Seongkook Heo

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My vision is to expand the interaction bandwidth between humans and computers by enabling users to manipulate virtual objects in a rich, nuanced, and bi-directional way like they do in the real world. I design and build new sensing techniques and haptic feedback technologies and interaction techniques that carefully matched human sensing capabilities and motor skills.

Appointments

2019 – **University of Virginia, Charlottesville, VA, USA**
Assistant Professor, Department of Computer Science

2017 – 2019 **University of Toronto, Toronto, ON, Canada**
Postdoctoral Researcher, Department of Computer Science

Education

Feb 2017 **Korea Advanced Institute of Science and Technology**, Daejeon, South Korea
Ph.D. Computer Science
Advisor: Geehyuk Lee

Aug 2009 **Korea Advanced Institute of Science and Technology**, Daejeon, South Korea
M.S. Digital Media
Advisor: Geehyuk Lee

Feb 2007 **Sungkyunkwan University**, Suwon, South Korea.
B. S. Electric and Electronic Engineering

Feb 2007 **Sungkyunkwan University**, Suwon, South Korea.
B. S. Computer Engineering (Double major)

Professional Experience

Jan – Apr 2016 **Autodesk Research, Toronto, Canada**
Research Intern supervised by Dr. Tovi Grossman
Developing interaction techniques for wearable devices **[C.14]**

May–Aug 2015 **Microsoft Research, Redmond, USA**
Research Intern supervised by Dr. Ken Hinckley
Developing interaction techniques for mobile devices **[C.12]**

Jun – Aug 2008 **Samsung Advanced Institution of Technology (SAIT), Suwon, South Korea**
Research Intern at Multi-modal Interaction Lab
Designing multi-modal interaction techniques for consumer electronics

2005–2006 **AhnLab, Seoul, South Korea**
Software Engineering Intern

Peer-reviewed Publications (index starting with C: conference paper, J: Journal paper)

C. 23 Erfan Pakdamanian, Shili Sheng, Sonia Bae, **Seongkook Heo**, Sarit Kraus, and Lu Feng. (2021) DeepTake: Prediction of Driver Takeover Behavior using Multimodal Data. ***CHI '21. (To appear)***

J. 6 Hyunju Kim, Sanghwa Hong, Junki Kim, Taesoo Jang, Woontaek Woo, **Seongkook Heo**, and Byungjoo Lee. (2020) RealityBrush: an AR authoring system that captures and utilizes kinetic properties of everyday objects. ***Multimedia Tools and Applications.***

C. 22 Keunwoo Park, Daehwa Kim, **Seongkook Heo**, and Geehyuk Lee. (2020) MagTouch: Robust Finger Identification for a Smartwatch Using a Magnet Ring and a Built-in Magnetometer. ***CHI '20.*** (Acceptance rate: 24.3%)

C.21 **Seongkook Heo**, Jaeyeon Lee, Daniel Wigdor. (2019) PseudoBend: Producing Haptic Illusions of Stretching, Bending, and Twisting Using Grain Vibrations. ***UIST '19.*** (Acceptance rate: 20.6%)

C.20 Devamardeep Hayatpur, **Seongkook Heo**, Haijun Xia, Wolfgang Stuerzlinger, Daniel Wigdor. (2019) Plane, Ray, and Point: Enabling Precise Spatial Manipulations with Shape Constraints. ***UIST '19.*** (Acceptance rate: 20.6%)

C.19 Sanghwa Hong, Eunseok Jeong, **Seongkook Heo**, Byungjoo Lee. (2018) FDSense: Estimating Young's Modulus and Stiffness of End Effectors to Facilitate Kinetic Interaction on Touch Surfaces. ***UIST '18.*** (Acceptance rate: 20.6%)

C.18 Zhicong Lu, **Seongkook Heo**, Daniel Wigdor. (2018) StreamWiki: Enabling Viewers of Knowledge Sharing Live Streams to Collaboratively Generate Archival Documentation for Effective In-Stream and Post-Hoc Learning. ***CSCW'18***. (Acceptance rate: 25.6%)

