Jeeseop Kim

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Research Interests

   My primary academic interests span robotics, control theory, optimization, dynamical systems, and machine learning. My research goal is to establish a firm foundation that extends the state-of-the-art methods for designing resilient and intelligent control algorithms for a wide range of collaborative work. This overview includes but is not limited to 1) collaborative multi-agent systems with decentralized and distributed control policies, 2) autonomous robot control and planning for various applications, 3) agile robots without compromising safety features.

   My research has a clear blueprint from theoretical developments to experimental validations to achieve two specific objectives: 1) Creating algorithms to systematically design robust and intelligent controllers for high-dimensional and complex hybrid dynamical systems; and 2) Transferring the control framework into practice with a highly dynamic robot platform. These algorithms advance knowledge in the design of feedback controllers for dynamical models arising from various collaborative works that I target. The theoretical innovations also offer a unique opportunity to advance human-robot interaction, robotic legged locomotion, autonomous robot with safety features.

Education

Ph.D. in Mechanical Engineering   August, 2022
     Dissertation: Collaborative Locomotion of Quadrupedal Robots:
              From Centralized Predictive Control to Distributed Control
     Advisor: Prof. Kaveh Akbari Hamed
     Virginia Polytechnic Institute and State University, USA

M.S. in Intelligence and Information   March, 2017
     (previously Department of Transdisciplinary Studies (Program in Intelligent Systems))
     Advisor: Prof. Jaeheung Park
     Seoul National University, South Korea

B.S. in Mechanical and Aerospace Engineering   March, 2014
     Seoul National University, South Korea

Appointments

Postdoctoral Scholar
     Mechanical and Civil Engineering , California Institute of Technology   Oct. 2022 - present
     Advisor: Prof. Aaron D. Ames

Graduate Research Assistant
     Mechanical Engineering, Virginia Tech   Aug. 2019 - Aug. 2022
     Advisor: Prof. Kaveh Akbari Hamed

     Mechanical Engineering, Virginia Tech   Aug. 2017 - Jul. 2019
     Advisor: Prof. Tomonari Furukawa

     Transdisciplinary Studies, Seoul National University, South Korea   Jan. 2014 - Jul. 2017
     Advisor: Prof. Jaeheung Park

Undergraduate Research Assistant
     Dynamic Robotic Systems Lab, Seoul National University, South Korea   Jun. 2013 - Sep. 2013

Supervisor: Prof. Jaeheung Park

Biorobotics Lab, Seoul National University, South Korea   Mar. 2012 - Feb. 2013
Supervisor: Prof. Kyu-Jin Cho

Teaching Experience	**Teaching Assistant**

Mechanical Engineering, Virginia Polytechnic Institute and State University, USA
   ME5524: Bayesian Robotics
   ME5984: Advanced Experimental Robotics

Transdisciplinary Studies, Seoul National University, South Korea
   493.601: Convergent Robotics Technology
   493.611: Dynamics and Control of Robot-Environment Interaction

Theses & Dissertation

[T2] Jeeseop Kim
Collaborative Locomotion of Quadrupedal Robots:
From Centralized Predictive Control to Distributed Control
PhD Dissertation, Virginia Polytechnic Institute and State University, 2022.

[T1] Jeeseop Kim
Improvement of Humanoid Gait Control using Actuator Deformation Model
Master Thesis, Seoul National University, South Korea, 2017.

Journal Articles

Under review

[J6] **J. Kim**, R. T. Fawcett, V. R. Kamidi, A. D. Ames and K. Akbari Hamed,
"Layered Control for Cooperative Locomotion of Two Quadrupedal Robots: Centralized and Distributed Approaches,"
IEEE Transactions on Robotics, Under review.

Published

[J5] V. R. Kamidi, **J. Kim**, R. T. Fawcett, A. Ames, and K. Akbari Hamed,
"Distributed Quadratic Programming-Based Nonlinear Controllers for Periodic Gaits on Legged Robots,"
IEEE Control Systems Letters, Vol. 6, pp. 2509-2514, Apr, 2022.

[J4] **J. Kim**, and K. Akbari Hamed,
"Cooperative locomotion via supervisory predictive control and distributed nonlinear controllers,"
ASME Journal of Dynamic Systems, Measurement, and Control, Vol. 144, Issue. 3, p. 031005, Mar, 2022.

