

# **Minkyu Kim**

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## **Education**

- 2016–present Ph.D., Mechanical Engineering, The University of Texas at Austin
- Supervisor: Luis Sentis (Human centered robotics lab)
- 2010–2012 M.S., Mechanical & Aerospace Engineering, Seoul National University, South Korea
- Supervisor: Frank Chongwoo Park
- 2006–2010 B.S., Mechanical & Aerospace Engineering, Seoul National University, South Korea

## **Research Topic in Ph.D.**

### **Human-Centered Robotics Laboratory (Advisor: Luis Sentis)**

- Research topics
  - Social Navigation using awareness model (non-verbal interaction)
  - Teaching social-acceptable Navigation (supervised learning)
  - Person following robot
    - Sensor Fusion, Extended Kalman Filter
    - Face recognition, Color Histogram matching
    - Trajectory Prediction using Supported Vector Machine (SVM)
  - Active Object Tracking
    - Particle Filtering
    - Partially-Observable Markov Decision Process (POMDP)
    - Information-Theoretic Approach
  - Multi Robot Target Search
    - Hierarchical Decision Making Framework
    - Heterogeneous Clustering
    - Traveling Salesman Problem
    - Sampling based approach
  - Navigation in Dense crowded Environment
    - Deep Reinforcement Learning

## Work Experience

2012–2016    Research Scientist, Korea Institute of Science and Technology (KIST), South Korea

- Medical and Assistant Robotics and Cognitive Haptics Laboratory
- Research topics
  - Human Robot Interaction
  - Human Intention Recognition
  - Human motion & force capture system
  - Exoskeleton system & Wearable sensors
- Projects
  - ADL Support System for the Elderly and Disabled
  - Development of bionic arms controlled by bionic interface
  - Prediction of human motion intention based on surface electromyogram and restoration of multi-sensory feedback for sensory-motor skills through remote-controller avatar
- Technical Transfer
  - Power Assistant Robotic System, Gemtech Co. LTD
  - Technology of power assistant robotic device is transferred for commercializing in the field of rehabilitation

## Skills

Programming	C/C++, Python, MATLAB, LabView
Robotics tool	ROS, RTX, XPC, OpenAI Gym, Gazebo, DART
Machine Learning	Tensorflow, PyTorch
CAD	SOLIDWORKS, 3DMAX, Blender

## Publications

### **Journals**

- [1] Lee, Jaemin, **Minkyu Kim**, and Keehoon Kim. "A Control Scheme to Minimize Muscle Energy for Power Assistant Robotic Systems under Unknown External Perturbation." IEEE Transactions on Neural Systems and Rehabilitation Engineering (2017).
- [2] **Minkyu Kim** and Luis Sentis. "Active Object Tracking using Context Estimation: Handling Occlusions and Detecting Missing Targets", Applied Intelligence, 2022

### **Conferences & Workshops**

- [1] **Minkyu Kim**, Ryan Gupta, and Luis Sentis. "Information-Theoretic Based Target Search with Multiple Agents." RSS 2021 Robotics for People (R4P): Perspectives on Interaction, Learning, and Safety.