C.17 **Seongkook Heo**, Christina Chung, Geehyuk Lee, Daniel Wigdor. (2018) Thor's Hammer: An Ungrounded Force Feedback Device Utilizing Propeller-Induced Propulsive Force. ***CHI '18***. (Acceptance rate: 25.7%)

C.16 Zhicong Lu, Haijun Xia, **Seongkook Heo**, Daniel Wigdor. (2018) You Watch, You Give, and You Engage: A Study of Live Streaming Practices in China. ***CHI '18***. (Acceptance rate: 25.7%)

C.15 Sunggeun Ahn, **Seongkook Heo**, Geehyuk Lee. (2017) Typing on a Smartwatch for Smart Glasses. ***ISS '17***.(Acceptance rate: 26.9%)

C.14 **Seongkook Heo**, Michelle Annett, Ben Lafreniere, Tovi Grossman, George Fitzmaurice. (2017) No Need to Stop What You're Doing: Exploring No-Handed Smartwatch Interaction. ***GI '17.***

J.5 **Seongkook Heo** and Geehyuk Lee. (2017) Vibrotactile Compliance Feedback for Tangential Force Interaction. ***IEEE Transactions on Haptics***, Vol. 10, Issue 3.

C.13 **Seongkook Heo**, Jingun Jung, and Geehyuk Lee. (2016) MelodicTap: Fingering Hotkey for Touch Tablets. ***OZCHI '16.***

C.12 Ken Hinckley, **Seongkook Heo**, Christian Holz, Hrvoje Benko, Abigail Sellen, Richard Banks, Kenton O'Hara, Gavin Smyth, and William Buxton. (2016) Pre-Touch Sensing for Mobile Interaction. ***CHI '16.*** (Acceptance Rate: 23%)

J.4 Jonggi Hong, **Seongkook Heo**, Poika Isokoski, and Geehyuk Lee. (2016) Comparison of Three QWERTY Keyboards for a Smartwatch. ***Interacting with Computers***, Vol. 28, Issue 6.

C.11 Chang-Min Kim, **Seongkook Heo**, Kyeong Ah Jeong, and Youn-Kyung Lim. (2016) Formula One: Mobile Device Supported Rapid In-the-Wild Design and Evaluation of Interactive Prototypes. ***HCI Korea '16*** *(Best paper award).*

C.10   Jonggi Hong, **Seongkook Heo**, Poika Isokoski, and Geehyuk Lee. (2015) SplitBoard: A Simple Split Soft Keyboard for Wristwatch-sized Touch Screens. *CHI '15.* (Acceptance Rate: 23%)

C.9   **Seongkook Heo**, Jiseong Gu, and Geehyuk Lee. (2014) Expanding Touch Input Vocabulary by Using Consecutive Distant Taps. *CHI '14* (Acceptance Rate: 23%)*.*

J.3   Jaehyun Han, **Seongkook Heo**, Hyong-Euk Lee, and Geehyuk Lee. (2014) IrPen: A 6-DOF Pen System to Support Over-the-surface Interactions with Tablet Computers. *IEEE Computer Graphics and Applications*, Vol. 34, Issue 3.

C.8   **Seongkook Heo**, Jaehyun Han, and Geehyuk Lee. (2013) Designing Rich Touch Interaction through Proximity and 2.5D Force Sensing Touchpad, *OZCHI '13.*

C.7   **Seongkook Heo** and Geehyuk Lee. (2013) Indirect Shear Force Estimation for Multi-Point Shear Force Operations. *CHI '13.* (Acceptance Rate: 20%)

C.6   Jiseong Gu, **Seongkook Heo**, Jaehyun Han, Sunjun Kim, and Geehyuk Lee. (2013) LongPad: A TouchPad Using the Whole Area below the Keyboard on a Laptop. *CHI '13.* (Acceptance Rate: 20%)

C.5   Jinhyuk Choi, **Seongkook Heo**, Jaehyun Han, Geehyuk Lee, and Junehwa Song. (2013) Mining Social Relationship Types in an Organization by using Communication Patterns, *CSCW '13.*

J.2   Jaehyun Han, Sangwon Choi, **Seongkook Heo**, and Geehyuk Lee. (2012) Optical touch sensing based on internal scattering in a touch surface. *Electronics Letters*, Vol. 48, Issue 22.

