

Seongkook Heo

Alfred Weaver Assistant Professor, University of Virginia

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I am interested in the design and development of interactive technologies and systems that enrich the human-computer and human-computer-human interactions.

Appointments

Aug 2019 **University of Virginia**, Charlottesville, Virginia, USA
– present Alfred Weaver Assistant Professor, Department of Computer Science

May 2017 **University of Toronto**, Toronto, Ontario, Canada
– Aug 2019 Postdoctoral Researcher, Department of Computer Science
Advisor: Dr. Daniel Wigdor

Education

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

Jun 2009 **Korea Advanced Institute of Science and Technology (KAIST)**
Daejeon, South Korea
M.S. Digital Media
Advisor: Minsoo Hahn

Feb 2007 **Sungkyunkwan University**, Suwon, South Korea
B.S. Electric and Electronic Engineering
B.S. Computer Engineering (Double Major)

Professional Experience

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

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

Selected Honors and Awards


2023 **ACM CHI Best Paper Award (1%) ACM MobileHCI Best Paper Award**
2023 **IEEE VR Best Poster Award**
2021 **Meta Research Award**
2021 **University of Virginia Engineering Research Innovation Award**
2016 **Naver Ph.D. Fellowship**

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

In Human-Computer Interaction, CHI, UIST, CSCW are considered as top venues.

- C.31 Adil Rahman, and **Seongkook Heo**.
2023  Frappé: An Ultra Lightweight Mobile UI Framework for Rapid API-based Prototyping and Environmental Deployment. **MobileHCI '23. (Best Paper Award)**
- C.30 Md Aashikur Rahman Azim, Adil Rahman, and **Seongkook Heo**.
2023 UnifiedSense: Enabling Without-Device Gesture Interactions Using Over-the-shoulder Training Between Redundant Wearable Sensors. **MobileHCI '23.**
- J.8 Md Aashikur Rahman Azim, Adil Rahman, **Seongkook Heo**.
2023 SequenceSense: A Tool for Designing Usable Foot-Based Gestures Using a Sequence-Based Gesture Recognizer. **International Journal of Human-Computer Studies.**
- C.29 Carl Hildebrandt, Wen Ying, **Seongkook Heo**, and Sebastian Elbaum.
2023 Mimicking real forces on a drone through a haptic suit to enable cost-effective validation. **ICRA 2023.**
- C.28 Adil Rahman, Md. Aashikur Rahman Azim, and **Seongkook Heo**.
2023  Take my hand: Automated hand-based spatial guidance for the visually impaired. **CHI '23 (Best Paper Award).**
- C.27 Erzhen Hu, Jens Emil Grønbaek, Wen Ying, Ruofei Du, and **Seongkook Heo**.
2023 Thingsshare: Ad-hoc digital copies of physical objects for sharing things in video meetings. **CHI '23.**
- C.26 Erzhen Hu, Jens Emil Grønbaek, Austin Houck, and **Seongkook Heo**.
2023 Utilizing proxemic metaphors for conversational floor transitions in multiparty video meetings. **CHI '23.**
- J.7 Sanghwa Hong, **Seongkook Heo**, and Byungjoo Lee. MaterialSense: Estimating and utilizing material properties of contact objects in multi-touch interaction. **International Journal of Human-Computer Studies.**
- C.25 Erfan Pakdamanian, Erzhen Hu, Shili Sheng, Sarit Kraus, Seongkook Heo, and Lu Feng. Enjoy the ride consciously with CAWA: Context-aware advisory warnings for automated driving. **AutoUI '22.**
- C. 24 Erzhen Hu, Md. Aashikur Rahman Azim, and Seongkook Heo. Fluidmeet: Enabling frictionless transitions between in-group, between-group, and private conversations during virtual breakout meetings. **CHI '22.**
- C. 23 Erfan Pakdamanian, Shili Sheng, Sonia Bae, **Seongkook Heo**, Sarit Kraus, and Lu Feng. DeepTake: Prediction of Driver Takeover Behavior using Multimodal Data. **CHI '21.**
- J. 6 Hyunju Kim, Sanghwa Hong, Junki Kim, Taesoo Jang, Woontaek Woo, **Seongkook Heo**, and Byungjoo Lee.


