Seokhyun (Shawn) Hwang

Ph.D. Student | University of Washington

☑ Human Computer Interaction ☑ VR / AR
☑ Haptic Interface ☑ Wearable Device

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EDUCATION

☑ **University of Washington, United States** | Information Science, Information School (Expected) Sep 2024 – Present
  Doctor of Philosophy (Ph.D.) (Advisor: Jacob O. Wobbrock)

☑ **Gwangju Institute of Science and Technology, Korea** | Intelligent Robotics, School of Integrated Technology Sep 2021 – Aug 2023
  Master of Science (M.S.) (Advisor: SeungJun Kim)

☑ **Gwangju Institute of Science and Technology, Korea** | Department of Mechanical Engineering Mar 2017 – Aug 2021
  Bachelor of Science (B.S.)

PROFESSIONAL EXPERIENCE

☑ **University of Washington |** Teaching Assistant Sep 2024 – Present

☑ **Gwangju Institute of Science and Technology** | Research Associates Sep 2023 – Aug 2024

☑ **Gwangju Institute of Science and Technology** | Teaching Assistant Sep 2021 – Aug 2023

☑ **Human-Centered Intelligence Systems Lab** | Research Intern (Advisor: SeungJun Kim) Jan 2021 – Aug 2021

☑ **Intelligent Medical Robotics Lab** | Research Intern (Advisor: Jungwon Yoon) Jun 2020 – Dec 2020

☑ **BA Energy Lab** | Industrial-Academic Intern Dec 2019 – Feb 2020

☑ **National University of Laos |** Experiment Instructor Jul 2019
  • Educational volunteer for college students of the NUOL and Khon, Kaen University of Thailand

☑ **2019 GIST Science Camp** | Instructor, Experiment Team Leader, Design Team Leader Jan 2019
  • Providing experimental education to elementary and middle school students in the local community

TECHNICAL STRENGTHS

☑ **Modeling & Designing** | Autodesk Inventor, Fusion 360, Blender, KiCad

☑ **Software & Tools** | Unity, MATLAB, LABVIEW, COMSOL Multiphysics, Cubase, Adobe Premiere Pro, Final Cut Pro

☑ **Programming Languages** | C, C#, MATLAB, Python, JAVA

RESEARCH PROJECTS

☑ **Blurring the Boundary Between Reality and Virtuality: Research on Novel Haptic Devices**

  • Creation and evaluation of a small, lightweight haptic system that uses electrical muscle stimulation (EMS) combined with biomechanical simulation to stimulate multiple muscles simultaneously, providing users with precise directional haptic force feedback [c.5, w.4]

  • Improvement of the response time limitations of previous thermal haptic devices by using motorized Peltier modules, creating a device capable of providing a high level of realism in situations requiring rapid sensory transitions [c.8, w.1]

  • Development of exemplary VR applications utilizing haptic devices in industrial settings [c.8, w.4] and VR game content [c.5, c.8, w.1]

☑ **Towards Seamless Walking in Virtual Environments: Redirected Walking (RDW)**

  • Development and usability testing of various haptic systems to enhance the obstacle avoidance capability of RDW technology, overcoming the physical limitations of real-world space, thereby enhancing the seamless walking experience

  • Creation of haptic devices that can provide vestibular stimulation (galvanic, bone conduction vibration, thermal) [c.1, c.3, p.2, pa.1], olfactory stimulation, auditory stimulation [j.2, p.1], and visual stimuli with optical flow [j.1], along with algorithms to determine the optimal type and timing of stimulation

  • Further implementation of algorithms to improve RDW's spatial scalability by predicting user paths through real-time sensing of walking data and deep learning-based user path prediction – responsible for implementing the real-time gait sensor streaming system [p.4]

☑ **Utilizing Haptic Technology for Accessibility**

  • Development and implementation of a hat-shaped haptic device that induces the "Hanger reflex" to expand the field of vision for people with low vision [c.6]

  • Development of an intelligent walker that integrates pressure sensors, linear actuators, and motorized wheels, dynamically changing its form to match the patient's intent and the surrounding environment, aimed at improving rehabilitation performance for patients with lower body motor impairments [w.2]

☑ **Interactions Between Autonomous Vehicles (AVs) and People**

  • Development and evaluation of a haptic system that activates muscles via EMS based on the content and movement of the vehicle to address motion sickness, a major limitation of VR use in AVs [c.4, w.3]

  • Development and evaluation of an in-car VR locomotion system that allows users to freely explore the environment, rather than simply observing content on predetermined routes [p.3, cc.1, cc.2]

  • Creation and distribution of a comprehensive dataset of AV passengers' real-time needs and biometric signals [c.7]