- [2] **Minkyu Kim**, et al. "An Architecture for Person-Following using Active Target Search." AAAI 2021 Spring Symposium Series, Machine Learning for Mobile Robot Navigation in the Wild
- [3] **Minkyu Kim**, et al. "Social Navigation Planning Based on People's Awareness of Robots." ACM/IEEE International Conference on Human Robot Interactions 2021. Applications for nHRI (HRI Workshop)
- [4] Rachel Schlossman, **Minkyu Kim**, Ufuk Topcu, L, Sentis. "Toward achieving formal guarantees for human-aware controllers in human-robot interactions." International Conference on Intelligent Robots and Systems (IROS) 2019.
- [5] Y. Jiang, N. Walker, **M. Kim**, N. Brissonneau, D. S. Brown, J. W. Hart, S. Niekum, L. Sentis and Peter Stone, "LAAIR: A Layered Architecture for Autonomous Interactive Robots", AAAI 2018 Fall Symposium on Reasoning and Learning in Real-World Systems for Long-Term Autonomy (FSS 2018), October 2018.
- [6] Kim, Joowan, **Minkyu Kim**, and Keehoon Kim. "Development of a wearable HCI controller through sEMG & IMU sensor fusion." Ubiquitous Robots and Ambient Intelligence (URAI), 2016 13th International Conference on. IEEE, 2016.
- [7] **Kim, MinKyu**, Jaemin Lee, and Keehoon Kim. "Enhancement of sEMG-based gesture classification using mahalanobis distance metric." Biomedical Robotics and Biomechanics (BioRob), 2016 6th IEEE International Conference on. IEEE, 2016.
- [8] **MinKyu Kim**, Jaemin Lee, and Keehoon Kim, "Tele-operation System with Reliable Grasping Force Estimation to Compensate for the Time-Varying sEMG Feature", International Conference Robotics and Automation (ICRA) 2016
- [9] Jaemin Lee, **Minkyu Kim**, and Keehoon Kim, "A robust Control Method of Multi-DOF Power-Assistant Robots for Unknown External Perturbation using sEMG Signals", International Conference on Intelligent Robots and Systems (IROS) 2015
- [10] **MinKyu Kim**, Jaemin Lee, Hyungyu Ko and Keehoon Kim, "A preliminary analysis of window size and voting size with a time delay for a robust real-time sEMG pattern recognition", International Conference on Ubiquitous Robots and Ambient Intelligent (URAI) 2014
- [11] Jaemin Lee, **MinKyu Kim** and Keehoon Kim "Integrated Control Method for Power-Assisted Rehabilitation: Ellipsoid Regression and Impedance Control." , International Conference on Intelligent Robots and Systems (IROS), Chicago, 2014
- [12] **MinKyu Kim**, Kwanghyun Ryu, Yonghwan Oh, Sang-Rok Oh, and Keehoon Kim, "Implementation of Real-Time Motion and Force Capturing System for Tele-manipulation based on sEMG Signals and IMU Motion Data," IEEE International Conference on Robotics and Automation (ICRA), Hong Kong, 2014
- [13] **Kim, MinKyu**, and Keehoon Kim. "Increasing performance of a pattern recognition system using a semg signal by setting multi-references." Ubiquitous Robots and Ambient Intelligence (URAI), 2013 10th International Conference on. IEEE, 2013.
- [14] **Kim, MinKyu**, and Keehoon Kim. "Pilot study on prediction of human hand configuration using transient state of surface-electromyography signals." Control, Automation and Systems (ICCAS), 2013 13th International Conference on. IEEE, 2013.
- [15] Kwon Joong Son, **Minkyu Kim** and Keehoon Kim, "Analytical Modeling of Disk-Type Piezo-

electric Variable Friction Tactile Displays” IEEE/ASME International Conference on Advanced Intelligent Mechatronics, Wollongong, Australia, pp. 1725-1730, July 9-12, 2013

### **Theses and dissertations**

- [1] **Minkyu Kim**. Golf Swing Motion Optimization using Robot Dynamics. (2012), The Department of Mechanical & Aerospace Engineering, Seoul National University.

### **Under Review**

- [1] **Minkyu Kim**, Ryan Gupta, and Luis Sentis. ”KC-TSS: An Algorithm for Heterogeneous Robot Teams Performing Resilient Real-Time Target Search”, Submitted, **(under review)**
- [2] **Minkyu Kim**, Jeamin Lee, Keehoon Kim, ”Rapid Classification of Human Gestures before Actual Movements Using sEMG signals”, Submitted **(Under review)**

### **Patents**

- [1] Keehoon Kim, Sin-jung Kim, **MinKyu Kim**, “Wearable Electromyogram Sensor System” (US20140364703 A1, 14/088,859, US)
- [2] Apparatus for Supporting A Muscular Strength and A Kit Having the Same (PCT/KR2015/003767)

### **Honors and Awards**

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| 2018      | 5th Place, RoboCup@Home 2018, Team Austin Villa  |
| 2017      | 3rd Place, RoboCup@Home 2017, Team Austin Villa  |
| 2015      | Bronze Award, Korea Invention Patent Exhibition 2015   |
| 2014      | Best Application Award, URAI 2014 <ul style="list-style-type: none"><li>• International Conference on Ubiquitous Robots and Ambient Intelligence</li><li>• “A Control Method of Power-Assisted Robot for Upper Limb Considering Intention-based Motion by Using sEMG signal”</li></ul> |
| 2006-2010 | National Scholarship for Science and Engineering <ul style="list-style-type: none"><li>• Korea Student Aid Foundation (KOSAF)</li><li>• Granted full tuition for regular 8 semesters</li></ul>   |

### **Youtube list**

Videos available at <http://minkyukim.net/media>