- 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*.
- C.21 **Seongkook Heo**, Jaeyeon Lee, Daniel Wigdor.
2019 PseudoBend: Producing Haptic Illusions of Stretching, Bending, and Twisting Using Grain Vibrations. *UIST '19*.
- C.20 Devamardeep Hayatpur, **Seongkook Heo**, Haijun Xia, Wolfgang Stuerzlinger, Daniel
2019 Wigdor.
Plane, Ray, and Point: Enabling Precise Spatial Manipulations with Shape Constraints. *UIST '19*.
- 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*
- 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*.
- 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*.
- 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*.
- C.15 Sunggeun Ahn, **Seongkook Heo**, Geehyuk Lee.
2017 Typing on a Smartwatch for Smart Glasses. *ISS '17*.
- C.14 **Seongkook Heo**, Michelle Annett, Ben Lafreniere, Tovi Grossman, George
2017 Fitzmaurice.
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
2016 Banks, Kenton O'Hara, Gavin Smyth, and William Buxton.
Pre-Touch Sensing for Mobile Interaction. *CHI '16*.
- 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
2016  Chang-Min Kim, **Seongkook Heo**, Kyeong Ah Jeong, and Youn-Kyung Lim.
Formula One: Mobile Device Supported Rapid In-the-Wild Design and Evaluation of Interactive Prototypes. *HCI Korea '16 (Best Paper award)*.
- C.10
2015 Jonggi Hong, **Seongkook Heo**, Poika Isokoski, and Geehyuk Lee.
SplitBoard: A Simple Split Soft Keyboard for Wristwatch-sized Touch Screens. *CHI '15*.
- C.9
2014 **Seongkook Heo**, Jiseong Gu, and Geehyuk Lee.
Expanding Touch Input Vocabulary by Using Consecutive Distant Taps. *CHI '14*.
- J.3
2014 Jaehyun Han, **Seongkook Heo**, Hyong-Euk Lee, and Geehyuk Lee.
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
2013 **Seongkook Heo**, Jaehyun Han, and Geehyuk Lee.
Designing Rich Touch Interaction through Proximity and 2.5D Force Sensing Touchpad, *OZCHI '13*.
- C.7
2013 **Seongkook Heo** and Geehyuk Lee.
Indirect Shear Force Estimation for Multi-Point Shear Force Operations. *CHI '13*.
- C.6
2013 Jiseong Gu, **Seongkook Heo**, Jaehyun Han, Sunjun Kim, and Geehyuk Lee.
LongPad: A TouchPad Using the Whole Area below the Keyboard on a Laptop. *CHI '13*.
- C.5
2013 Jinhyuk Choi, **Seongkook Heo**, Jaehyun Han, Geehyuk Lee, and Junehwa Song.
Mining Social Relationship Types in an Organization by using Communication Patterns, *CSCW '13*.
- J.2
2012 Jaehyun Han, Sangwon Choi, **Seongkook Heo**, and Geehyuk Lee.
Optical touch sensing based on internal scattering in a touch surface. *Electronics Letters*, Vol. 48, Issue 22.
- C.4
2012 **Seongkook Heo** and Geehyuk Lee.
ForceDrag: Using Pressure as a Touch Input Modifier, *OZCHI '12*.
- C.3
2011 **Seongkook Heo**, Jaehyun Han, Sangwon Choi, Seunghwan Lee, Geehyuk Lee, Hyong-Euk Lee, SangHyun Kim, Won-Chul Bang, DoKyoon Kim, and ChangYeong Kim.
IrCube tracker: an optical 6-DOF tracker based on LED directivity. *UIST '11*.
- C.2
2011 **Seongkook Heo** and Geehyuk Lee.
Force gestures: augmenting touch screen gestures with normal and tangential forces. *UIST '11*.
- C.1
2011 **Seongkook Heo** and Geehyuk Lee.
Forcetap: extending the input vocabulary of mobile touch screens by adding tap gestures. *MobileHCI '11*.
- J.1
2011 Jaehyun Han, **Seongkook Heo**, G Lee, Won-Chul Bang, DoKyoon Kim, and ChangYeong Kim.
6-DOF tracker using LED directivity. *Electronics Letters*, Vol. 47, Issue 3.

Book Chapters

- B. 1 **Seongkook Heo**, Jaehyun Han, and Geehyuk Lee
2013 Designing for hover-and force-enriched touch interaction. *Australian Computer-Human Interaction Conference*, Springer, Cham, 2013

