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Human-centered Robotics and Automation Laboratory  
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Curriculum vitae last updated: July 1, 2021

## RESEARCH INTERESTS

**Robotics:** field robotics, teleoperation, haptics, agricultural robotics

**Systems and Control:** hybrid systems, discrete event systems, supervisory control

## EDUCATION

**Korea Advanced Institute of Science and Technology (KAIST)**, Daejeon, Republic of Korea

**Ph.D.**, Mechanical Engineering

**January 2010**

- Thesis: *Control for Optimized Kinesthetic Perception in Scaled Teleoperation of Soft Tissues*

**Pusan National University**, Pusan, Republic of Korea

**M.S.**, Mechanical and Intelligent Systems Engineering

**August 2000**

- Thesis: *Failure Diagnosis and Recovery of Discrete Event Systems*

**B.S.**, Mechanical and Production Engineering

**February 1998**

- Graduation Research: *Development of Three-Legged Walking Robot*

## PROFESSIONAL EXPERIENCES

**Chonnam National University**, Gwangju, Republic of Korea

Associate Professor, HRA Laboratory Director

**March 2015 – Present**

- Human-centered Robotics and Automation Laboratory, Department of Rural and Biosystems Engineering
- Topic: *Field Robotics, Agricultural Robotics and Automation*

**Chonnam National University**, Gwangju, Republic of Korea

Adjunct Professor

**March 2018 – Present**

- Department of Robotics Engineering Convergence

**Samsung Heavy Industries**, Daejeon, Republic of Korea

Principal Researcher, Telerobotics Group Leader

**September 2012 – February 2015**

- Marine and Offshore Research Center, Central Research Institute
- Topic: *Haptic Teleoperation of Unmanned Automated Vehicles for Marine and Offshore Tasks*

**Max Planck Institute for Biological Cybernetics**, Tübingen, Germany

Research Scientist

**April 2010 – August 2012**

- Human-Robot Interaction Group, Department of Human Perception, Cognition and Action
- Topic: *Human-Centered Control and Evaluation in Haptics and Teleoperation*

**Korea University**, Seoul, Republic of Korea

Visiting Researcher

**November 2010 – January 2011**

- Biological Cybernetics Group, Department of Brain and Cognitive Engineering
- Topic: *Operator's Perceptual Sensitivity in Multi-Robot Teleoperation*

**The University of Tokyo**, Tokyo, Japan

Research Associate

**January 2010 – March 2010**

- Intelligent Control System Laboratory, Institute of Industrial Science
- Topic: *Psychophysics-based Control in Teleoperation of Soft Environment*

**Samsung Electronics**, Cheonan, Republic of Korea

Senior Researcher, Inspection Equipment Team Leader

**December 2005 – November 2009**

- Equipment Innovation Group, Mobile Display Center, LCD Business

- Topic: *Development and Innovation of Robotic Manipulator and Inspection Equipment in LCD Fabrication*

**LG Electronics**, Pyungtaek, Republic of Korea

Senior Researcher

**January 2003 – November 2005**

- Evaluation Technology Group, Production Engineering Research Institute
- Topic: *Control System Integration of Inspection Equipment and Development of Inspection Algorithm for Defects in Flat Panel Display*

## TEACHING EXPERIENCES

**Chonnam National University**, Gwangju, Republic of Korea

Associate Professor

**March 2015 – Present**

- Department of Rural and Biosystems Engineering
- Subjects
  - Undergraduate
    - ENG2005: Advanced Engineering Mathematics I
    - AGE2001: Advanced Engineering Mathematics II
    - AGE2002: Statics
    - MAE2012: Dynamics
    - AGE3039: Data Communications and Network
    - AGE4002: Automatic Control
    - AGE4050: Biosystems Automation
    - AGE4051: Biosystems Modeling and Practice
    - AGE4055: Biosystems Robotics
  - Graduate
    - GR16705: Advanced Robotics
    - GR21916: Telerobotics and Its Applications
    - GR21917: Haptics and Virtual Reality
    - GR21918: Discrete Event Systems Control
    - GR21919: Machine Learning

**Korea Advanced Institute of Science and Technology (KAIST)**, Daejeon, Republic of Korea

Teaching Assistant

**September 2007 – January 2009**

- Department of Mechanical Engineering
- Subjects: MAE360: *Modeling and Control of Engineering Systems*, MAE453: *Introduction to Robotics Engineering*, MAE460: *Automatic Control*

Teaching Assistant

**September 2000 – December 2002**

- Department of Mechanical Engineering
- Subjects: MAE205: *Mechanical Engineering Laboratory*, MAE307: *Applied Electronics*, MAE460: *Automatic Control*, ME682: *Computer Integrated Manufacturing*

**Pusan National University**, Pusan, Republic of Korea

Teaching Assistant

**March 1998 – August 1999**

- School of Mechanical Engineering
- Subjects: DM27545: *Basic Experiment of Electronics*, DM23831: *Manufacturing Automation*

## HONORS AND AWARDS

- Best Presentation Video Award (Jongpyo Jun and Jaehwi Seol), *International Conference on Control, Automation and Systems*, 2020
- Outstanding Undergraduate Student Paper Award (Jeong In Kim), *ICROS Annual Conference*, 2020
- Outstanding Student Paper Award (Jeongeun Kim), *Korean Society for Agricultural Machinery Spring Conference*, 2019
- Outstanding Student Paper Award (Seungwon Kim and Chanyoung Ju), *Korean Society for Agricultural Machinery Fall Conference*, 2018
- Outstanding Student Paper Award (Jeongeun Kim and Chang-Gyu Lee), *Korean Society for Agricultural Machinery Fall Conference*, 2017
- Outstanding Student Paper Award (Chanyoung Ju and Sungjun Park), *Korean Society for Agricultural Machinery Spring Conference*, 2017
- Outstanding Student Paper Award (Youngju Park, Chanyoung Ju, and Hyunjin Lee), *Korean Society for Agricultural Machinery Spring Conference*, 2016
- Outstanding Paper Award, *International Conference on Control, Automation and Systems*, 2011
- Oversea Postdoctoral Fellowship, *National Research Foundation of Korea*, 2011 – 2012

- Max Planck Society Fellowship, *Max Planck Society*, 2010 – 2012
- Governmental Full Scholarship, *KAIST*, 2000 – 2002 & 2007 – 2009
- Merit-based Scholarship, *Pusan National University*, 1994 – 2000

## PUBLICATIONS

(<sup>†</sup>: corresponding author, \*: equal contribution)

### Book Chapters

- [B1] M. Riedel, A. Franchi, P. R. Giordano, H. H. Bühlhoff, and **H. I. Son<sup>†</sup>**, “Experiments on International Haptic Control of Multiple UAVs,” *Intelligent Autonomous Systems 12, Advances in Intelligent Systems and Computing*, vol. 194, pp. 227–238, 2013.
- [B2] Y. E. Song, M. Niitsuma, T. Kubota, H. Hashimoto, and **H. I. Son<sup>†</sup>**, “Multimodal Human-Robot Interface with Gesture-Based Virtual Collaboration,” *Robot Intelligence Technology and Applications 2012*, pp. 91–104, 2013.

