Seongkook Heo

Postdoctoral Research Fellow
University of Toronto

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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 just as they do in the real world. As an HCI researcher with a background in Computer Science and Electrical Engineering, I design and build new sensing techniques, haptic feedback technologies, and interaction techniques that carefully blend with human sensing capabilities and motor skills.

Education

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

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

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

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

Professional Experience

May 2017 – Present **University of Toronto, Toronto, Canada**
Postdoctoral Research Fellow working with Prof. Daniel Wigdor
Developing interaction techniques and haptic feedback technologies

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

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

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

Aug 2005– Feb 2006 **AhnLab, Seoul, South Korea**
Software Engineering Intern
Developed and Tested System Security Software

Peer-reviewed Conference Publications (In HCI, *CHI, UIST, CSCW* are considered as premier publication venues)

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 2018: ACM Symposium on User Interface Software and Technology. 809-823. (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.
CSCW2018: ACM Conference on Computer-Supported Cooperative Work and Social Computing. 26 pages. (Acceptance rate: 27%)

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 2018: ACM Conference on Human Factors in Computing Systems. 11 pages. (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 2018: ACM Conference on Human Factors in Computing Systems. 13 pages. (Acceptance rate: 25.7%)

C.15 Sunggeun Ahn, **Seongkook Heo**, Geehyuk Lee. (2017) Typing on a Smartwatch for Smart Glasses.
*ISS 2017: ACM International Conference on Interactive Surfaces and Spaces.*201-209. (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 2017: Proceedings of Graphics Interface. 107 – 116.

C.13 **Seongkook Heo**, Jingun Jung, and Geehyuk Lee. (2016) MelodicTap: Fingering Hotkey for Touch Tablets.
OzCHI '16: Proceedings of Australian Conference on Human-Computer Interaction. 396-400.

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 2016: ACM Conference on Human Factors in Computing Systems. 2869-2881. (Acceptance Rate: 23%)

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.
HCIK 2016: Proceedings of HCI Korea. 333-338. (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 2015: ACM Conference on Human Factors in Computing Systems. 1233-1236. (Acceptance Rate: 23%)

C.9 **Seongkook Heo**, Jiseong Gu, and Geehyuk Lee. (2014) Expanding Touch Input Vocabulary by Using Consecutive Distant Taps.
CHI 2014: ACM Conference on Human Factors in Computing Systems. 2597-2606. (Acceptance Rate: 23%).

C.8 **Seongkook Heo**, Jaehyun Han, and Geehyuk Lee. (2013) Designing Rich Touch Interaction through Proximity and 2.5D Force Sensing Touchpad,
OzCHI '13: Proceedings of Australian Conference on Human-Computer Interaction. 401-404.

C.7 **Seongkook Heo** and Geehyuk Lee. (2013) Indirect Shear Force Estimation for Multi-Point Shear Force Operations.
CHI 2013: ACM Conference on Human Factors in Computing Systems. 281-284. (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 2013: ACM Conference on Human Factors in Computing Systems. 1421-1430. (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 2013: ACM Conference on Computer-Supported Cooperative Work. 295-302.*

C.4 **Seongkook Heo** and Geehyuk Lee. (2012) ForceDrag: Using Pressure as a Touch Input Modifier. *OzCHI '12: Proceedings of Australian Conference on Human-Computer Interaction.* 204-207.

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 2011: ACM Symposium on User Interface Software and Technology.* 577-586. (Acceptance Rate: 26%)

C.2 **Seongkook Heo** and Geehyuk Lee. (2011) Force gestures: augmenting touch screen gestures with normal and tangential forces. *UIST 2011: ACM Symposium on User Interface Software and Technology.* 621-626. (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 2011: ACM SIGCHI International Conference on Human Computer Interaction with Mobile Devices and Services.* 113-122. (Acceptance Rate: 23%)

Peer-reviewed Journal Publications

J.5 **Seongkook Heo** and Geehyuk Lee. (2017) Vibrotactile Compliance Feedback for Tangential Force Interaction. ***IEEE Transactions on Haptics***, Vol. 10, Issue 3, 444-455.

