

# Joon-Ha Kim

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## Education

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

## Research Experience

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

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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

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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. **IROS Best Robocup 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

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#### *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

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#### *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*

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**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*

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**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*

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