Hyunsoo Shin

CONTACT INFORMATION

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EDUCATION

Hanyang University, Republic of Korea

Ph.D., Electrical and Electronic Engineering, Feb 2023

- Title: "Development and Application Robotic Transcranial Magnetic Stimulation"
- Advisor: Sungon Lee

M.S., Electronic Systems Engineering, Feb 2017

- Title: "Control of a robot for non-invasive brain stimulation using position based visual servoing"
- Advisor: Sungon Lee

B.A., Electronic Systems Engineering, Feb, 2015

- Graduation Project: "Vibration sensing touch input device using accelerometers"
- Advisor: Youngjin Choi

RESEARCH EXPERIENCE

Visiting Scholar

- Researcher, Dec 2019 ∼ Jul 2020

  - Research topic: Extraction of shoreline for autonomous shipping

  - Professor : Peter Slaets (Intelligent Mobile Platform (IMP) Research Group, KU Leuven, Belguim)

Assistant

- Research Assistant, Feb 2015 ∼ Feb 2019

  - Professor : Sungon Lee

Project

- Development of Non-invasive Brain Stimulation System for Innovative Interaction, Korea Government (MSIT), Mar 2015 ∼ Aug 2019
  - Kinematic analysis of six-dof serial robot for brain stimulation
  - Control of positioning robot with tracking system
  - Repeatability and accuracy experiment
- Automatic positioning and navigation system developed for brain stimulation device for TMS, Korea Government (MSIT), Jun 2016 ∼ Jun 2018
  - Kinematic calibration
  - Communication between robot and navigation program
- Development of robotic work control technology capable of grasping and manipulating various objects in everyday life environment based on multimodal recognition and using tools, Ministry of Trade, Industry & Energy (MOTIE, Korea), Apr 2018 ∼ Dec 2021

- Pose estimation
- Integration of robotic grasping and recognition

- Study on sensation generated by non-invasive nerve/muscle stimulation for realistic and immersive extended reality, Korea Government (MSIT), Jun 2022 ∼ Feb 2025
  - Improvement of realism in virtual reality

International Journal

R Algabri, **H. Shin** and S Lee, "Real-time 6DoF full-range markerless head pose estimation" Expert Systems with Applications (2024)

H. Shin, H. Jeong et al. "Robotic transcranial magnetic stimulation in the treatment of depression: a pilot study." Scientific Reports (2023).

J. Seo, **H. Shin** et al. "A phased array ultrasound system with a robotic arm for neuromodulation." Medical Engineering & Physics (2023).

J. Lee†, **H. Shin**† and S. Lee. "Development of a Wide Area 3D Scanning System with a Rotating Line Laser." Sensors (2021)

H. Shin†, W. Ryu†, S. Cho and S. Lee. "Development of a Spherical Positioning Robot and Neuro-Navigation System for Precise and Repetitive Non-Invasive Brain Stimulation." Appl. Sci. (2019)

Papers in Preparation

H. Shin and S. Lee, "Robust Hand-Eye Calibration Using Well-Conditioned Motion Guidance" Robotics and Computer-Integrated Manufacturing (to be submitted, Dec 2023)

H. Shin, J. Lee, and S. Lee, "The effect of vibrotactile and perception induced by transcranial magnetic stimulation over the primary motor cortex in virtual hand illusion" Virtual Reality (revision, Dec 2023)

Domestic Journal

H. Shin, MR Afzal, and S. Lee, "Segmentation-Based Depth Map Adjustment for Improved Grasping Pose Detection" The Journal of Korea Robotics Society (2024)

Conference Presentations

S. Baelen, **H. Shin** et al., "Preliminary results on increased situational awareness for inland vessels using onboard LiDAR" Global Oceans 2020: Singapore – U.S. Gulf Coast (2020)

H. Shin, H. Hwang, H. Yoon and S. Lee. "Integration of deep learning-based object recognition and robot manipulator for grasping objects." Ubiquitous Robots (2019)

H. Shin, W. Ryu and S. Lee. "Design of a 6-DOF Serial Manipulator for Transcranial Magnetic Stimulation" Asian Conference on Computer Aided Surgery (2016)

Patent

- A robot having a joint structure using parallel mechanism, 10-1914153, KR (2018)
- MEDICAL MULTI-DOF ROBOT, 1020200139611, KR (2020)
- MEDICAL MULTI-DOF ROBOT, WO2022092554A1, PCT (2022)

Award

Bronze prize, Capstone Design Contest of Hanyang University (Oct 2014)

Best journal paper award, Korean Society of Medical Robotics (Oct 2021)

SCHOLARSHIP

Lotte Scholarship Foundation, Republic of Korea, (2009 $\sim$ 2010)

PROFESSIONAL SKILLS

Hand-eye Calibration

- Selection of the motion
- Reprojection error
- Symmetric transfer error

Sensor Fusion

- Multi-camera calibration
- Absolute orientation
- Kabsch algorithm

Robot Calibration

- Identification Jacobian
- Convolutional neural network

Visual Servoing

- Pose estimation
- Feedback control with orientation error
- Motion compensation for head movement

Virtual Reality

- Improvement of realism

Languages & Library

- C++, Matlab, Python, Unity, RStudio
- OpenCV, Open3D, Pytorch, ROS