### Journal Articles

- [J1] J. Seol, J. Kim, and **H. I. Son<sup>†</sup>**, “Field Evaluations of A Deep Learning-based Intelligent Spraying Robot with Flow Control for Pear Orchards,” *Precision Agriculture*, in revision.
- [J2] C. Ju and **H. I. Son<sup>†</sup>**, “Modeling and Control of Heterogeneous Field Robots under Partial Observation,” *Information Sciences*, in revision.
- [J3] C. Ju and **H. I. Son<sup>†</sup>**, “A Hybrid Systems-based Hierarchical Control Architecture for Heterogeneous Field Robot Teams,” *IEEE Transactions on Cybernetics*, in revision.
- [J4] Y. H. Park, J. Seol, and **H. I. Son<sup>†</sup>**, “Three-axis Attitude Control of Korean Cabbage Harvester Cutting Device Based on Sensor Fusion,” *Journal of Institute of Control, Robotics and Systems*, vol. 27, no. 3, pp. 277–284, 2021. (in Korean)
- [J5] J. Jun, J. Kim, J. Seol, J. Kim, and **H. I. Son<sup>†</sup>**, “Towards An Efficient Tomato Harvesting Robot: 3D Perception, Manipulation, and End-Effector,” *IEEE Access*, vol. 9, pp. 17631–17640, 2021.
- [J6] J. Han, K. Cho, I. Jang, C. Ju, **H. I. Son**, and G. Yang, “Development of a Shared Controller for Obstacle Avoidance in a Teleoperation System for Obstacle Avoidance,” *International Journal of Control, Automation and Systems*, vol. 18, no. 11, pp. 2974–2982, 2020.
- [J7] J. Kim, C. Ju, and **H. I. Son<sup>†</sup>**, “A Multiplicatively Weighted Voronoi-based Workspace Partition for Heterogeneous Seeding Robots,” *Electronics*, vol. 9, no. 11:1813, pp. 1–15, 2020.
- [J8] J. Seol and **H. I. Son<sup>†</sup>**, “Bargaining Model-based Coverage Area Subdivision of Multiple UAVs in Remote Sensing,” *Journal of Biosystems Engineering*, vol. 45, no. 3, pp. 133–144, 2020.
- [J9] J. Seol, S. Lee, and **H. I. Son<sup>†</sup>**, “A Review of End-effector for Fruit and Vegetable Harvesting Robot,” *Journal of Korea Robotics Society*, vol. 15, no. 2, pp. 91–99, 2020.
- [J10] C. Ju and **H. I. Son<sup>†</sup>**, “Autonomous Tracking of Micro-Sized Flying Insects Using UAV: A Preliminary Results,” *Journal of the Korean Society of Industry Convergence*, vol. 23, no. 1, pp. 125–137, 2020.
- [J11] J. Kim and **H. I. Son<sup>†</sup>**, “A Voronoi Diagram-based Workspace Partition for Weak Cooperation of Multi-Robot System in Orchard,” *IEEE Access*, vol. 8, no. 1, pp. 20676–20686, 2020.
- [J12] J. Kim, J. Seol, and **H. I. Son<sup>†</sup>**, “Preliminary Experimental Results of a Deep Learning-based Intelligent Spraying System for Pear Orchard,” *Journal of Institute of Control, Robotics and Systems*, vol. 26, no. 1, pp. 23–28, 2020. (in Korean)
- [J13] C. Ju and **H. I. Son<sup>†</sup>**, “Modeling and Control of Heterogeneous Agricultural Field Robots based on Ramadge-Wonham Theory,” *IEEE Robotics and Automation Letters*, vol. 5, no. 1, pp. 48–55, 2020.
- [J14] S. Kim\*, C. Ju\*, J. Kim, and **H. I. Son<sup>†</sup>**, “A Tracking Method for the Invasive Asian Hornet: A Brief Review and Experiments,” *IEEE Access*, vol. 7, no. 1, pp. 176998–177008, 2019.
- [J15] C. Ju and **H. I. Son<sup>†</sup>**, “A Distributed Swarm Control for an Agricultural Multiple Unmanned Aerial Vehicle System,” *Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering*, vol. 233, no. 10, pp. 1298–1308, 2019.
- [J16] **H. I. Son<sup>†</sup>**, “The Contribution of Force Feedback to Human Performance in the Teleoperation of Multiple Unmanned Aerial Vehicles,” *Journal on Multimodal User Interfaces*, vol. 13, no. 4, pp. 335–342, 2019.
- [J17] J. Kim\*, S. Kim\*, C. Ju\*, and **H. I. Son<sup>†</sup>**, “Unmanned Aerial Vehicles in Agriculture: A Review of Perspective of Platform, Control, and Applications,” *IEEE Access*, vol. 7, no. 1, pp. 105100–105115, 2019.

- [J18] C. Ju and **H. I. Son**<sup>†</sup>, “Evaluation of Haptic Feedback in the Performance of a Teleoperated Unmanned Ground Vehicle in an Obstacle Avoidance Scenario,” *International Journal of Control, Automation and Systems*, vol. 17, no. 1, pp. 168–180, 2019.
- [J19] C. Ju, J. Kim, S. Jo, S. Kim, and **H. I. Son**<sup>†</sup>, “스마트 농업을 위한 무인항공기의 기술개발 동향 및 활용 분야,” *Institute of Control, Robotics and Systems Magazine*, vol. 24, no. 4, pp. 15–26, 2018. (in Korean)
- [J20] C. Ju and **H. I. Son**<sup>†</sup>, “Design of Supervisors for the Control of Agricultural Multiple UAV System: A Preliminary Result,” *Journal of Institute of Control, Robotics and Systems*, vol. 24, no. 11, pp. 1005–1013, 2018. (in Korean)
- [J21] C. Ju and **H. I. Son**<sup>†</sup>, “Multiple UAV Systems for Agricultural Applications: Control, Implementation, and Evaluation,” *Electronics*, vol. 7, no. 9:162, pp. 1–19, 2018.
- [J22] C. Ju, S. Park, S. Park, and **H. I. Son**<sup>†</sup>, “Effects of the Position and Orientation Inaccuracies in Haptic Guidance on the Task Performance in Teleoperation Systems: Peg-in-hole Task,” *Journal of Institute of Control, Robotics and Systems*, vol. 23, no. 11, pp. 981–989, 2017.
- [J23] S. Park, C. Ju, and **H. I. Son**<sup>†</sup>, “농업용 로봇 및 자동화 기술 분석과 국내외 동향,” *Magazine of the Korean Society of Agricultural Engineers*, vol. 59, no. 3, pp. 17–29, 2017. (in Korean)
- [J24] A. Hong, D. G. Lee, H. H. Bülthoff, and **H. I. Son**<sup>†</sup>, “A Multimodal Feedback for Multiple Mobile Robots Teleoperation in Outdoor Environments,” *Journal of Multimodal User Interfaces*, vol. 11, no. 1, pp. 67–80, 2017.
- [J25] C. Ju, S. Park, Y. Park, D. Lee, J. Kim, and **H. I. Son**<sup>†</sup>, “미래 농업을 위한 바이오시스템공학,” *Institute of Control, Robotics and Systems Magazine*, vol. 22, no. 3, pp. 43–57, 2016. (in Korean)
- [J26] **H. I. Son**<sup>†</sup> and T. Bhattacharjee, “A Passivity Criterion for Real-Time Haptic Simulation of Viscoelastic Soft Tissues,” *Proceedings of the Institution of Mechanical Engineering, Part I: Journal of Systems and Control Engineering*, vol. 23, no. 9, pp. 1062–1071, 2016.
- [J27] D. G. Lee, S. Oh, and **H. I. Son**<sup>†</sup>, “Maintenance Robot for 5MW Offshore Wind Turbines and Its Control,” *IEEE/ASME Transactions on Mechatronics*, vol. 21, no. 5, pp. 2272–2283, 2016.
- [J28] Y. Park\*, H. Lee\*, C. Ju\*, and **H. I. Son**<sup>†</sup>, “Development of Multi-drone System for Smart Agriculture: A Work-in-progress Report,” *Journal of Institute of Convergence Technology*, vol. 6, no. 1, pp. 43–47, 2016. (in Korean)
- [J29] **H. I. Son**<sup>†</sup>, J. H. Cho, T. Bhattacharjee, H. Jung, and D. Y. Lee, “Analytical and Psychophysical Comparison of Bilateral Teleoperators for Enhanced Perceptual Performance,” *IEEE Transactions on Industrial Electronics*, vol. 61, no. 11, pp. 6202–6212, 2014.
- [J30] **H. I. Son**<sup>†</sup>, H. Jung, J. H. Cho, D. Y. Lee, and H. H. Bülthoff, “A Psychophysical Evaluation of Teleoperator’s Viscosity Perception of Soft Environments,” *Robotica*, vol. 32, no. 1, pp. 1–17, 2014.
- [J31] D. Lee<sup>†</sup>, A. Franchi, **H. I. Son**, H. H. Bülthoff, and P. R. Giordano, “Semiautonomous Haptic Teleoperation Control Architecture of Multiple Unmanned Aerial Vehicles,” *IEEE/ASME Transactions on Mechatronics*, vol. 18, no. 4, pp. 1334–1345, 2013.
- [J32] **H. I. Son**, A. Franchi, L. Chuang, J. Kim, H. H. Bülthoff, and P. R. Giordano<sup>†</sup>, “Human-Centered Design and Evaluation of Haptic Cueing for Teleoperation of Multiple Mobile Robots,” *IEEE Transactions on Cybernetics*, vol. 43, no. 2, pp. 597–609, 2013.
- [J33] J. H. Cho, **H. I. Son**, D. G. Lee, T. Bhattacharjee, and D. Y. Lee<sup>†</sup>, “Gain-Scheduling Control of Teleoperation Systems Interacting with Soft Tissues,” *IEEE Transactions on Industrial Electronics*, vol. 60, no. 3, pp. 946–957, 2013.
- [J34] I. S. Yu, H. S. Woo, **H. I. Son**, W. Ahn, H. Jung, and D. Y. Lee<sup>†</sup>, “Design of a Haptic Interface for a Gastrointestinal Endoscopy,” *Advanced Robotics*, vol. 26, no. 18, pp. 2115–2143, 2012.
- [J35] A. Franchi<sup>†</sup>, C. Secchi, **H. I. Son**, H. H. Bülthoff, and P. R. Giordano, “Bilateral Teleoperation of Groups of Mobile Robots with Time-Varying Topology,” *IEEE Transactions on Robotics*, vol. 28, no. 5, pp. 1019–1033, 2012.
- [J36] **H. I. Son**<sup>†</sup>, T. Bhattacharjee, and H. Hashimoto, “Effect of Impedance-Shaping on Perception of Soft Tissues in Macro-Micro Teleoperation,” *IEEE Transactions on Industrial Electronics*, vol. 59, no. 8, pp. 3273–3285, 2012.
- [J37] **H. I. Son**<sup>†</sup> and M.-H. Oh, “Real-Time Automatic Inspection of Macro Defects in In-line TFT Fabrication Process,” *Proceedings of the Institution of Mechanical Engineering, Part E: Journal of Process Mechanical Engineering*, vol. 226, no. 2, pp. 178–183, 2012.

