SEOKHYUN KIM

Robotics Researcher, Pittsburgh, PA
+1 412-592-2234 ⋄ hyun10028@gmail.com

EDUCATION

Carnegie Mellon University Aug. 2025 - Present
Master of Mechanical Engineering, GPA: 4.0 (Current) Pittsburgh, PA, USA

Tohoku University April 2019 - March 2025
Bachelor of Electrical Engineering, GPA: 3.4 Sendai, Miyagi, Japan

RESEARCH EXPERIENCE

Microrobotics Lab Sept. 2025 - Present
Graduate Research (Carnegie Mellon University)

- Designed and fabricated a 33 g untethered quadruped robot, integrating custom PCBs, DC motors, sensors, and onboard electronics
- Investigated motor current as proprioceptive feedback to overcome sensing limitations in miniature robotic platforms
- Developed an MLP-based classifier to estimate leg stance and swing phases using motor current measurements, eliminating the need for additional contact sensors
- Developing a closed-loop gait controller using estimated foot-ground contact events to regulate inter-leg coordination

Biorobotics Lab Feb. 2026 - Present
Graduate Research Assistant (Carnegie Mellon University)

- Implemented VINS-Fusion for visual-inertial state estimation of an underwater snake robot to collect motion data for system identification
- Designed waterproof enclosures and sealing solutions to protect onboard electronics, sensors, and electrical connections
- Developing a thruster-free underwater snake robot that generates propulsion through bio-inspired body undulation
- Investigating actuator integration and mechanical design to enable reliable articulated motion in underwater environments

Real-World Computing Lab Dec. 2023 - June 2025
Undergraduate Research Assistant (Tohoku Univeristy)

- Investigated biological principles of quadruped locomotion through mathematical modeling of limb coordination
- Developed decentralized locomotion controllers using central pattern generators (CPGs) and local sensory feedback
- Modeled interactions between neural oscillators and sensory feedback to study intra-limb and inter-limb coordination
- Demonstrated emergent gait patterns through numerical simulations without prescribing fixed phase relationships between limbs

PROJECTS

Feline Self-Righting Reflex Robot

- Designed and fabricated a robot integrating a 2-DOF articulated spine and 1-DOF actuated tail to achieve aerial self-righting
- Trained reinforcement learning controllers in MuJoCo and deployed them on physical hardware for zero-shot sim-to-real transfer
- Experimentally evaluated the contribution of tail actuation to feet-first landing performance across different initial body orientations

Geometric Mechanics of Locomotion

- Reproduced simulations from *Nonconservativity and Noncommutativity in Locomotion* to study geometric principles of robot locomotion
- Modeled how changes in body shape generate robot movement using geometric mechanics
- Simulated snake robot gaits to predict and visualize locomotion resulting from cyclic body motions

Additional Projects

- **Modern Control Theory:** PID, LQR, MRAC controllers; EKF SLAM; A* planning on autonomous vehicles and quadrotors in Webots
- **Self-Balancing Motorcycle:** Reaction-wheel-based balancing control; mechanical design and prototyping; real-time visualization and adjustable control parameters
- **Introduction to AI/ML:** ML-based prediction of optimal material distributions under varying loading conditions; structural performance evaluation using stress-field visualization
- **Volumetric LED Display:** High-speed rotating platform with continuous power delivery; programmed LED synchronization for 3D visualization

PUBLICATIONS

Kim, S., Sawada, G., Maeda, S., Hattori, S., Suzuki, S., Yasui, K. and Ishiguro, A., "Decentralized Intra-Limb Coordination Mechanisms Toward Whole-Body Coordinated Quadruped Locomotion," 2025 Adaptive Motion of Animals and Machines (AMAM): Embodied Intelligence in Biology and Robotics

Sawada, G., **Kim, S.**, Suzuki, S., Yasui, K., Fukuhara, A. and Ishiguro, A., "A Simple Head-Trunk-Limb Coordination Control Capable of Three Types of Quadruped Galloping," 2025 SICE Festival with Annual Conference (SICE FES)

Kim, S., Hwang, J., Choi, I., Lee, C., Lee, K., Jung, S., Williamson, A. and Webster-Wood. V., "Meow-Mentum: A Multi-Strategy Aerial Self-Righting Robot for Evaluating the Contribution of an Actuated Tail Across Fall Conditions," 2027 International Conference on Robotics and Automation (ICRA) - (Submitted)

SKILLS

Programming languages: Python, C++, C, Matlab
Software: CAD (SolidWorks, Onshape, Fusion), MuJoCo, Arduino, KiCAD, OpenCV, PyTorch, ROS 1
Fabrication: CNC Machining, 3D Printing (FDM, SLA), Laser Cutting, Milling, Soldering, PCB Assembly
Languages: English (Fluent), Japanese (Fluent), Korean (Native)

AWARDS

Korea-Japan Joint Government Scholarship Program: Awarded a full scholarship covering tuition and living expenses for four years of undergraduate study at Tohoku University