Workshop papers, Posters, and Demonstrations

- p.12 Wen Ying and **Seongkook Heo**.
2023  VRScroll: A Shape-Changing Device for Precise Sketching in Virtual Reality, *IEEE VR '23 Poster (Best Poster Award)*
- p.11 Peiyu Zhang, Wen Ying, and **Seongkook Heo**.
2022 Fringer: A Finger-Worn Passive Device Enabling Computer Vision Based Force Sensing Using Moiré Fringes. *UIST '22 Poster*
- p.10 Md Aashikur Rahman Azim, Adil Rahman, **Seongkook Heo**.
2022 Over-The-Shoulder Training Between Redundant Wearable Sensors for Unified Gesture Interactions. *UIST '22 Poster*.
- p.9 Archana Narayanan, Erzhen Hu, and **Seongkook Heo**.
2022 Enabling Remote Hand Guidance in Video Calls using Directional Force Illusion. *CSCW '22 Poster*.
- w.1 Zihao Su, Faysal Shezan, Yuan Tian, David Evans, and **Seongkook Heo**.
2022 Perception Hacking for 2D cursorjacking in Virtual Reality. *CHI'22, Workshop on Novel Challenges of Safety, Security and Privacy in Extended Reality, 2022*
- p.8. Anastasia Lalamentik and **Seongkook Heo**.
2020 Tactile glance: Encoding notifications using illusive movement constraints for eyes-and ears-free interaction. *IEEE Haptics Symposium 2020 Works-in-progress*
- d.3 **Seongkook Heo**, Christina Chung, Geehyuk Lee, and 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.
2017 Creating haptic illusion of compliance for tangential force input using vibrotactile actuator. *UIST '17 Demo*
- p.7 Jaehyun Han, **Seongkook Heo**, Jiseong Gu, and Geehyuk Lee.
2014 Trampoline: A double-sided elastic touch device for repoussé and chasing techniques. *CHI '14 Works-in-progress*
- p.6 **Seongkook Heo** and Geehyuk Lee
2013 Ta-tap: Consecutive distant tap operations for one-handed touch screen use. *UIST '13 Poster*
- p.5 **Seongkook Heo**, Yong-Ki Lee, Jiho Yeom, and Geehyuk Lee.
2012 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
2011 Thickpad: A hover-tracking touchpad for a laptop. *UIST '11 Demo*

- p.4
2011 **Seongkook Heo** and Geehyuk Lee.
Force gestures: Augmented touch screen gestures using normal and tangential force.
CHI '11 Works-in-progress
- p.3
2008 **Seongkook Heo**, Dongwook Lee, and Minsoo Hahn
Floatingpad: A touchpad based 3d input device. **ICAT '08 Poster**
- p.2
2008 Seungwoo Lee, **Seongkook Heo**, Youmin Kim, Youngjae Kim, Soojin Lee, and
Minsoo Hahn
An Interactive Knocking Floor. **Ubicomp '08 Poster**
- p.1
2007 Seungsoon Park, Seungwoo Lee, **Seongkook Heo**, Kyoung Shin Park, and Minsoo
Hahn
Escape!: an indoor location-based horror game that uses indirect ambient cues
UCS '07 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

Teaching

- Spring 2020- Instructor, **CS4501/6501: Engineering Interactive Technologies**, University of Virginia
- Fall 2019- 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 Teaching Assistant, **CS420: Compiler Design**, KAIST
- Spring Teaching Assistant, KAIST

Invited Talks

- Dec 2023 Connecting Realities for Fluid Computer-Mediated Communication
University of Maryland, College Park
- Nov 2023 Connecting Realities for Fluid Computer-Mediated Communication
Google
- May 2022 As we may chat: virtualizing proxemic cues for fluid transitions in virtual meetings
UNIST
- Dec 2021 Why I Chose Academia
KAIST
- Nov 2021 Physicalizing Virtual and Augmented Reality
Virginia Tech
- Nov 2021 Physicalizing Virtual and Augmented Reality
George Mason University
- Sep 2021 Physicalizing Virtual and Augmented Reality
Yonsei University
- 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 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 Enriching interaction on and over the surface
2014 *Korea Electronics Technology Institute*
Feb Completing Touch
2014 *TEDxKAIST Salon: Beyond Now*

Academic Service

Organizing Committee ACM ISS 2019 Demos Co-Chair, IEEE SIEDS 2021 Workshop Organizer

Program Committee CHI 2019, 2020, 2022, 2024, UIST 2020, MobileHCI 2015, VRST 2021, 2022, TEI 2022

Reviewer CHI, UIST, DIS, TEI, MobileHCI, SIGGRAPH ASIA, ICMI, IEEE VR, IMWUT, IEEE Trans. Haptics, ACM TOCHI, IJHCS, Frontiers in Virtual Reality

Volunteering Workshop Instructor for Girls Who Code@UVA, Mentor for HooHacks 2023, Judge for Girls Hoo Hack 2023, Student Volunteer at World Haptics Conference 2015 and UIST 2016