- [J38] **H. I. Son**<sup>†</sup>, T. Bhattacharjee, and H. Hashimoto, “Enhancement in Operator’s Perception of Soft Tissues and Its Experimental Validation for Scaled Teleoperation Systems,” *IEEE/ASME Transactions on Mechatronics*, vol. 16, no. 6, pp. 1096–1109, 2011.
- [J39] **H. I. Son**<sup>†</sup>, T. Bhattacharjee, and H. Hashimoto, “Effect of Scaling on the Performance and Stability of Teleoperation Systems Interacting with Soft Environments,” *Advanced Robotics*, vol. 25, no. 11-12, pp. 1577–1601, 2011.
- [J40] **H. I. Son**<sup>†</sup>, “Design and Implementation of Decentralised Supervisory Control for Manufacturing System Automation,” *International Journal of Computer Integrated Manufacturing*, vol. 24, no. 3, pp. 242–256, 2011.
- [J41] **H. I. Son**<sup>\*</sup>, T. Bhattacharjee<sup>\*</sup>, and D. Y. Lee<sup>†</sup>, “Estimation of Environmental Force for the Haptic Interface of Robotic Surgery,” *International Journal of Medical Robotics and Computer Assisted Surgery*, vol. 6, no. 2, pp. 221–230, 2010.
- [J42] **H. I. Son**<sup>†</sup>, “Automatic Inspection Method for Macro Defects in TFT-LCD Color Filter Fabrication Process,” *IEICE Electronics Express*, vol. 6, no. 8, pp. 516–521, 2009.
- [J43] **H. I. Son** and S. Lee<sup>†</sup>, “A Comparison of Decentralized and Partially Observed Supervisors: Application to a CIM Testbed,” *Journal of Institute of Control, Robotics and Systems*, vol. 14, no. 11, pp. 1155–1164, 2008. (in Korean)
- [J44] **H. I. Son**<sup>†</sup> and S. Lee, “Failure Diagnosis and Recovery based on DES Framework,” *Journal of Intelligent Manufacturing*, vol. 18, no. 2, pp. 249–260, 2007.
- [J45] **H. I. Son**, K. W. Kim, and S. Lee<sup>†</sup>, “Failure Diagnosis of Discrete Event Systems,” *Journal of Control, Automation and Systems Engineering*, vol. 7, no. 5, pp. 375–383, 2001. (in Korean)
- [J46] **H. I. Son** and S. Lee<sup>†</sup>, “Design and Implementation of Supervisors to Control of a CIM Testbed,” *Journal of Control, Automation and Systems Engineering*, vol. 6, no. 6, pp. 478–485, 2000. (in Korean)

#### Refereed Conference Articles

- [C1] J. Jun, J. Seol, and **H. I. Son**<sup>†</sup>, “A Novel End-effector for Tomato Harvesting Robot: Mechanism and Evaluation,” *Proceedings of the International Conference on Control, Automations and Systems (ICCAS)*, pp. 118–121, Pusan, South Korea, October 2020. **★Best Presentation Video Award (out of 311 Papers)**
- [C2] J. Kim, J. Seol, S. Lee, S.-W. Hong, and **H. I. Son**<sup>†</sup>, “An Intelligent Spraying System with Deep Learning-based Semantic Segmentation of Fruit Trees in Orchards,” *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 3923–3929, Paris, France, June 2020.
- [C3] S. Kim, J. Kwak, C. Ju, and **H. I. Son**<sup>†</sup>, “Tributary Mapping with Autonomous Unmanned Aerial Vehicle : Feasibility Analysis via Simulation,” *Proceedings of the International Conference on Control, Automations and Systems (ICCAS)*, pp. 963–964, Jeju, South Korea, October 2019.
- [C4] J. Kim, J. Seol, and **H. I. Son**<sup>†</sup>, “Deep Learning-based Intelligent Spraying Systems,” *Proceedings of the International Conference on Control, Automations and Systems (ICCAS)*, pp. 965–966, Jeju, South Korea, October 2019.
- [C5] C. Ju and **H. I. Son**<sup>†</sup>, “Hybrid Systems based Modeling and Control of Heterogeneous Agricultural Robots for Field Operations,” *Proceedings of 2019 ASABE Annual International Meeting*, pp. 1–5, Boston, Massachusetts, July 2019.
- [C6] C. Ju and **H. I. Son**<sup>†</sup>, “Discrete Event Systems based Modeling for Agricultural Multiple Unmanned Aerial Vehicles: Automata Theory Approach,” *Proceedings of the International Conference on Control, Automations and Systems (ICCAS)*, pp. 258–260, PyeongChang, South Korea, October 2018.
- [C7] S. Cho, J. Jun, H. Jeong, and **H. I. Son**<sup>†</sup>, “Design of a 4-Finger End-Effector for Paprika Harvesting,” *Proceedings of the International Conference on Control, Automations and Systems (ICCAS)*, pp. 255–257, PyeongChang, South Korea, October 2018.
- [C8] M. J. Hwang, S. Y. Chung, K. Lee, I. J. Song, and **H. I. Son**<sup>†</sup>, “Registration between Robot and Workspace in Virtual Environment for Off-line Programming,” *Proceedings of the Conference of the Industrial Electronics Society (IECON)*, pp. 779–784, Florence, Italy, October 2016.
- [C9] D. G. Lee, S. Oh, and **H. I. Son**<sup>†</sup>, “Wire-Driven Parallel Robotic System and Its Control for Maintenance of Offshore Wind Turbines,” *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 902–908, Stockholm, Sweden, May 2016.
- [C10] C. Ha, S. Park, J. Her, I. Jang, Y. Lee, G. R. Cho, **H. I. Son**, and D. Lee<sup>†</sup>, “Whole Body Multi-Modal Semi-Autonomous Teleoperation System of Mobile Manipulator,” *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 164–170, Seattle, USA, May 2015.



