

MICHAEL SEOKYOUNG HAN

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HIGHLIGHT

A highly multidisciplinary Ph.D. candidate with a strong background in Mechanical Engineering, specializing in robotics. Have a comprehensive understanding of the overall development process with over 10 years of diverse experiences in designing and implementing robotic systems. From intense model-based systems to data-driven machine learning models, have various experiences in the system realization. Eager to take on new challenges and explore innovative concepts making the world better tomorrow.

EDUCATION

Ph.D. Candidate in Mechanical Engineering

University of Louisville, Louisville, KY, USA

Jan. 2021 - Spring 2024(Exp)

Research Focus : **Soft robotics, Kinematics and dynamics, Position/Force control, Machine-learning, Human-robot interaction, Robot Manipulation, Sensor system, Signal processing, Optoelectronic system**

M.S. in Mechatronics

Gwangju Institute of Science and Technology(GIST), Gwangju, Korea

Aug. 2015

Research Focus : **Motion control, Tendon-driven robotic system, Iterative learning control**

Thesis Title : Development of a Tensegrity Robot and Feedforward Control via Iterative Learning Control Algorithm

B.S. in Mechanical and Automotive Engineering

Kookmin University, Seoul, Korea

Aug. 2013

AWARDS AND HONORS

Winner Prize, <i>Hackerthon Pitch Competition</i> , \$1500, Humana Foundation, USA	2023
Application for providing correlation between dog's behavior and heart rate	
NSF LaunchIt I-Corp Innovation Award, \$1600, NSF, USA	2023
Smart device for dogs	
Graduate Student Travel Award, University of Louisville, USA	2023, 2021
IEEE ROBOSOFT, MRS(Materials Research Society) meetings	
Winner Prize, <i>Mechatronics Capstone Project</i> , GIST, Korea	2014
Anti-collision system for automobile doors	
Winner Prize, <i>International Micro-Robot Competition</i> , Japan	2012
Scholarship, <i>Autonomous Vehicle Robot Competition</i> , \$1500, Samsung, Korea	2011
Grade Scholarship Award, Kookmin University, Korea	2012

PROFESSIONAL SKILLS

Coding Language : **Matlab, Python, Embedded C**

Mechanical Design and Testing Tool : **SolidWorks, COMSOL, 3D Printing, CNC, Laser Cutting, Zemax, NI Labview, Simulink**

Misc : **Github, ROS, Illustrator, Latex**

PROFESSIONAL EXPERIENCE

Ph.D. Candidate, Research Assistant

University of Louisville, KY, USA

Advisor : Dr. Cindy K. Harnett

Jan. 2021 - Present

Funded by NSF

- Devised **soft tactile sensor**, which can detect lateral as well as normal force
- Designed **adaptive grasping controller** with an own-developed **optoelectronic soft tactile sensor**
- Constructing **highly-anthropomorphic robotic manipulator** system

Robotics R&D Engineer

Aug. 2016 - Apr. 2019

University of Texas Health Science Center(UTHealth), Houston, TX

Spun-off ColubrisMX, Inc, Series A(2017, \$16M), Currently EndoQuest Robotics

Supervisor : Dr. Dongsuk Sin

- Constructed an **automated calibration system** based on a learning control method for verification surgical apparatuses assembly.
- Developed control strategies for **tendon-driven minimally invasive surgical robot** systems. Especially, **kinematics of the articulated robot** structures and **motion control based on optimization and machine-learning** were the main focus.
- Researched how to bridge a gap between the system model and real hardware to make **high accuracy motion**, which has to do with controlling undesirable movement of robot such as hysteresis, friction, etc.

Research Associate

Aug. 2015 - Jul. 2016

Gwangju Institute of Science and Technology(GIST) Funded by Korea Atomic Energy Research Institute

Advisor : Dr. Hyosung Ahn

- Conducted research to identify dynamics of a **tensegrity robot** to maintain its stable posture and make consistent locomotion
- Designed **iterative learning controller** generating improved movement after repetitive motion study

Research Intern

Jan. 2012 - Aug. 2013

Kookmin University

- Led an undergraduate team developing an autonomous vehicle robot(**sensor fusion, SLAM algorithm**)

PUBLICATIONS

Journal Articles

1. **Michael S. Han**, Cindy K. Harnett, "Journey from Human Hands to Robot Hands : Biological Inspiration of Anthropomorphic Robotic Manipulators", *Bioinspiration & Biomimetics*, 2024
2. **Michael S. Han**, Cindy K. Harnett, "Soft, All-Polymer Optoelectronic Tactile Sensor for Stick-Slip Detection", *Advanced Materials Technologies*, 2022
3. Yoon, S., Cheon, S.Y., Park, S., Lee, D., Lee, Y., **Han, S.**, Kim, M. and Koo, H., "Recent advances in optical imaging through deep tissue: imaging probes and techniques", *Biomaterials Research*, 2022
4. S. Jin, **S. Han**, "Gain optimization of kinematic control for wire-driven surgical robot with layered joint structure considering actuation velocity bound", *The Journal of Korea Robotics Society*, 2020
5. S. Jin, S. Lee, J. Lee, **S. Han**, "Kinematic Model and Real-Time Path Generator for a Wire-Driven Surgical Robot Arm with Articulated Joint Structure", *Applied Sciences*, 2019

Peer-Reviewed Conference Publications

1. (*Accepted*) **Michael S. Han**, J-T. Lin, Cindy K. Harnett, "A Bio-Inspired Robotic Finger Driven and Shape-Sensed by Soft Optical Tendons", *RoboSoft IEEE*, 2024, San Diego

2. (*Accepted*) Paul Bupe, Jr., Yuhao Jiang, J-T. Lin, Tram Nguyen, **Michael S. Han**, Daniel M. Aukes, C. K. Harnett, “Embedded Optical Waveguide Sensors for Dynamic Behavior Monitoring in Twisted-Beam Structures”, RoboSoft IEEE, 2024, San Diego
3. Christopher J. Kimmer, **Michael S. Han**, Cindy K. Harnett, “Strained Elastic Surfaces with Adjustable-Modulus Edges (SESAMEs) for Soft Robotic Actuation”, ICRA IEEE, 2023, London
4. **Michael S. Han**, Dan O. Popa, Cindy K. Harnett, “Anti-Slipping Adaptive Grasping Control with a Novel Optoelectronic Soft Sensor”, RoboSoft IEEE, 2023, Singapore
5. **S. Han**, K. Jeong, H. Ahn, “Iterative Learning Control for Trajectory Tracking of Tensegrity Robot”, Control Automation Robotics & Vision on IEEE, 2014

Conference Extended Abstracts and Posters

1. **Michael S. Han**, “Measurement of Lateral Force and Slipping Based on Optical Fiber Mechanism”, Materials Research Society, 2021 Fall

Patents

1. **Michael S. Han**, Cindy K. Harnett, “Optoelectronic Soft Tactile Sensor for a Stick-Slip Control”, US Patent Application No.18/220,443, 2024/1/11
2. **S. Han**, T. JANG, D. Kim, H. KIM, J. LEE, K. Nam, Y. Park, D. Shin, “End effector and end effector drive apparatus”, AU2020210173B2, application date Jun. 2017
3. T. JANG, D. Kim, H. KIM, J. LEE, K. Nam, Y. Park, D. Shin, **S. Han**, “Surgical apparatus”, EP3799822A1, application date Dec. 2017