C.4   **Seongkook Heo** and Geehyuk Lee. (2012) ForceDrag: Using Pressure as a Touch Input Modifier, *OZCHI '12.*

C.3   **Seongkook Heo**, Jaehyun Han, Sangwon Choi, Seunghwan Lee, Geehyuk Lee, Hyong-Euk Lee, SangHyun Kim, Won-Chul Bang, DoKyoon Kim, and ChangYeong Kim. (2011) IrCube tracker: an optical 6-DOF tracker based on LED directivity. *UIST '11.* (Acceptance Rate: 26%)

C.2   **Seongkook Heo** and Geehyuk Lee. (2011) Force gestures: augmenting touch screen gestures with normal and tangential forces. *UIST '11.* (Acceptance Rate: 26%)

C.1   **Seongkook Heo** and Geehyuk Lee. (2011) Forcetap: extending the input vocabulary of mobile touch screens by adding tap gestures. *MobileHCI '11.* (Acceptance Rate: 23%)

J.1   Jaehyun Han, **Seongkook Heo**, G Lee, Won-Chul Bang, DoKyoon Kim, and ChangYeong Kim. (2011) 6-DOF tracker using LED directivity. *Electronics Letters*, Vol. 47, Issue 3.

Book Chapters

B.1   **Seongkook Heo**, Jaehyun Han, and Geehyuk Lee. Designing for Hover-and Force-Enriched Touch Interaction. *Computer-Human Interaction. Cognitive Effects of Spatial Interaction, Learning, and Ability*, Springer, 2015. 68-87.

Peer-reviewed Posters and Demonstrations (index starting with p: posters, d: demonstrations)

p.8   Anastasia Lalamentik, **Seongkook Heo.** (2020) Tactile Glance: Encoding Notifications using Illusive Movement Constraints for Eyes- and Ears-free Interaction. *IEEE Haptics Symposium 2020 Work-in-progress*

d.3   **Seongkook Heo**, Christina Chung, Geehyuk Lee, Daniel Wigdor. (2018) Thor's Hammer: An Ungrounded Force Feedback Device Utilizing Propeller-Induced Propulsive Force. *CHI '18 Demo.*

d.2 **Seongkook Heo** and Geehyuk Lee.
Creating Haptic Illusion of Compliance for Tangential Force Input using Vibrotactile Actuator.
UIST '17 Demo.

p.7 Jaehyun Han, **Seongkook Heo**, and Geehyuk Lee.
Trampoline: A Double-sided Elastic Touch Device for Repousse and Chasing Techniques.
CHI '14 Works-in-progress.

p.6 **Seongkook Heo** and Geehyuk Lee.
Ta-tap: Consecutive Distant Tap Operations for One-handed Touch Screen Use. *UIST '13 Poster.*

p.5 **Seongkook Heo**, Yongki-Lee, Jiho Yeom, and Geehyuk Lee.
Design of a Shape Dependent Snapping Algorithm. *CHI '12 Works-in-progress.*

d.1 Sangwon Choi, Jaehyun Han, Sunjun Kim, **Seongkook Heo,** and Geehyuk Lee.
ThickPad: A Hover-tracking Touchpad for a Laptop, *UIST '11 Demo.*

p.4 **Seongkook Heo** and Geehyuk Lee.
Force gestures: Augmented Touch Screen Gestures using Normal and Tangential Force, *CHI '11 Works-in-progress.*

p.3 **Seongkook Heo**, Dongwook Lee, and Minsoo Hahn.
FloatingPad: A Touchpad based 3D Input Device, *ICAT '08 Poster.*

p.2 Seungwoo Lee, **Seongkook Heo**, Youmin Kim, Youngjae Kim, Soojin Lee, and Minsoo Hahn.
An Interactive Knocking Floor, *UbiComp 2008 Poster.*

p.1 Seungsoon Park, Seungwoo Lee, **Seongkook Heo**, Kyoungsin Park, and Minsoo Hahn.
Escape!: An Indoor Location-based Horror Game using Indirect Ambient Cues,
UCS 2007 Poster.