- [C11] D. G. Lee, G. R. Cho, M. S. Lee, B.-S. Kim, S. Oh, and **H. I. Son**<sup>†</sup>, “Human-Centered Evaluation of Multi-User Teleoperation for Mobile Manipulator in Unmanned Offshore Plant,” *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 5431–5438, Tokyo, Japan, November 2013.
- [C12] A. Hong, H. H. Bühlhoff, and **H. I. Son**<sup>†</sup>, “A Visual and Force Feedback for Multi-Robot Teleoperation in Outdoor Environments: A Preliminary Result,” *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 1463–1470, Karlsruhe, Germany, May 2013.
- [C13] **H. I. Son**<sup>†</sup>, A. Hong, H. H. Bühlhoff, and D. Lee, “Effects of Imperfect Communication Network on Haptic Teleoperator’s Performance,” *Proceedings of the International Conference on Control, Automations and Systems (ICCAS)*, pp. 1772–1777, Jeju, Korea, October 2012. **(Invited)**
- [C14] M. Riedel, A. Franchi, P. R. Giordano, H. H. Bühlhoff, and **H. I. Son**<sup>†</sup>, “Experiments on Intercontinental Haptic Control of Multiple UAVs,” *Proceedings of the International Conference on Intelligent Autonomous Systems (IAS)*, pp. 1–5, Jeju, Korea, July 2012. **(Invited)**
- [C15] J. H. Cho<sup>†</sup>, **H. I. Son**, M. Annerstedt, A. Robertsson, and R. Johansson, “Enhancement of Human Operator’s Perceptual Sensitivity for Telesurgical Systems via Polytopic System Approach,” *Proceedings of the IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob)*, pp. 75–80, Roma, Italy, June 2012.
- [C16] **H. I. Son**<sup>†</sup>, L. Chuang, J. Kim, and H. H. Bühlhoff, “Haptic Feedback Can Improve Human Perceptual Awareness in Multi-Robots Teleoperation,” *Proceedings of the International Conference on Control, Automations and Systems (ICCAS)*, pp. 1323–1328, Gyeonggi-do, Korea, October 2011. **(Invited)**  
★**Outstanding Paper Award (out of 408 Papers)**
- [C17] **H. I. Son**<sup>†</sup>, L. Chuang, A. Franchi, J. Kim, D. Lee, S.-W. Lee, H. H. Bühlhoff, and P. R. Giordano, “Measuring an Operator’s Maneuverability Performance in the Haptic Teleoperation of Multiple Robot,” *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 3039–3046, San Francisco, USA, September 2011.
- [C18] **H. I. Son**<sup>†</sup>, J. Kim, L. Chuang, A. Franchi, P. R. Giordano, D. Lee, and H. H. Bühlhoff, “An Evaluation of Haptic Cues on the Tele-Operator’s Perceptual Awareness of Multiple UAVs’ Environments,” *Proceedings of the IEEE World Haptics Conference (WHC)*, pp. 149–154, Istanbul, Turkey, June 2011.
- [C19] D. Lee<sup>†</sup>, A. Franchi, P. R. Giordano, **H. I. Son**, and H. H. Bühlhoff, “Haptic Teleoperation of Multiple Unmanned Aerial Vehicles over the Internet,” *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 1341–1347, Shanghai, China, May 2011.
- [C20] A. Franchi<sup>†</sup>, P. R. Giordano, C. Secchi, **H. I. Son**, and H. H. Bühlhoff, “A Passivity-Based Decentralized Approach for the Bilateral Teleoperation of a Group of UAVs with Switching Topology,” *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 898–905, Shanghai, China, May 2011.
- [C21] J. H. Cho, **H. I. Son**, T. Bhattacharjee, D. G. Lee, and D. Y. Lee<sup>†</sup>, “Position-Position Control with Gain-Scheduling for Telesurgical Systems,” *Proceedings of the International Conference on Advanced Mechatronics (ICAM)*, pp. 283–288, Osaka, Japan, 2010.
- [C22] **H. I. Son**, T. Bhattacharjee, H. Jung, and D. Y. Lee<sup>†</sup>, “Psychophysical Evaluation of Control Scheme Designed for Optimal Kinesthetic Perception in Scaled Teleoperation,” *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 5346–5351, Anchorage, USA, May 2010.
- [C23] **H. I. Son**, T. Bhattacharjee, and D. Y. Lee<sup>†</sup>, “Control Design Based on Analytical Stability Criteria for Optimized Kinesthetic Perception in Scaled Teleoperation,” *Proceedings of the ICCAS-SICE International Joint Conference*, pp. 3365–3370, Fukuoka, Japan, 2009.
- [C24] **H. I. Son**<sup>\*</sup>, T. Bhattacharjee<sup>\*</sup>, and D. Y. Lee<sup>†</sup>, “Passivity Analysis of Haptic Systems Interacting with Viscoelastic Virtual Environment,” *Proceedings of the International Conference on Advanced Robotics (ICAR)*, pp. 1–6, Munich, Germany, 2009. <sup>\*</sup>*equally contributed*
- [C25] **H. I. Son** and D. Y. Lee<sup>†</sup>, “Two-Channel Control for Scaled Teleoperation,” *Proceedings of the International Conference on Control, Automation and Systems (ICCAS)*, pp. 1284–1289, Seoul, Korea, 2008.
- [C26] T. Bhattacharjee, **H. I. Son**, and D. Y. Lee<sup>†</sup>, “Haptic Control with Environment Estimation for Telesurgery,” *Proceedings of the International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 3241–3244, Vancouver, Canada, 2008.
- [C27] **H. I. Son** and D. Y. Lee<sup>†</sup>, “Enhancement of Kinesthetic Perception for Microsurgical Teleoperation using Impedance-Shaping,” *Proceedings of the International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, pp. 1939–1942, Vancouver, Canada, 2008.

- [C28] **H. I. Son<sup>†</sup>**, “Failure Diagnosis and Recovery based on DES Framework,” *Proceedings of the IEEE International Conference on Mechatronics (ICM)*, PP. 255–260, Istanbul, Turkey, 2004.
- [C29] S. P. Yoo, D. Y. Lee<sup>†</sup>, and **H. I. Son**, “Design and Verification of Supervisory Controller of High-Speed Train,” *Proceedings of the IEEE International Symposium on Industrial Electronics (ISIE)*, pp. 1290–1295, Pusan, Korea, 2001.

