

Curriculum Vitae/Resume

WOOSONG KANG | PH.D. STUDENT | ROBOTICS RESEARCHER | KAIST SCHOOL OF COMPUTING

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Research Interests

Humanoid Whole-Body Control	Coordinated and robust control of humanoid locomotion and manipulation.
Learning-Based Robot Control	Reinforcement and imitation learning for adaptive whole-body behaviors and motion tracking.
Legged Robot Locomotion	Agile and stable locomotion for bipedal, quadrupedal, and wheeled-legged robots.
Motion Generation and Adaptation	Task-conditioned generation, retargeting, and adaptation of whole-body reference motions.
Model-Based and Actuator-Aware Control	Dynamics-based optimization and actuator-aware control for accurate and feasible robotic motions.

Education

Korea Advanced Institute of Science and Technology(KAIST)

Ph.D in Computer Science

Daejeon, Republic of Korea

2026 - present

- Robust Intelligence and Robotics Lab (RIRO), Prof. Daehyung Park
- Focus : Humanoid Robot, Whole-body Control, Imitation/Reinforcement Learning, Human-aware Navigation

Daegu Gyeongbuk Institute of Science and Technology(DGIST)

Daegu, Republic of Korea

M.S in Robotics Engineering

2019 - 2021

- Motion Control Lab (MCL), Prof. Sehoon Oh
- **Thesis title:** Development and Control of High Driving-Force Quadruped Robot
- Focus : Quadruped Robot, Leg Locomotion, Series Elastic Actuator(SEA), Torque Control

Daegu Gyeongbuk Institute of Science and Technology(DGIST)

Daegu, Republic of Korea

Bachelor of Engineering

2015 - 2019

University of California, Berkeley

Berkeley, CA

Visiting Student

July. 2016 - Aug. 2016

Research Experience

Korea Advanced Institute of Science and Technology (KAIST)

Daejeon, Republic of Korea

Research Assistant

2026 - Present

- **Project: Humanoid Whole-Body Teleoperation Pipeline**
- Designed and implemented an Isaac Sim-based teleoperation environment for whole-body humanoid motion control and data collection.
- Developed a human-to-robot motion-retargeting pipeline that generates whole-body joint references for real-time humanoid teleoperation.
- Enabled demonstration data collection on both simulated and real humanoid robots through an integrated teleoperation and retargeting workflow.
- **Technical Skills:** Motion retargeting, Whole-body control, Isaac Sim, Isaac Lab, and Real-robot deployment.
- **Project: IROS 2026 Humanoid IKEA Assembly Challenge**
- Developing a precise base-positioning method that aligns the humanoid robot with manipulation targets according to task-specific reference poses.
- Training and evaluating vision-language-action (VLA) policies for learning and executing humanoid manipulation skills from demonstration data.
- Working on integrating reinforcement learning-based locomotion, precise positioning, and VLA-based manipulation for autonomous furniture assembly.
- **Technical Skills:** Reinforcement learning, Humanoid locomotion, Precise positioning, Vision-Language-Action models, and Manipulation policy learning.

Daegu Gyeongbuk Institute of Science and Technology(DGIST)

Research Assistant

2019 - 2020

- **Project :Development of High-Speed Running Multi-Legged Robot Using Back-Driveable Actuator System**
- Designed a quadruped robot platform with a waist actuator
- Proposed a novel running control algorithm for robot legs based on the SLIP model
- Enhanced force control performance algorithm for Series Elastic Actuators
- **Technical Skills:** Spring-Loaded Inverted Pendulum(SLIP) algorithm, Solidworks , LabVIEW based real-time experiments, MATLAB Simscape simulation , etc.
- **Project :Developing a variable exercise machine with the Tension Control Module**
- Designed an affordable high torque actuator module enabling force control to adapt to dynamic load changes during exercise
- Developed a control algorithm capable of adjusting load in response to user intent
- **Technical Skills:** High-Torque Actuator Development, Force Control Algorithm, etc.
- **Project : Development of Interworking modular Exo-suit Technology for Strength Support**
- Devised an auxiliary force control algorithm for enhancing the precision strength of SEA integrated into exosuits
- **Technical Skills:** Impedance Control, Harmonic Drive Ripple Compensation , Cogging Torque Compensation, etc.

Undergraduated Group Research Program(UGRP)

DGIST

Junior Student

Mar. 2017 - Dec. 2017

- **Project : Probabilistic Inference of Emotion in Text by Using Deep Learning Technology**
- Developed a deep learning algorithm for emotion analysis based on a seven-step emotion classification
- **Technical Skills:** Recurrent Neural Network(RNN) , Caffe Framework, etc.

Undergraduated Group Research Program(UGRP)

DGIST

Senior Student

Mar. 2018 - Dec. 2018

- **Project : Beginning and Significance of Scientific Skepticism**
- Analyzed case studies of pseudoscience and proposed methodologies for distinguishing pseudoscience
- **Technical Skills:** Writing Skill

Work Experience

KangZ Robotics

Sole Proprietor

2024 - 2025

- **Project : Real-Time Haptic-Robot Synchronization Algorithm**
- Implementing a virtual wall with force feedback to prevent a haptic device from penetrating the boundary.
- Synchronizing trajectory with the robot to control manipulator movement using inverse kinematics based on the haptic device's target position.
- **Technical Skills:** Geomagic Touch haptic force rendering, Inverse Kinematics Control, ROS-based real-time experiments, MATLAB simulation, etc.
- **Project : Coordinated Manipulator Control for Desired Tension**
- Performed tension control by utilizing the force of manipulators to achieve desired cable tension.
- **Technical Skills:** Tension Control, Inverse Kinematics Control, MATLAB simulation, Gripper force control, etc.

