

Joon-Ha Kim

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Education

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| Korea Advanced Institute of Science and Technology
<i>Ph.D., Mechanical Engineering</i> <ul style="list-style-type: none">• Advisor: Hae-Won Park, Ph.D | Sep 2019 – Present
<i>Daejeon, Korea</i> |
| Korea Advanced Institute of Science and Technology
<i>M.S., Mechanical Engineering</i> <ul style="list-style-type: none">• Thesis: Real time A* adaptive Action Set Footstep Planning with Human Locomotion Energy Approximations considering Angle Difference for Heuristic Function• Advisor: Jun-Ho Oh, Ph.D | Feb 2017 – Feb 2019
<i>Daejeon, Korea</i> |
| Hanyang University
<i>B.S., Mechanical Engineering</i> | Mar 2013 – Feb 2017
<i>Seoul, Korea</i> |

Research Experience

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| Research Scientist
<i>Korea Advanced Institute of Science and Technology, Humanoid Research Center</i> <ul style="list-style-type: none">• Development of EtherCAT Communication Master (SOEM and Xenomai) and Slave Module (Microchip lan9252) | Mar, 2019 – Aug, 2019
<i>Daejeon, Korea</i> |
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Journal Publications

1. “STEP: State Estimator for Legged Robots Using a Preintegrated Foot Velocity Factor,” IEEE Robotics and Automation Letters, published online, 2022 – Yeeun Kim, Byeongho Yu, Eungchang Mason Lee, **Joon-Ha Kim**, Hae-Won Park, Hyun Myung
2. “Legged Robot State Estimation with Dynamic Contact Event Information,” IEEE Robotics and Automation Letters, published online, 2021 – **Joon-Ha Kim**, Seungwoo Hong, Gwanghyeon Ji, Seunghun Jeon, Jemin Hwangbo, Jun-Ho Oh, Hae-Won Park

Peer-reviewed International Conference Proceedings

1. “Contact-Implicit Differential Dynamic Programming for Model Predictive Control with Relaxed Complementarity Constraints,” 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022. – Gijeong Kim, Dongyun Kang, **Joon-Ha Kim**, Hae-Won Park
2. “DRPD, Compact Dual Reduction Ratio Planetary Drive for Actuators of Articulated Robots,” 2022 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022. – Tae-Gyu Song, Young-Ha Shin, Seungwoo Hong, Hyungho Chris Choi, **Joon-Ha Kim**, Hae-Won Park
3. “Design of KAIST HOUND, a Quadruped Robot Platform for Fast and Efficient Locomotion with Mixed-Integer Nonlinear Optimization of a Gear Train,” 2022 International Conference on Robotics and Automation (ICRA), 2022. – Young-Ha Shin, Seungwoo Hong, Sangyoung Woo, JongHun Choe, Harim Son, Gijeong Kim, **Joon-Ha Kim**, KangKyu Lee, Jemin Hwangbo, Hae-Won Park

4. “Monte Carlo Tree Search Gait Planner for Non-Gaited Legged System Control,” 2022 International Conference on Robotics and Automation (ICRA), 2022. – Lorenzo Amatiucci, **Joon-Ha Kim**, Jemin Hwangbo, Hae-Won Park
5. “Avoiding Obstacles during Push Recovery Using Real-Time Vision Feedback,” 2021 International Conference on Robot Intelligence Technology and Applications (RiTA), 2021. – Min-Gyu Kim, Seungwoo Hong, **Joon-Ha Kim**, Hae-Won Park
6. “Real-Time Constrained Nonlinear Model Predictive Control on SO(3) for Dynamic Legged Locomotion,” 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020. **Robocup Best Paper award**. – Seung-Woo Hong, **Joon-Ha Kim**, Hae-Won Park
7. “Avoiding Obstacles during Push Recovery Using Real-Time Vision Feedback,” 2019 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2019. – Hyobin Jeong, **Joon-Ha Kim**, Okkee Sim, Jun-Ho Oh

Domestic Conference Proceedings

1. “Real-time Bilateral Teleoperation with Electric and Hydraulic Actuator,” The Korea Robotics Society Annual Conference, 2021. – Yeseong Jeong, Seunghoon Shin, Soonpyo Kwon, Buyoun Cho, Sung Woo Kim, **Joon-Ha Kim**, Jun-Ho Oh, Hae-Won Park
2. “Design of Foothold Optimization Model for Controlling Legged Robots,” The Korea Robotics Society Annual Conference, 2021. – Mingyu Kim, Seungwoo Hong, **Joon-Ha Kim**, Hae-Won Park
3. “GPU Acceleration of Probabilistic Local Height Map that Resolves Race Condition,” The Korea Robotics Society Annual Conference, 2021. – Soonpyo Kwon, **Joon-Ha Kim**, Juwoong Byun, Hae-Won Park
4. “Footstep Planning with Energy Related Cost Functions Considering Angle Difference,” The Korea Robotics Society Annual Conference, 2019. – **Joon-Ha Kim**, Soonpyo Kwon, Jonghun Choe, Uiuk Jeong, Jun-Ho Oh
5. “Vision-based Continuous Footstep Planner over Uneven Terrain of the Humanoid Robot HUBO,” The Korea Robotics Society Annual Conference, 2018. – Moonyoung Lee, **Joon-Ha Kim**, Hyunmin Jo, Hyunsub Park, Dylan Wallace, Blake Hament, Minkyu Kim

Professional Activities

Reviewer

- Journals: IEEE Robotics and Automation Letters.
- Conferences: IEEE International Conference on Intelligent Robots and Systems, IEEE International Conference on Humanoid Robots, International Conference on Robot Intelligence Technology and Applications.

Awards & Honors

Outstanding Teaching Assistant Award

Korea Advanced Institute of Science and Technology, Mechanical Engineering

2021

IROS Best RoboCup Paper Award

IEEE IROS, RoboCup Federation

2020

Outstanding Teaching Assistant Award

Korea Advanced Institute of Science and Technology, Mechanical Engineering

2020

Specialized Skills

Main Programmer of "KAIST Hound" Quadruped Robot

Programming Languages: C, C++, Python, MATLAB

Low Level: Communication (EtherCAT, Serial, SPI), RTOS (Xenomai, Preempt RT, RedHawk),
MCU Programming (Microchip, MBED, Arduino)

Libraries: ROS, ROS2, Pytorch, Eigen

Research Interests

Legged Robot State Estimation, Optimal Control, Lie Algebra, Learning Based Control