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, 811-825.

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, 22-29.

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.

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. (2015) Designing for Hover-and Force-Enriched Touch Interaction. ***Computer-Human Interaction. Cognitive Effects of Spatial Interaction, Learning, and Ability***, Springer. 68-87.

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

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 2018 Demo: Extended Abstracts of the Conference on Human Factors in Computing Systems.*

d.2 **Seongkook Heo** and Geehyuk Lee. (2017) Creating Haptic Illusion of Compliance for Tangential Force Input using Vibrotactile Actuator. *UIST 2017 Demo: Adjunct Proceedings of the ACM Symposium on User Interface Software and Technology.* 21-23.

p.7 Jaehyun Han, **Seongkook Heo**, and Geehyuk Lee. (2018) Trampoline: A Double-sided Elastic Touch Device for Repousse and Chasing Techniques.
CHI 2014 Works-in-progress: Extended Abstracts of the Conference on Human Factors in Computing Systems. 1627-1632.

p.6 **Seongkook Heo** and Geehyuk Lee. (2013) Ta-tap: Consecutive Distant Tap Operations for One-handed Touch Screen Use.
UIST 2013 Poster: Adjunct Proceedings of the ACM Symposium on User Interface Software and Technology. 91-92.

p.5 **Seongkook Heo**, Yongki-Lee, Jiho Yeom, and Geehyuk Lee. (2012) Design of a Shape Dependent Snapping Algorithm.
CHI 2012 Works-in-progress: Extended Abstracts of the Conference on Human Factors in Computing Systems. 2207-2212.

d.1 Sangwon Choi, Jaehyun Han, Sunjun Kim, **Seongkook Heo,** and Geehyuk Lee. (2011) ThickPad: A Hover-tracking Touchpad for a Laptop.
UIST 2011 Demo: Adjunct Proceedings of the ACM Symposium on User Interface Software and Technology. 15-16.

p.4 **Seongkook Heo** and Geehyuk Lee. (2011) Force gestures: Augmented Touch Screen Gestures using Normal and Tangential Force.
CHI 2011 Works-in-progress: Extended Abstracts of the Conference on Human Factors in Computing Systems. 1909-1914.

p.3 **Seongkook Heo**, Dongwook Lee, and Minsoo Hahn. (2008) 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. (2008) An Interactive Knocking Floor.
UbiComp 2008 Poster.

p.1 Seungsoon Park, Seungwoo Lee, **Seongkook Heo**, Kyoungsin Park, and Minsoo Hahn. (2007) 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 Touch screen controlling method in mobile device, and mobile device thereof, KR Patent #1496017, 2/16/2015

P.21 User interface method and apparatus using successive touches, US Patent Pending, Application #US20150026619, 1/22/2015

P.20 Optical touchpad apparatus with proximity and force sensing capabilities and method of sensing touch in apparatus, KR Patent #1449833, 10/2/2014

P.19 Device and method of video playback control using force and contact position information, KR Patent #1393261, 4/30/2014

P.18 Method and apparatus of playing haptic feedback for shear movement, KR Patent Pending, Application #2014-0026719, 3/6/2014

P.17 Apparatus and method for multi-touch sensing using total internal reflection, KR Patent #1356835, 1/22/2014

P.16 Method and apparatus for one-handed application of multi-touch gesture using continuous touch, KR Patent Pending, Application #2013-0083986, 7/17/2013

P.15 Method and system for body tracking for spatial gesture recognition, KR Patent #1256046, 4/12/2013

P.14 Device and method for identifying multi-touch points using internal scattering, PCT/KR2012/006624, 8/21/2012

P.13 Method for controlling touch screen in portable device, and portable device of the same, KR Patent #1177650, 8/21/2012