Patents

P.24 Pre-interaction context associated with gestures and touch interactions, US Patent Pending,
Application #US20180239509A1, 2/20/2017

P.23 Pre-touch sensing for mobile interaction, US Patent Pending,
Application #US20180004386A1, 6/30/2016

P.22 Method and apparatus of playing haptic feedback for shear movement, KR Patent Pending,
Application #2014-0026719, 3/6/2014

P.21 Touch screen controlling method in mobile device, and mobile device thereof, KR Patent
#1496017, 2/16/2015

P.20 Method and apparatus for one-handed application of multi-touch gesture using continuous
touch, KR Patent Pending, Application #2013-0083986, 7/17/2013

P.19 Optical touchpad apparatus with proximity and force sensing capabilities and method of
sensing touch in apparatus, KR Patent #1449833, 10/2/2014

P.18 User interface method and apparatus using successive touches, US Patent Pending,
Application #US20150026619, 1/22/2015

P.17 Device and method of video playback control using force and contact position information,
KR Patent #1393261, 4/30/2014

P.16 Device and method for identifying multi-touch points using internal scattering,
PCT/KR2012/006624, 8/21/2012

P.15 Method and system for body tracking for spatial gesture recognition,
PCT/KR2012/006372, 8/10/2012

P.14   Apparatus and method for multi-touch sensing using total internal reflection, KR Patent #1356835, 1/22/2014

P.13   Method and system for body tracking for spatial gesture recognition, KR Patent #1256046, 4/12/2013

P.12   System and method for estimating position and direction, EU Patent #EP2385390, 21/8/2013, China Patent #CN102279380, 21/10/2015 US Patent Pending, Application #US20110261270, 4/18/2011

P.11   Method for controlling touch screen in portable device, and portable device of the same, KR Patent #1177650, 8/21/2012

P.10   Apparatus and method for sensing a moving object and a virtual golf simulation device using the same capable of accurately implementing the center point coordinate about an extracted object, KR Patent #1019801, 2/25/2011

P.9   Apparatus and method for sensing a moving object and a virtual golf simulation device using the same capable of obtaining a multiple exposure image about a moving object, KR Patent #1019823, 2/25/2011

P.8   Apparatus and method for sensing a moving object and a virtual golf simulation device using the same capable of accurately extracting an image of an object, KR Patent #1019798, 2/25/2011

P.7   Apparatus and method for sensing a moving object and a virtual golf simulation device using the same capable of exactly extracting the center point coordinate of a moving object using a low speed camera, KR Patent #1019824, 2/25/2011

P.6   Apparatus and method for sensing a moving ball and a virtual golf simulation device using the same capable of obtaining the center point coordinate about an image of a ball, KR Patent #1019829, 2/25/2011

P.5   Sensing processing device for a moving object and a method thereof, and a virtual golf simulation device using the same capable of accurately extracting center point coordinate of an overlapped object, KR Patent #1019782, 2/25/2011

P.4   Apparatus and method for sensing a moving ball and a virtual golf simulation device using the same capable of obtaining an image of a moving ball, KR Patent #1019847, 2/25/2011

P.3   Device and method for sensing processing of a moving object, and a virtual golf simulation device using the same capable of achieving accuracy of sensing, KR Patent #1019902, 2/25/2011

P.2   Method for controlling touch screen on portable device using built-in accelerometer, and portable device of the same, KR Patent #1173400, 8/6/2011

P.1   Apparatus for sensing if a driver drives a car safely, KR Patent #1054062, 7/28/2011