[J3] R. T. Fawcett, A. Pandala, **J. Kim**, and K. Akbari Hamed,
"Real-time planning and nonlinear control for quadrupedal locomotion with articulated tails,"
ASME Journal of Dynamic Systems, Measurement, and Control, Vol. 143, Issue. 7, p. 071004, Jul, 2021.
(2022 ASME DSCD Rudolf Kalman Best Paper Award)

[J2] K. Akbari Hamed, **J. Kim**, A. Pandala,
"Quadrupedal locomotion via event-based predictive control and QP-based virtual constraints,"
IEEE Robotics and Automation Letters, Vol. 5, Issue. 3, pp. 4463-4470, Jul, 2020.

[J1] **J. Kim**, Y. Omori, A. Sifat, and T. Furukawa,
"Adjustably designed torque controlled humanoid platform,"
International Journal of Mechanical and Production Engineering, Vol. 7, Issue. 2, pp. 52-57, May, 2019.

Conference Papers	*Under review* ■

[C 5] R. T. Fawcett, L. Amanzadeh, **J. Kim**, A. D. Ames and K. Akbari Hamed,
"Distributed Data-Driven Predictive Control for Multi-Agent Collaborative Legged Locomotion,"
IEEE International Conference on Robotics and Automation (ICRA), Under review.

Published ■

[C 4] **J. Kim**, Y. Omori, A. Sifat, and T. Furukawa,
"Adjustably designed torque controlled humanoid platform,"
International Conference on Control, Automation, Robotics and Vision Engineering, Washington DC, USA, 21-22 Nov, 2018.

[C 3] **J. Kim**, M. Kim, and J. Park,
"Improvement of humanoid walking control by compensating actuator elasticity,"
International Conference on Humanoid Robots (ICHR), Cancun, Mexico, 15-17 Nov, 2016.

[C 2] J. Jung, **J. Kim**, S. Kim, W. Kwon, S. Na, K. Kim, J. Lee, G. Suh, and J. Park,
"Application of robot manipulator for cardiopulmonary resuscitation,"
International Symposium on Experimental Robotics (ISER), Tokyo, Japan, 3-6 Oct, 2016.

[C 1] **J. Kim**, M. Kim, and J. Park,
"Improvement of humanoid gait stability using reduction gear deformation model,"
The 31st Institute of Control, Robotics and Systems (ICROS), Seoul, Korea, 10-11 Mar, 2016.

Patent

[*P*2-2] **J. Kim**, *et al*, Automatic cardiopulmonary resuscitation device and control method therefor, 2021. No. US11071686B2 (US Patent)

[*P*2-1] **J. Kim**, *et al*, Automatic cardiopulmonary resuscitation device and control method therefor, 2020. No. 108697572B (CN Patent), No. 3409258B1 (EU Patent)

[*P*1] **J. Kim**, *et al*, Apparatus for automatic cardiovascular pulmonary resuscitation, 2016. Korea Patent No.10-2016-0172286.

Honors

Awards

ASME Dynamic Systems & Control Division Rudolf Kalman Best Paper Award	2022
The Best Presentation Award, Institute of Control, Robotics and Systems 2016	2016
Darpa Robotics Challenge DRC Finalist	2015
The Best Presentation Award from Bachelor Thesis, Seoul National University	2012

Fellowship

Research Assistant Scholarships, Virginia Tech, Blacksburg, USA	Jul. 2017 - Aug. 2022
Gwan-ak Scholarship, Seoul National University, Seoul, South Korea	Mar. 2014 - Feb. 2015
National Scholarship from Korea Student Aid Foundation, South Korea	Mar. 2009 - Feb. 2010

Academic Services

Conference Reviewer

IEEE American Control Conference (ACC)	2022
IEEE International Conference on Robotics and Automation (ICRA)	2020 - 2022
IEEE Conference on Decision and Control (CDC)	2020 - 2022
IEEE International Conference on Intelligent Robots and Systems (IROS)	2021 - 2022

Invited Presentations	[P 1] **Collaborative Locomotion of Quadrupedal Robots: From Centralized Predictive Control to Distributed Control**

[P 1] **Collaborative Locomotion of Quadrupedal Robots: From Centralized Predictive Control to Distributed Control**
Department of Mechanical and Civil Engineering, Control and Dynamical Systems, AMBER Lab seminar,
California Institute of Technology, Pasadena CA (virtually), May, 2022.

Professional Skills

- ○ Robotics
- ○ Cooperative Robotics
- ○ Robot Locomotion
- ○ Autonomous Robots
- ○ Control Theory
- ○ Nonlinear Control
- ○ Distributed Control
- ○ Hybrid Dynamical Systems
- ○ Multiagent Systems
- ○ Optimization

Technical skills

Operating Systems: Ubuntu(Linux), ROS
Programming Language: C/C++, Python, MATLAB
Design and Simulation Software: Solidworks, Unigraphics(NX)

References available upon request

last Updated on October 12, 2022