  • Development and design evaluation of an AR-based virtual agent for communication between AVs and pedestrians [c.2]

CONFERENCES & JOURNALS

[c.8] Kang, S., Kim, G., **Hwang, S.**, Park, J., Elsharkawy, A., and SeungJun Kim "Flip-Pelt: Motor-Driven Peltier Elements for Rapid Thermal Stimulation and Congruent Pressure Feedback in Virtual Reality." *Proceedings of the 2024 ACM Symposium on User Interface Software and Technology (Accepted)*

[c.7] Kim, G., **Hwang, S.**, Seong, M., Yeo, D., Daniela Rus, and SeungJun Kim "TimelyTale: A Multimodal Dataset Assessing Passenger's Demands for Explanations in Highly Automated Vehicles." *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, Vol. 8, No.3*

[c.6] Jo, T., Yeo, D., Kim, G., **Hwang, S.**, and SeungJun Kim "WatchCap: Improving Scanning Efficiency in People with Low Vision through Compensatory Head Movement Stimulation." *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies, Vol. 8, No. 2*

[j.2] Lee, J., **Hwang, S.**, Kim, K., and SeungJun Kim "Evaluation of Visual, Auditory, and Olfactory Stimulus-Based Attractors for Intermittent Reorientation in Virtual Reality Locomotion." *Virtual Reality 28, 104 (2024)*

[c.5] **Hwang, S.**, Oh, J., Kang, S., Seong, M., Elsharkawy, A., and SeungJun Kim "ErgoPulse: Electrifying Your Lower Body With Biomechanical Simulation-based Electrical Muscle Stimulation Haptic System in Virtual Reality." *Proceedings of the 2024 CHI conference on Human Factors in Computing Systems* 🏆 **Honorable mention**

[c.4] Elsharkawy, A., Ataya, A., Yeo, D., An, E., **Hwang, S.**, and SeungJun Kim "SYNC-VR: Synchronizing Your Senses to Conquer Motion Sickness for Enriching In-Vehicle Virtual Reality." *Proceedings of the 2024 CHI conference on Human Factors in Computing Systems* 🏆 **Honorable mention**

[j.1] Lee, J., **Hwang, S.**, Ataya, A., and SeungJun Kim "Effect of Optical Flow and User VR Familiarity on Curvature Gain Thresholds for Redirected Walking." *Virtual Reality 28, 35 (2024)*

[c.3] **Hwang, S.**, Kim, Y., Seo, Y, and SeungJun Kim "Enhancing Seamless Walking in Virtual Reality: Application of Bone-Conduction Vibration in Redirected Walking." *2023 IEEE International Symposium on Mixed and Augmented Reality (ISMAR)* 🏆 **Honorable mention**

[c.2] Kang, Y., Choi, S., An, E., **Hwang, S.**, and SeungJun Kim "Designing Virtual Agent Human–Machine Interfaces Depending on the Communication and Anthropomorphism Levels in Augmented Reality." *Proceedings of the 2023 International Conference on Automotive UI* 🏆 **Honorable mention**

[c.1] **Hwang, S.**, Lee, J., Kim, Y., Seo, Y, and SeungJun Kim "Electrical, Vibrational, and Cooling Stimuli-Based Redirected Walking: Comparison of Various Vestibular Stimulation-Based Redirected Walking Systems." *Proceedings of the 2023 CHI conference on Human Factors in Computing Systems*

POSTERS & WORKSHOPS

[w.4] **Hwang, S.**, Kang, S., Oh, J., Park, J., Shin, S., Yiyue Luo, DelPreto, J., Wojciech Matusik, Daniela Rus, and SeungJun Kim "Proposal of a Framework for Enhancing Teleoperation Experience with Biomechanical Simulation-Based Electrical Muscle Stimulation in Virtual Reality." *UbiComp '24: Companion of the 2024 on ACM International Joint Conference on Pervasive and Ubiquitous Computing*

[w.3] Elsharkawy, A., Ataya, A., Yeo, D., Seong, M., **Hwang, S.**, DelPreto, J., Wojciech Matusik, Daniela Rus, and SeungJun Kim "Adaptive In-Vehicle Virtual Reality for Reducing Motion Sickness: Manipulating Passenger Posture During Driving Events." *UbiComp '24: Companion of the 2024 on ACM International Joint Conference on Pervasive and Ubiquitous Computing*

[w.2] Choi, Y., Yeo, D., **Hwang, S.**, Seong, M., Moon, J., Yiyue Luo, Wojciech Matusik, Daniela Rus, and Kim, K. "Intelligence Walker: A Seamless Mobility Assist Device for the Elderly." *2024 IEEE ICRA Workshop on Wearable*