Korea Institute of Machinery and Materials(KIMM)

Full-time Researcher(Technical Research Personnel)

2021 - 2024

- **Project : Wheeled-Leg Robot Development and Locomotion Control**
- Designed a robot leg incorporating topology optimization to achieve desired linear trajectory
- Analyzed the jumping conditions of a robot and developed a control algorithm to enable it to jump to desired heights
- Developed a control algorithm enabling a robot to maintain balance and navigate through changing external environments
- Developed a takeoff-velocity matching and torque-optimized force trajectory controller for commanded-height jumping of a wheeled-bipedal robot
- **Technical Skills** Linear Quadratic Control(LQR), Spring-Loaded Inverted Pendulum(SLIP), Optimization, ROS-based real-time simulation/experiments, Reinforcement Learning Algorithm, etc.
- **Project : Dual Arm Robot Development and Control**
- Conducted manufacturing and validation experiments for a novel actuator
- Developed a Dual Arm Robot and implemented robot control to grasp cups and pour water by integrating grippers
- Exhibited at RobotWorld 2023
- **Technical Skills:** Dynamometer test, Inverse Kinematics Control, ROS-based real-time experiments, MATLAB simulation, etc.

- **Project : Quadrupedal Robot High-speed Running Locomotion Algorithm**
- Developed hopping and gait pattern generation algorithms for a quadruped robot
- Proposed new control algorithms for achieving high-speed running with estimated ground reaction forces
- **Technical Skills:** Sensorless Force Estimation Algorithm, LabVIEW based real-time experiments, MATLAB Simscape simulation , etc.

Publications

IN PREPARATION

PC-SureNAV:Preference-Conditioned Superpixel Graph-based Constraint Relaxation for Navigation in Over-constrained Environment

Woosong Kang, Hyungjin Kwon, Sehee Jeong, Keonyoung Koh, Injin Park, Daehyung Park

In Preparation (2026). IEEE, 2026

JOURNAL ARTICLES

Accurate Jumping Control of Wheeled-Bipedal Robots via Takeoff Velocity Matching and Torque-Optimized Force Trajectory

Woosong Kang, Jeongdo Ahn, Young Hun Lee, Jongwoo Park, InDong Hwang, Jongcheon Park, Dong Il Park

Robotics and Autonomous Systems (Under Review). Elsevier, Under Review

Iterative Periodic Running Control Through Swept Angle Adjustment With Modified SLIP Model

Woosong Kang, Jeil Jeong, Jeongwoo Hong, Changmin Yeo, Dong Il Park, Sehoon Oh

IEEE Robotics and Automation Letters (2024). IEEE, 2024

Robust Whole-Body Balance Control of Wheeled-Bipedal Robot for Perception-Less Terrain Adaptation

In Dong Hwang, Woosong Kang, Wonsuk Jung, Dong Il Park, Young Hun Lee

IEEE Access (2026). 2026

CONFERENCE PROCEEDINGS

Development of Rotating Workspace Ground Contact Force Observer for Legged Robot

Woosong Kang, Chan Lee, Sehoon Oh

2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2021

Transparent Torque Sensor-less Impedance Rendering for Low-cost Direct Drive Motor

Chan Lee, Sangjin Bae, Woosong Kang, Sehoon Oh

2020 IEEE 16th International Workshop on Advanced Motion Control (AMC), 2020

Ripple Minimization for Harmonic-gear Series Elastic Actuator under Force Control

Woosong Kang, Chan Lee, Sangjin Bae, Sehoon Oh

2020 IEEE 16th International Workshop on Advanced Motion Control (AMC), 2020

Implementation of Integrated Dual SLIP Dynamics for Sagittal plane motion of Quadruped Robot

Woosong Kang, Chan Lee, Sehoon Oh

International Conference on Control, Automation and Systems (ICCAS) (2020) pp. 280–283. 2020

POSTER PRESENTATION

Developing a Jumping Algorithm for Overcoming Obstacle in a Wheeled Bipedal Robot

Woosong Kang, Younghun Lee, Jongcheon Park, Chanhon Park, Dongil Park

The Korean Society of Manufacturing Technology Engineers(KSMTE) Annual Autumn Conference, 2023

Torque Ripple Estimation, Characterization and Compensation for High Torque BLDC Motor based on Multi-sine Function

Woosong Kang, Chan Lee, Sehoon Oh

19th International Conference on Control, Automation and Systems (ICCAS), 2019

Skills

Programming Python, C/C++, ROS, Matlab, LabVIEW

Simulator Matlab/Simulink, Simscape, NVIDIA IsaacSim/Lab, Gazebo, Raisim

Miscellaneous Linux, Git, Solid Works

Website

Personal Website(Portfolio) woosongkang.github.io