*Non-refereed/Short Workshop/Conference Articles*

- [SC1] J. Seol, S. Lee, and **H. I. Son<sup>†</sup>**, “Design of End-effector for Harvesting Robot based on Suction Gripper for Tomato Harvesting,” In *ICROS Annual Conference*, pp. 67–69, Sokcho, Korea, July 2019. (in Korean)
- [SC2] J. I. Kim, J. Kim, and **H. I. Son<sup>†</sup>**, “Development of Deep Learning-based Tomato Detection and Manipulator Control System for Tomato Harvesting Robot,” In *ICROS Annual Conference*, pp. 525–526, Sokcho, Korea, July 2019. (in Korean) ★**Outstanding Undergraduate Student Paper Award (out of 255 Papers)**
- [SC3] C. Ju and **H. I. Son<sup>†</sup>**, “Formal Methods based Modular Supervisory Control for Heterogeneous Robot Team,” In *Workshop on Informed Scientific Sampling in Large-scale Outdoor Environments at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Macau, China, November 2019.
- [SC4] S. Kim, J. Kwak, C. Ju, S.-H. Yoo, and **H. I. Son<sup>†</sup>**, “A Feasibility Study of Tributary Mapping using Autonomous Unmanned Aerial Vehicle,” In *INWEPF-PAWEES 2019 International Conference*, Seoul, Korea, November 2019.
- [SC5] J. Seol and **H. I. Son<sup>†</sup>**, “Negotiation Strategy using Bargaining Model for Multi-UAV Task Allocation,” In *ICROS Annual Conference*, pp. 125–126, Gyeongju, Korea, May 2019. (in Korean)
- [SC6] J. Kim and **H. I. Son<sup>†</sup>**, “A Voronoi-based Task Allocation for Multiple Spraying Robots in Orchard,” In *ICROS Annual Conference*, pp. 123–124, Gyeongju, Korea, May 2019. (in Korean)
- [SC7] C. Ju and **H. I. Son<sup>†</sup>**, “Ramadge-Wonham Theory based Supervisory Control of Heterogeneous Agricultural Field Robots,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2019 Spring Conference*, Gyeongsang National University, South Korea, May 2019. (in Korean)
- [SC8] J. Kim and **H. I. Son<sup>†</sup>**, “A Voronoi-based Workspace Segmentation for Collaboration of Multiple Spraying Robots in Orchard,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2019 Spring Conference*, Gyeongsang National University, South Korea, May 2019. (in Korean) ★**Outstanding Student Paper Award (out of xxx Papers)**
- [SC9] H. Jeong, S. Cho, and **H. I. Son<sup>†</sup>**, “Development of Soft Gripper for Automatic Tomato Harvesting Robot in Controlled Environments Horticulture,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2019 Spring Conference*, Gyeongsang National University, South Korea, May 2019. (in Korean)
- [SC10] J. Seol and **H. I. Son<sup>†</sup>**, “Bargaining-based Negotiation Strategy for Area Subdivision of Remote Sensing using Multi-UAV,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2019 Spring Conference*, Gyeongsang National University, South Korea, May 2019. (in Korean)
- [SC11] **H. I. Son<sup>†</sup>**, “Research Status on Cooperative Control of Heterogeneous Agricultural Field Robots,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2019 Spring Conference*, Gyeongsang National University, South Korea, May 2019. (in Korean)
- [SC12] C. Ju and **H. I. Son<sup>†</sup>**, “Supervisory Controller Design for Cooperation of Heterogeneous Agricultural Robot Systems,” In *Korea Robotics Society Annual Conference*, pp. 411–412, PyeongChang, Korea, January 2019. (in Korean)
- [SC13] J. Kim and **H. I. Son<sup>†</sup>**, “Design of Deep Learning Based Intelligent Sprayer System for Pear Orchard,” In *Korea Robotics Society Annual Conference*, pp. 631–631, PyeongChang, Korea, January 2019. (in Korean)
- [SC14] S. Kim, C. Ju, and **H. I. Son<sup>†</sup>**, “Autonomous Unmanned Aerial Vehicle based Active Tracking and Mapping System of Small Insect,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2018 Fall Conference*, pp. 218, Seoul, Korea, October 2018. (in Korean) ★**Outstanding Student Paper Award (out of 220 Papers)**
- [SC15] C. Ju and **H. I. Son<sup>†</sup>**, “EToward a Supervisory Control of Multi-UAV Systems for Agricultural Applications,” In *Late Breaking Results Poster Session at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1, Madrid, Spain, October 2018.

- [SC16] S. Cho, J. Jun, and **H. I. Son<sup>†</sup>**, “End-effector with Four-finger Grasper for Autonomous Harvesting of Paprika,” In *Late Breaking Results Poster Session at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1, Madrid, Spain, October 2018.
- [SC17] J. Kim and **H. I. Son<sup>†</sup>**, “Intelligent Spraying System for Autonomous Orchard Sprayer: Work-In-Progress Report,” In *International Conference on Ubiquitous Robots (UR)*, pp. 1–3, Honolulu, Hawaii, USA, June 2018.
- [SC18] C. Ju and **H. I. Son<sup>†</sup>**, “A Haptic Teleoperation of Agricultural Multi-UAV,” In *Workshop on Robotic Vision and Action in Agriculture: the Future of Agri-Food Systems and Its Deployment to the Real-World at the IEEE International Conference on Robotics and Automation (ICRA)*, pp. 1–6, Brisbane, Australia, May 2018.
- [SC19] J. Kim and **H. I. Son<sup>†</sup>**, “지능형 방제를 위한 노즐 제어 시스템 개발,” In *ICROS Annual Conference*, pp. 339–340, Buan, Korea, May 2017. (in Korean)
- [SC20] C. Ju and **H. I. Son<sup>†</sup>**, “농업용 군집드론의 원격탐사 성능평가,” In *ICROS Annual Conference*, pp. 333–334, Buan, Korea, May 2017. (in Korean)
- [SC21] S. Park, J. Kim, J. Kim, and **H. I. Son<sup>†</sup>**, “A System for Searching Vespiary of Vespa Velutina Using UAV,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2017 Fall Conference*, pp. 61, Gwangju, Korea, October 2017. (in Korean)
- [SC22] S. Park, S. Park, and **H. I. Son<sup>†</sup>**, “Performance Evaluation of a Haptic Virtual Guide to Reduce the Damage of Fruits and Vegetables during Tele-Harvesting Task,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2017 Fall Conference*, pp. 62, Gwangju, Korea, October 2017. (in Korean)
- [SC23] J. Kim, C. Lee, and **H. I. Son<sup>†</sup>**, “An Intelligent Sprayer System for Fruit Trees Using RGB-D Camera: Preliminary Study,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2017 Fall Conference*, pp. 208, Gwangju, Korea, October 2017. (in Korean) ★**Outstanding Student Paper Award (out of 191 Papers)**
- [SC24] C. Ju, S. Park, S. Park, and **H. I. Son<sup>†</sup>**, “A Haptic Teleoperation of Agricultural Multi-UAV,” In *Workshop on Agricultural Robotics: Learning from Industry 4.0 and Moving into the Future at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1–6, Vancouver, Canada, September 2017.
- [SC25] Q. S. Le, J. Kim, J. Kim, and **H. I. Son<sup>†</sup>**, “Report on Work in Progress of Small Insect Tracking System using Autonomous UAV,” In *Proceedings of the International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, pp. 242–243, Jeju, Korea, June 2017.
- [SC26] H. Lee, C. Ju, S. Park, S. Park, and **H. I. Son<sup>†</sup>**, “Preliminary User Evaluation of Inaccuracy in Haptic Guidance for Teleoperated Maintenance Task of Nuclear Power Plant,” In *Proceedings of the International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, pp. 467–469, Jeju, Korea, June 2017.
- [SC27] S. Park, Q. Son Le, J. Kim, J. Kim, and **H. I. Son<sup>†</sup>**, “Vespa Velutina Tracking System using Autonomous UAV for Searching Vespiary,” In *International Symposium & Annual Meeting of the Entomological Society of Korea*, Gwangju, Korea, June 2017. (in Korean)
- [SC28] S. Park, H. Lee, and **H. I. Son<sup>†</sup>**, “Enhancing Situational Awareness for Teleoperation Tasks,” In *Late Breaking Results Session at the International Conference on Robotics and Automation (ICRA)*, Singapore, May 2017.
- [SC29] C. Ju, S. Park, and **H. I. Son<sup>†</sup>**, “Implementation of Agricultural Multi-UAV System with Distributed Swarm Control Algorithm into a Simulator,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2017 Spring Conference*, pp. 37–38, Gunwi, Korea, April 2017. (in Korean) ★**Outstanding Student Paper Award (out of 144 Papers)**
- [SC30] C. Ju, Y. Park, H. Lee, and **H. I. Son<sup>†</sup>**, “Haptic Teleoperation of Agricultural Multiple UAV,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2016 Fall Conference*, pp. 48, Cheonan, Korea, November 2016. (in Korean)
- [SC31] Y. Park, C. Ju, H. Lee, and **H. I. Son<sup>†</sup>**, “Psychophysical Performance Evaluation of Virtual Guide for Haptic Teleoperated Harvesting Robot,” In *Proceedings of the Korean Society for Agricultural Machinery (KSAM ) 2016 Fall Conference*, pp. 47, Cheonan, Korea, November 2016. (in Korean) ★**Outstanding Student Paper Award (out of 175 Papers)**
- [SC32] C. Ha, S. Park, J. Her, Y. Lee, I. Jang, G. R. Cho, **H. I. Son**, and D. Lee, “Semi-Autonomous Multi-Modal ROV Teleoperation System,” In *Workshop on Telerobotics for Real-Life Applications: Opportunities, Challenges, and New Developments at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 1–5, Chicago, USA, September 2014.