[w.1] Kang, S., Kim, G., **Hwang, S.**, Park, J., Elsharkawy, A., and SeungJun Kim "Dual-sided Peltier Elements for Rapid Thermal Feedback in Wearables." *2024 IEEE ICRA Workshop on Wearable*

[p.4] Kim, Y., **Hwang, S.**, Oh, J., and SeungJun Kim "GaitWay: Gait Data-Based VR Locomotion Prediction System Robust to Visual Distraction." *Extended Abstracts of the 2024 CHI conference on Human Factors in Computing Systems*

[p.3] Gim, B., Kang, S., Kim, G, Yeo, D., **Hwang, S.**, and SeungJun Kim "Curving the Virtual Route: Applying Redirected Steering Gains for Active Locomotion in In-Car VR." *Extended Abstracts of the 2024 CHI conference on Human Factors in Computing Systems*

[p.2] **Hwang, S.**, Lee, J., Kim, Y., and SeungJun Kim "REVES: Redirection Enhancement Using Four-Pole Vestibular Electrode Stimulation." *Extended Abstracts of the 2022 CHI conference on Human Factors in Computing Systems*

[p.1] Lee, J., **Hwang, S.**, Kim, K., and SeungJun Kim "Auditory and Olfactory Stimuli-Based Attractors to Induce Reorientation in Virtual Reality Forward Redirected Walking." *Extended Abstracts of the 2022 CHI conference on Human Factors in Computing Systems*

PATENTS & COPYRIGHTED CONTENTS

[pa.1] **Hwang, S.**, Lee, J., Kim, Y., Seo, Y., and SeungJun Kim "Method and System for Supporting Walking in Virtual Environment." *US Patent App. 18/783,599 |KR Patent App. 10-2023-0,155,898*

[cc.1, 2] SeungJun Kim, Kang, S., Kang, Y., Kim, K., Seong, M., An, E., Yang, H., Yeo, D., Oh, J., Jeon, H., Jo, T., and **Hwang, S.** "Mobility-Linked Virtual Reality-Based Underwater Exploration Immersive Content Game Software (**[cc.2]:** Underwater Exploration & Ocean Trash Collection Game). & (**[cc.1]:** Underwater Exploration & Underwater Gem Collection Game)." *Copyright for Computer Program Works [cc.2]: C-2022-050134 & [cc.1]: C-2022-050133 (KR)*

AWARDS & HONORS

▣ **Gell Mason Endowed Fellowship, University of Washington**	Sep 2024
▣ **Provost-Funded Fellow, University of Washington**	Sep 2024
▣ **Startup Funding, University of Washington**	Sep 2024
▣ **Special Recognitions, ACM IMWUT** | Outstanding Reviews in 2024 IMWUT	Aug 2024
▣ **Honorable Mentions, 2024 CHI conference on Human Factors in Computing Systems** | Top 5% of Conference Papers [c.5]	May 2024
▣ **Honorable Mentions, 2024 CHI conference on Human Factors in Computing Systems** | Top 5% of Conference Papers [c.4]	May 2024
▣ **Honorable Mentions, IEEE International Symposium on Mixed and Augmented Reality** | 2nd Prize of Conference Papers [c.3]	Oct 2023
▣ **Honorable Mentions, International ACM Conference on Automotive UI** | Top 5% of Conference Papers [c.2]	Sep 2023
▣ **Special Recognitions, ACM UIST** | Outstanding Reviews in 2023 UIST	May 2023
▣ **Government Supported Scholarship, Korea** | Master's Degree Government Scholarship	Sep 2021 – Aug 2023
▣ **President Award, GIST** | 1st Prize in Table Tennis Robot at the 4th GIST Creative Convergence Competition in 2020	Aug 2020
▣ **Scholarship for Academic Excellence**	Sep 2020 – Dec 2020
▣ **Industry-Academic Cooperation Scholarship**	Dec 2019 – Feb 2020
▣ **Scholarship for Overseas Summer Semester Exchange Students** | Boston University Exchange Student Scholarship	Jun 2018 – Aug 2018
▣ **Government Supported Scholarship, Korea** | Bachelor's Degree Government Scholarship	Mar 2017 – Aug 2021

INVITED TALKS

▣ **University of Chicago, Human Computer Integration Lab |** Invited Presentation (hosted by Pedro Lopes)	Jan 2024
▣ **HCI Korea 2024, ACM SIGCHI |** Invited Presentation on "Vestibular Stimuli-Based Redirected Walking" (hosted by Inseok Hwang)	Jan 2024