeling** and **whole-body control** for legged and humanoid robots, with experience in reinforcement learning, robot perception, and real-time ROS 2 systems.

Education

Korea University — **Seoul, Republic of Korea**

M.S. in Mechanical Engineering; Advisor: Prof. Shinsuk Park; GPA: 3.78/4.0 — *Mar. 2025 – Feb. 2027 (Expected)*

Korea University — **Seoul, Republic of Korea**

B.S. in Mechanical Engineering; GPA: 3.48/4.0 — *Mar. 2019 – Feb. 2025*

Research Experience

Balance-Aware Whole-Body Control for Humanoid Standing Manipulation *Mar. 2025 – Present*

Human-Machine Systems Lab, Korea University

- Developed a physics-informed **Balance Demand Descriptor (BDD)** from centroidal dynamics to encode the direction and magnitude of lower-body balance demand induced by upper-body motion, payloads, and external interaction.
- Integrated BDD into a reinforcement-learning locomotion policy to promote stance-consistent mitigation and direction-appropriate corrective stepping under continuous upper-body demand.

Visual Perception for Quadrupedal Object Interaction *Mar. 2025 – Nov. 2025*

Human-Machine Systems Lab, Korea University

- Built a ROS 2 dual-camera system to track a ball and moving ArUco markers across fixed global and onboard views, transforming observations into a common coordinate frame for robust target localization.

Real-Time Architecture for a Generative-AI-Based Mobile Manipulator *Mar. 2025 – Aug. 2026*

Human-Machine Systems Lab, Korea University

- Designed a ROS 2 architecture connecting simulation, an LLM, a user interface, and a physical robot; implemented edge-based data collection and cloud synchronization without interrupting the real-time control cycle.

Quadruped Robot Obstacle Avoidance *Mar. 2024 – Feb. 2025*

Undergraduate Researcher, Human-Machine Systems Lab, Korea University

- Developed an ORB-SLAM- and UV-disparity-based quadruped navigation pipeline for localization, obstacle detection, and avoidance; presented the work at the KSPE 2025 Spring Conference.

Selected Publications & Manuscripts

H.-Y. Ju, **J.-H. Kim**, and S.-S. Park, "A Study on Improving Sim-to-Real Accuracy through Dynamics Parameter Tuning in Reinforcement Learning-based Mapless Navigation," *Journal of Institute of Control, Robotics and Systems*, accepted, 2026.

J.-H. Kim and S.-S. Park, "Feasible Is Not Faithful: Intent-Preserving Constraint Realization for Contact Tasks on Unknown Surfaces," *IEEE Robotics and Automation Letters*, submitted, Nov. 2026. Preprint on arXiv.

J.-H. Kim, J. Kim, and S.-S. Park, "Hold Before You Step: IMU-Resolved Disturbance Estimation for In-Place Push Recovery on Force-Sensorless Humanoids," manuscript in preparation. Preprint on arXiv.

J.-H. Kim and S.-S. Park, "Balance Demand Descriptor: A Physics-Informed Representation of Whole-Body Dynamics for Humanoid Standing Manipulation," manuscript in preparation.

J.-H. Kim and S.-S. Park, "Obstacle Detection Using ORB-SLAM and UV-Disparity with a Low-Cost Quadruped Robot," *KSPE 2025 Spring Conference*, May 2025.

Technical Skills

Programming	Python, C/C++, MATLAB
Robotics & Learning	ROS 2, PyTorch, reinforcement learning, Pinocchio, URDF/XACRO
Simulation & Optimization	Isaac Gym, Isaac Sim, MuJoCo, Gazebo, CVXPY, CasADi
Perception & Development	OpenCV, ORB-SLAM, Git, Linux/Ubuntu

Honors & Research Support

Master's Research Encouragement Grant, National Research Foundation of Korea 2025
President's Award, Creative Challenger Program, Korea University Jan. 2025