- [SC33] Y. E. Song, M. Niitsuma, T. Kubota, H. Hashimoto and **H. I. Son**, “Mobile Multimodal Human-Robot Interface for Virtual Collaboration,” In *Proceedings of the IEEE International Conference Cognitive Infocommunications*, Kosice, Slovakia, December 2012.
- [SC34] Y. E. Song, M. Niitsuma, T. Kubota, H. Hashimoto and **H. I. Son**, “Human-Robot Interface for Virtual Collaboration,” In *International Conference on Robot Intelligence Technology and Applications*, Gwangju, Korea, December 2012.
- [SC35] Y. E. Song, M. Niitsuma, T. Kubota, H. Hashimoto and **H. I. Son**, “Multimodal Multi-User Human-Robot Interface for Virtual Collaboration,” In *International Conference on Ubiquitous Robots and Ambient Intelligence*, pp. 18–22, Daejeon, Korea, November 2012.
- [SC36] A. Hong, H. H. Bühlhoff, and **H. I. Son**, “Experimental Design for the Evaluation of a Multimodal Feedback in Multi-Robot Teleoperation,” In *ICROS Annual Conference*, pp. 1–2, Seoul, Korea, 2012. (Invited)
- [SC37] J. Kim, **H. I. Son**, and H. H. Bühlhoff, “Psychophysical Evaluation of Haptic Feedback Algorithms for the Teleoperation of Multi-UAVs,” In *International Conference on Ubiquitous Robots and Ambient Intelligence*, pp. 602–603, Pusan, Korea, 2010.
- [SC38] P. R. Giordano, A. Franchi, **H. I. Son**, C. Secchi, D. Lee, and H. H. Bühlhoff, “Towards Bilateral Teleoperation of Multi-Robot Systems,” In *Workshop for Young Researchers on Human-Friendly Robotics*, pp.1–2, Tübingen, Germany, 2010.
- [SC39] J. Lee, H. Kim, **H. I. Son** and J. Yang, “Virtual Machine for Analyzing and Optimizing a TFT-LCD Manufacturing Equipment: Industrial Issues and Approach,” In *Control, Automation, and Systems Symposium*, pp. 698–700, Korea, 2008.
- [SC40] **H. I. Son** and D. Y. Lee, “Enhancement of Kinesthetic Perception for Microsurgical Teleoperation,” In *KSME Conference on Bioengineering*, pp. 259–260, Korea, 2008. (in Korean)
- [SC41] **H. I. Son**, H. W. Kim, H. H. Lee, and D. H. Jeong, “Macro Defect Inspection of TFT-LCD Color Filter Glass: System and Algorithm,” In *European Optical Society Conference on Industrial Imaging and Machine Vision*, pp. 129–130, Munich, Germany, 2005.
- [SC42] **H. I. Son**, K. W. Kim, and S. Lee, “Failure Recovery of Discrete Event Systems,” In *Joint Workshop on Control, Automation and Robotics*, pp. 304–309, Korea, 2000. (in Korean)
- [SC43] **H. I. Son**, K. W. Kim, and S. Lee, “Failure Diagnosis of Discrete Event Systems,” In *Joint Workshop on Control, Automation and Robotics*, pp. 298–303, Korea, 2000. (in Korean)
- [SC44] **H. I. Son**, K. W. Kim, and S. Lee, “DES Approach Failure Recovery of Pump-valve System,” *Proceedings of the Korean Society of Precision Engineering Conference*, pp. 647–650, Korea, 2000. (in Korean)
- [SC45] **H. I. Son**, K. W. Kim, and S. Lee, “DES Approach Failure Diagnosis of Pump-valve System,” *Proceedings of the Korean Society of Precision Engineering Conference*, pp. 643–646, Korea, 2000. (in Korean)
- [SC46] **H. I. Son** and S. Lee, “Implementation of DES Testbed to Investigate Supervisory Control Theory,” *Proceedings of the Korean Automatic Control Conference*, pp. D190–D193, Korea, 1999. (in Korean)
- [SC47] **H. I. Son**, C. S. Kim, and S. Lee, “The Design of DES Supervisor for the Control of Manufacturing Cell,” *Proceedings of the Korean Society of Precision Engineering Conference*, pp. 721–724, Korea, 1999. (in Korean)
- [SC48] J. H. Shin, **H. I. Son**, C. S. Kim, and S. Lee, “The Modeling of Manufacturing Cell for The Real Time Supervisory Control,” *Proceedings of the Korean Automatic Control Conference*, pp. 176–179, Korea, 1998. (in Korean)

## PATENTS

- [P1] **H. I. Son**, J. Jun, and J. Kim *Variable Apparatus for Multi Pest Control*, 10–2130479, Republic of Korea, Issued, 2020.
- [P2] **H. I. Son**, S. Park, and S. Park *End Effector of Robot*, 10–2021078, Republic of Korea, Issued, 2019.
- [P3] Y. E. Song, **H. I. Son**, D. G. Lee, M. S. Lee, and H. Jung, *Guiding Device for Underwater Cleaning Robot*, 10–1516558, Republic of Korea, Issued, 2015.
- [P4] Y. E. Song, **H. I. Son**, D. G. Lee, M. S. Lee, and H. Jung, *Underwater Remote Control Robot*, 10–1516557, Republic of Korea, Issued, 2015.
- [P5] Y. E. Song, **H. I. Son**, D. G. Lee, M. S. Lee, and H. Jung, *Apparatus for Displaying Photographing Image of Robot*, 10–1516545, Republic of Korea, Issued, 2015.

- [P6] M. S. Lee, H. Jung, **H. I. Son**, Y. E. Song, and D. G. Lee, *Robot, Feedback Force Generating Device for Controlling the Same*, 10–1516544, Republic of Korea, Issued, 2015.
- [P7] M. S. Lee, **H. I. Son**, Y. E. Song, D. G. Lee, and H. Jung, *Cleaning Robot Used for Ship, and Method of Attaching and Retrieving the Same To/From Ship Surface*, 10–1516542, Republic of Korea, Issued, 2015.
- [P8] H. Jung, S. H. Baek, **H. I. Son**, Y. E. Song, D. G. Lee, and M. S. Lee, *Robot Used for Ship, and Apparatus for Setting Driving Section of Robot*, 10–1516540, Republic of Korea, Issued, 2015.
- [P9] Y. E. Song, **H. I. Son**, D. G. Lee, M. S. Lee, and H. Jung, *Underwater Cleaning Robot*, 10–1516539, Republic of Korea, Issued, 2015.
- [P10] D. G. Lee, **H. I. Son**, M. S. Lee, Y. E. Song, and H. Jung, *Apparatus for Division Control of Robot Arm*, 10–1497320, Republic of Korea, Issued, 2015.
- [P11] D. G. Lee, Y. E. Song, **H. I. Son**, M. S. Lee, and H. Jung, *Apparatus for Guide Moving Path of Robot*, 10–1487681, Republic of Korea, Issued, 2015.
- [P12] D. Y. Lee, B. Kang, H. Jung, **H. I. Son**, M. S. Lee, and S. Oh, *Haptic Sensing Manipulating Apparatus and System for Cleaning the Hull of a Ship*, 10–1479144, Republic of Korea, Issued, 2014.
- [P13] H. Jung, **H. I. Son**, Y. E. Song, D. G. Lee, and M. S. Lee, *Apparatus for Simulation of Virtual Robot*, 10–1465950, Republic of Korea, Issued, 2014.
- [P14] D. G. Lee, **H. I. Son**, Y. E. Song, M. S. Lee, and H. Jung, *Simulation Device Used for Training of Robot Control*, 10–1475207, Republic of Korea, Issued, 2014.
- [P15] D. G. Lee, **H. I. Son**, Y. E. Song, M. S. Lee, and H. Jung, *Apparatus for Setting Cleaning Area of Ship*, 10–1465950, Republic of Korea, Issued, 2014.
- [P16] D. Y. Lee, **H. I. Son**, and H. J. Woo, *Haptic Device For Cell Manipulation*, 10–0945881, Republic of Korea, Issued, 2010.