Awards and Honors

2016   Naver Ph.D. Fellowship Award

2016   HCI Korea Best Paper Award

2013   ACM UIST Student Innovation Contest, 2nd Place in Most Creative

2012   ACM UIST Student Innovation Contest, 2nd Place in People's Choice

2011   ACM UIST Student Innovation Contest, 2nd Place in People's Choice

Academic Service

Organizing Committee	ACM ISS 2019 Demos Co-Chair
Program Committee	MobileHCI 2015, CHI 2019, CHI 2020, UIST 2020
Session Chair	CHI 2019
Reviewer	CHI, UIST, DIS, TEI, MobileHCI, SIGGRAPH ASIA, ICMI, IEEE VR, IMWUT IEEE Transactions on Haptics, Sensors, ACM Transactions on Computer-Human Interaction
Student Volunteer	World Haptics Conference '15, UIST '16

Teaching

Spring 2020-21	Instructor, **CS4501/6501: Engineering Interactive Technologies**, University of Virginia
Fall 2019-20	Instructor, **CS6501: Human-Computer Interaction**, University of Virginia
Fall 2018	Guest Lecturer, **CSC318: Design of Interactive Computational Media,** University of Toronto
Winter 2018	Guest Lecturer, **CSC2514: Human-Computer Interaction**, University of Toronto
Fall 2011	Teaching Assistant, **CS684: Human-Computer Interaction**, KAIST
Spring 2010-11	Teaching Assistant, **CS472: Human-Computer Interaction**, KAIST
2012 Spring	Teaching Assistant**, CS420: Compiler Design**, KAIST

Invited Talks

May 2020	High-bandwidth Human-Computer Interaction: Possibilities and Challenges *University of Copenhagen*
Oct 2019	User Interface for Future Computers *Korean-American Scientists and Engineers Association (KSEA) Central VA Chapter*
Apr 2019	Towards Man-Computer Symbiosis *Pohang University of Science and Technology (POSTECH)*
Apr 2019	Towards Man-Computer Symbiosis *University of Virginia*
Nov 2018	Expanding Touch Interaction Bandwidth by Making Computers to Feel Our Touch and to be Felt *TUX: Toronto User Experience Speaker Series*
Aug 2018	As We May Touch—toward richer and more natural touch interaction *Oculus Research*
Jul 2018	As We May Touch—toward richer and more natural touch interaction *EPIC Group, Microsoft Research*
Feb 2018	Let it move—Creating force and movement feedback on the surface and in the air *Future Reality Lab, New York University*
Dec 2017	Let it move—Creating force and movement feedback on the surface and in the air *HCI Group, Saarland University*
Nov 2016	As We May Touch—toward richer and more natural touch interaction *HCI Group, KAIST*

Jan 2016	Enriching Touch – with force, hover, and manual dexterity *DGP Lab, University of Toronto*
Jan 2016	Enriching Touch – with force, hover, and manual dexterity *Autodesk Research*
Oct 2014	Enriching Touch *HiDeep Co.*
Mar 2014	Enriching interaction on and over the surface *Korea Electronics Technology Institute*
Feb 2014	Completing Touch *TEDxKAIST Salon: Beyond Now*

Media and Press Coverage

- Microsoft's hover gestures for Windows phones are magnificent, *The Verge*, May 2016
- Smartphones next big thing: 'Pre-Touch', *SlashGear*, May 2016
- Apple should definitely copy Microsoft's incredible finger-sensing smartphone technology, *Business Insider*, May 2016
- Microsoft Research anticipates the future with pre-sensing touchscreen prototype, *gizmag*, May 2016
- Microsoft Research's New Touchscreen Can (Almost) Read Your Mind, *Co.Design*, May 2016
- Infrared laptop trackpad ignores accidental touches, *New Scientist*, Jan 2013
- Intelligent Keyboard-Wide Touchpad Is Smart Enough to Ignore Your Palms, *Gizmodo*, Feb 2013