P.12 Method and system for body tracking for spatial gesture recognition, PCT/KR2012/006372, 8/10/2012

P.11 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.10 Apparatus for sensing if a driver drives a car safely, KR Patent #1054062, 7/28/2011

P.9 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.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 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.1 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

Academic Service

Organizing Committee	ISS 2019 (Demo Chair)
Program Committee	CHI 2019, MobileHCI 2015
Reviewer	CHI, UIST, DIS, TEI, MobileHCI, SIGGRAPH ASIA, ICMI, TechSym, HCI Korea
Student Volunteer	World Haptics Conference ’15, UIST ’16

Awards and Honors

Naver Co. 2016	Naver Ph.D. Fellowship Award, KRW 5,000,000 (approx. $4500 USD)
HCI Korea 2016	Best Paper Award
UIST 2013	Student Innovation Contest, 2nd Place in Most Creative
UIST 2012	Student Innovation Contest, 2nd Place in People’s Choice
UIST 2011	Student Innovation Contest, 2nd Place in People’s Choice

Teaching Experience

2018 Fall	**CSC318, The Design of Interactive Computational Media, Guest Lecturer (1 unit)** Mathematical and Computational Sciences, University of Toronto
2018 Winter	**CSC428, Human-Computer Interaction (Undergrad course), Guest Lecturer (1 unit)** Department of Computer Science, University of Toronto
2010, 2011, 2014 Spring	**CS472, Human-Computer Interaction (Undergrad course), Teaching Assistant** School of Computing, KAIST
2012 Spring	**CS420, Compiler Design (Undergrad course), Teaching Assistant** School of Computing, KAIST
2010 Fall	**CS788, HCI – Physical Computing (Grad course), Teaching Assistant** School of Computing, KAIST

Mentoring

May – Sep 2018	**Devamardeep Hayatpur** (University of Toronto)
2017 – 2018	**Zhicong Lu** (University of Toronto) [C.16, C.18]
2017 – 2018	**Seyong Ha** (University of Toronto)
Aug – Sep 2017	**Christina Chung** (University of Toronto) [C.17]
2016 – 2017	**Sunggeun Ahn** (KAIST) [C.15]
2014	**Jonggi Hong** (KAIST) [C.10, J.4]

Invited Talks

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

- Meet Thor's Hammer An Ungrounded Force Feedback Device Using Propeller Propulsion, *VR and Fun*, Feb 2018
  https://www.vrandfun.com/meet-thors-hammer-ungrounded-force-feedback-device-using-propeller-propulsion/
- Microsoft's hover gestures for Windows phones are magnificent, *The Verge*, May 2016
  https://www.theverge.com/2016/5/5/11595564/microsoft-3d-touch-kinect-gestures-windows-phones
- Smartphones next big thing: 'Pre-Touch', *SlashGear*, May 2016
  https://www.slashgear.com/smartphones-next-big-thing-pre-touch-05438931/
- Apple should definitely copy Microsoft's incredible finger-sensing smartphone technology, *Business Insider*, May 2016
  https://www.businessinsider.com/microsoft-research-pre-touch-smartphone-gestures-2016-5
- Microsoft Research anticipates the future with pre-sensing touchscreen prototype, *gizmag*, May 2016
  https://newatlas.com/microsoft-research-pretouch-touchscreen/43211/
- Microsoft Research's New Touchscreen Can (Almost) Read Your Mind, *Fast*, May 2016
  https://www.fastcompany.com/3059606/microsoft-researchs-new-touchscreen-can-almost-read-your-mind
- Infrared laptop trackpad ignores accidental touches, *New Scientist*, Jan 2013
- Intelligent Keyboard-Wide Touchpad Is Smart Enough to Ignore Your Palms, *Gizmodo*, Feb 2013
  https://gizmodo.com/5982160/intelligent-keyboard-wide-touchpad-is-smart-enough-to-ignore-your-palms