## GRANTS AND PROJECTS

### Ongoing

- [OP1] Ministry of Agriculture, Food and Rural Affairs (421031-04): *Development of Monitoring, Fruit Thinning and Harvesting Robot for Hydroponic*. Co-PI. For approximately \$1,400,000 over 45 months (4/7/2021–12/31/2024).
- [OP2] Ministry of Agriculture, Food and Rural Affairs (320029-03): *Development of Greenhouse Cucumber Harvesting Robot*. Co-PI. For approximately \$430,000 over 33 months (4/1/2020–12/31/2022).
- [OP3] Ministry of Agriculture, Food and Rural Affairs (716001-07): *Development of Driving Platform for a Self-propelled Kimchi Cabbage Harvester*. Co-PI. For approximately \$300,000 over 38 months (1/1/2020–2/28/2023).
- [OP4] Rural Development Administration (PJ015053): *Development of Technologies for the Contamination Prevention and the Discriminant Analysis of Unpredictable Hazard Materials*. Participant. For approximately \$250,000 over 48 months (1/1/2020–12/31/2024).
- [OP5] Rural Development Administration (PJ014761): *Study on Unmanned Aerial Vehicle-based Active Searching of Vespa Velutina's Nests*. Co-PI. For approximately \$400,000 over 48 months (1/1/2020–12/31/2024).
- [OP6] Ministry of Trade, Industry and Energy (20004055): *Development of Robot Systems and Operation Procedures for Unmanned Automation on Monitoring, Spray, Harvest, and Movement in Horticulture*. Co-PI. For approximately \$200,000 over 33 months (4/1/2019–12/31/2021).
- [OP7] Ministry of Trade, Industry and Energy (P008473): *The Development of High Skilled and Innovative Manpower to Lead the Innovation based on Robot*. Participant. For approximately \$250,000 over 60 months (3/1/2019–2/29/2024).
- [OP8] National Research Foundation of Korea (NRF–2018R1D1A1B07046948): *A Study on Autonomous Cooperation for Heterogeneous Agricultural Field Robots*. PI. For approximately \$250,000 over 60 months (6/1/2018–5/31/2023).

### Completed

- [CP1] Ministry of Agriculture, Food and Rural Affairs (320086-01): *Development of Self-driving System for Followed Transport Robot in Greenhouse Smart Farm*. Co-PI. For approximately \$30,000 over 12 months (7/3/2020–7/2/2021).

- [CP2] Ministry of Trade, Industry and Energy (10076868): *Development of an Autonomous Sprayer suitable for Atypical Road Surface of an Actual Orchard*. Co-PI. For approximately \$400,000 over 45 months (4/1/2017–12/31/2020).
- [CP3] Ministry of Trade, Industry and Energy (10060070): *Development of Core Teleoperation Technologies for Maintaining and Repairing Tasks in Nuclear Power Plants*. Co-PI. For approximately \$300,000 over 48 months (12/1/2015–11/30/2019).
- [CP4] National Research Foundation of Korea: *Development of Soft Gripper for Tomato Harvesting in Green House*. PI. For approximately \$30,000 over 7 months (7/1/2018–1/31/2019).
- [CP5] Ministry of Agriculture, Food and Rural Affairs (316038-3): *Development of the Damage Minimizing Technology Against New Invasive and Damaging Wasps*. Co-PI. For approximately \$200,000 over 32 months (5/19/2016–12/31/2018).
- [CP6] Ministry of SMEs and Startups (C0532586): *Development of an Autonomous Robot for Harvesting Sweet Pepper (End-effector Modules)*. PI. For approximately \$100,000 over 12 months (8/1/2017–7/31/2018).
- [CP7] National Research Foundation of Korea (NRF–2015R1C1A1A02036875): *Multi-modal Swarm Teleoperation of Unmanned Agricultural Unmanned Aerial Robots for Enhancing Agricultural Performance*. PI. For approximately \$150,000 over 36 months (7/1/2015–6/30/2018).
- [CP8] Ministry of SMEs and Startups (C0512382, C0513968): *Development of an Autonomous Robot for Harvesting Sweet Pepper (Mobile Platform and Perception Modules)*. PI. For approximately \$60,000 over 9 months (7/20/2017–4/19/2018).
- [CP9] Ministry of Agriculture, Food and Rural Affairs (115062-2): *Development of Smart Multi-Drone System Based on Swarm Teleoperation for Enhancing Crop Production*. PI. For approximately \$120,000 over 24 months (12/18/2015–12/17/2017).
- [CP10] Chonnam National University (2015–0536): *Basic Study on Multi-modal Swarm Teleoperation of Unmanned Agricultural Unmanned Aerial Robots for Enhancing Agricultural Performance*. PI. For approximately \$30,000 over 1.8 years (7/1/2015–2/28/2017).
- [CP11] Ministry of Trade, Industry & Energy (2011–539–10041117): *Development of a Robot-Technologies with Damage-Monitoring and Improvement of Aeroelastic Performance for 5MW Offshore Wind Turbine Blade*. PI. For approximately \$2,600,000 over 4 years (12/1/2011–11/30/2015).
- [CP12] Ministry of Trade, Industry & Energy (2011–199–10040132): *Development of a Tele-Service Engine and Tele-Robot Systems with Multi-lateral Feedback*. PI. For approximately \$940,000 over 3 years (6/1/2011–5/31/2014).
- [CP13] National Research Foundation of Korea (NRF–2011–356–D00003): *Psychophysics Based Synchronization for Optimized Kinesthetic Perception of Remotely-Operated Gastrointestinal Endoscope*. PI. For approximately \$30,000 over 1 year (9/1/2011–8/31/2012).

## INVITED PRESENTATIONS

- [T1] *Research Status on Cooperative Control of Heterogeneous Agricultural Field Robots*, Korean Society for Agricultural Machinery Spring Conference, Gyeongsang National University, Korea, May 2019.
- [T2] *Heterogeneous Agricultural Field Robots: Applications in Agriculture and Life Science*, Joint Seminar between Chonnam National University and Jeonnam Agricultural Research & Extension Services, Gwangju, Korea, April 2019.
- [T3] *Applications of Heterogeneous Agricultural Field Robots into Agriculture and Life Science*, National Institute of Agricultural Sciences, Rural Development Administration, Jeonju, Korea, February 2019.
- [T4] *Robotics and Artificial Intelligence: Extension to Agriculture and Life Science*, International Joint Conference on Plant Protection, Gwangju, Korea, October 2018.
- [T5] *A Story about Telerobotics and Haptics*, National Research Foundation of Korea, Gwangju, Korea, October 2016.
- [T6] *Human-Centered Haptic Cueing Design*, Department of Mechanical Engineering, Korea National University Of Transportation, Chungju, Korea, January 2016.
- [T7] *Towards Human-Centered Agricultural Robotics and Automation*, Conference of the Korean Society of Sericultural Science, Gwangju, Korea, October 2015.
- [T8] *Towards Human-Centered Agricultural Robotics and Automation*, Conference of the Korean Precision Agricultural Engineering, Cheonan, Korea, June 2015.
- [T9] *Telerobotics Research for Offshore Applications in Samsung Heavy Industries*, School of Mechatronics, GIST, Gwangju, Korea, April 2014.

- [T10] *Telerobotics Research for Offshore Applications in Samsung Heavy Industries*, Department of Mechanical & Aerospace Engineering, Seoul National University, Seoul, Korea, March 2014.
- [T11] *Haptic Teleoperation in Offshore Applications*, The Cho Chun Shik Graduate School for Green Transportation, KAIST, Daejeon, Korea, November 2013.
- [T12] *On Telerobotics Research in Samsung Heavy Industries*, Samsung Technology Fair, Giheung, Korea, November 2013.
- [T13] *Human-Centered Teleoperation*, ICROS Annual Conference, Changwon, Korea, May 2013.
- [T14] *Telerobotics Research in Samsung Heavy Industries*, Max Planck Institute for Biological Cybernetics, Tübingen, Germany, May 2013.
- [T15] *Psychophysical Evaluation of Visual and Haptic Feedback in Teleoperation of Multiple Mobile Robots*, Workshop on Haptic Teleoperation of Mobile Robots: Theory, Applications and Perspectives at the IEEE International Conference on Robotics and Automation (ICRA), Minnesota, USA, May 2012.
- [T16] *Design Thinking in Haptics*, School of Design and Human Engineering, UNIST, Ulsan, Korea, May 2012.
- [T17] *Human-Centered Control and Evaluation in Haptics and Teleoperation*, Department of Mechanical Engineering, KAIST, Daejeon, Korea, November 2011.
- [T18] *Haptics and Teleoperation*, Max Planck Institute for Biological Cybernetics, Tübingen, Germany, April 2010.
- [T19] *Kinesthetic Perception Optimized Teleoperation*, Department of Electrical Engineering and Information Systems, The University of Tokyo, Tokyo, Japan, January 2010.

## ADVISING

### Postdoctoral Members

- [PD1] Sungjun Park, PostDoc, *Multimodal Shared Teleoperation of Multiple UAVs for Agricultural Applications* at Chonnam National University, 2017.

### Graduate Students

- [GS1] Yu Seong Jo, Integrated B.S.–M.S. Student, *Multirobot Coordination* at Chonnam National University, 2021–.
- [GS2] Junyoung Kwak, Integrated B.S.–M.S. Student, *Multirobot Planning* at Chonnam National University, 2021–.
- [GS3] Yong Hyun Park, Ph.D. Student, *Multirobot Planning and Scheduling* at Chonnam National University, 2021–.
- [GS4] Bo Sung Kim, Integrated M.S.–Ph.D. Student, *Localization and Tracking* at Chonnam National University, 2021–.
- [GS5] Jong Pyo Jun, Ph.D. Student, *Harvesting Robot* at Chonnam National University, 2020–.
- [GS6] Jaehwi Seol, M.S. Student, *Multirobot Control* at Chonnam National University, 2020–.
- [GS7] Chanyoung Ju, Ph.D. Student, *Process Control of Heterogeneous Multiple Robot* at Chonnam National University, 2019–.
- [GS8] Jeongeun Kim, M.S. Student, *Task Allocation of Multiple UGVs* at Chonnam National University, 2019–2021.
- [GS9] Chanyoung Ju, M.S. Student, *Cooperative Control of Multiple UAVs* at Chonnam National University, 2017–2019.
- [GS10] Sangsoo Park, Ph.D. Student, *Enhancement of Situational Awareness for Haptic Teleoperation* at Chonnam National University, 2017–2018.
- [GS11] Quang Son Le, Integrated M.S.–Ph.D. Student, *Visual SLAM of Multiple UAVs for Agricultural Applications* at Chonnam National University, 2016–2017.
- [GS12] Youngeun Song, Ph.D. Student, *Gesture-based Multi-Modal Human-Robot Interface for Virtual Collaboration* at The University of Tokyo, 2010–2013.
- [GS13] Ayoung Hong, Ph.D. Student, *Psychophysical Study of Multi-Modal Feedback in Multi-Robot Teleoperation* at Max Planck Institute for Biological Cybernetics, 2011–2012.
- [GS14] Junsuk Kim, M.S. Student, *Psychophysical Evaluation of Haptic Feedbacks in Multi-Robot Teleoperation* at Korea University, 2010–2011.



- [GS15] Tapomayukh Bhattacharjee, M.S. Student, *Analysis of Stability and Performance of Telesurgical Systems* at KAIST, 2008–2009.

#### *Undergraduate Students*

- [US1] Jeonghyeon Park at Chonnam National University, 2020–.
- [US2] Tae Yong Jeong, Jeong In Kim, and Sechang Lee at Chonnam National University, 2019–.
- [US3] Seungwon Kim, Jaehwi Seol, and Hyeongjung Jung at Chonnam National University, 2018–2020.
- [US4] Inbeom Hwang at Chonnam National University, 2015–2020.
- [US5] Jinsu Kim at Chonnam National University, 2017–2019.
- [US6] Jeongeun Kim at Chonnam National University, 2017–2019.
- [US7] Jihyang Song at Chonnam National University, 2015–2019.
- [US8] Chanyoung Ju, Hyuna Kim, Hyunjin Lee, Youngju Park at Chonnam National University, 2015–2018.
- [US9] Manho Jeon at Chonnam National University, 2015–2017.

## PROFESSIONAL SERVICES

#### *Professional Society Memberships*

- Senior Member, Institute for Electrical and Electronics Engineers (IEEE)
- Member, Institute of Control, Robotics and Systems (ICROS)
- Member, Korean Society for Agricultural Machinery (KSAM)
- Member, Korea Robotics Society for Agricultural Machinery (KROS)
- Founding Chair, Technical Committee on Agricultural and Construction Robotics, ICROS

#### *Editorships, Program Committees, Review Panels, and Conference Organization*

- Associate Editor, IEEE Access, 2019 – Present
- Editorial Board, Journal of Korea Robotics Society (KROS), 2019 – Present
- Editorial Board, Institute of Control, Robotics and Systems (ICROS) Magazine, 2016 – 2019
- Associate Editor, International Conference on Robotics and Automations (ICRA), 2016
- Guest Editor, *Electronics, Special Issue on Modeling, Control, and Applications of Field Robotics*, 2021
- Guest Editor, *Journal of Korea Robotics Society, Special Issue on Agricultural Robotics*, June, 2020
- Guest Editor, *Journal of Institute of Control, Robotics and Systems, Special Issue on Agricultural Robotics and Automation*, November, 2018

#### *Reviews*

- Journals: *IEEE Transactions on Robotics*, *IEEE Transactions on Control Systems Technology*, *IEEE Transactions on Cybernetics*, *IEEE Transactions on System, Man and Cybernetics, Part B: Cybernetics*, *IEEE Transactions on Haptics*, *IEEE Transactions on Industrial Electronics*, *IEEE/ASME Transactions on Mechatronics*, *IEEE Robotics & Automation Letters*, *Robotica*, *International Journal of Medical Robotics and Computer Assisted Surgery*, *Journal of Intelligent Manufacturing*, *Journal of Mechanical Science and Technology*, *Journal of Institute of Control, Robotics and Systems*
- Conferences: *IEEE International Conference on Robotics and Automation (ICRA)*, *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, *IEEE Engineering in Medicine and Biology Conference (EMBC)*, *World Haptics Conference (WHC)*, *International Conference on Control, Automation and Systems (ICCAS)*

## REFERENCES

Available upon request.