Ke Huo

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"Make the change that you want to see in the world."

Professional Experience

SpatialAI, Oculus — *Facebook*

Research Scientist — *Jan. 2019 -*

- Supporting best-in-class product research and development with a focus on enhancing spatial perception in AR/VR environment

Positional Tracking, Oculus — *Facebook*

Summer Intern — *May. 2018 - Aug. 2018*

- Helping delivering an exceptional virtual reality experience by improving performance and quality of our core tech software
- Supporting the development of Hardware and Software to enable better sensing of the user and his environment

Education

Beihang University(Beijing University of Aeronautics and Astronautics) — *Beijing, China*

B.S. in Aerospace Engineering — *Sep. 2005 - Jul. 2009*

University of Florida(UFL) — *Gainesville, FL, US*

M.S. in Aerospace Engineering — *Sep. 2010 - Aug. 2012*

Purdue University — *West Lafayette, IN, US*

Ph.D. Student in Aerospace Engineering — *Sep. 2012 - Aug. 2013*

Purdue University — *West Lafayette, IN, US*

Ph.D. Student in Mechanical Engineering — *Sep. 2013 - Dec. 2018*

Research Experience

Design and Interactions in Augmented Reality — *Purdue*

Human Robot Interaction in AR [C.11] — *Accepted at DIS 2019*

- A visual and spatial programming system for robot-IoT task authoring with AR
- Investigating an ecosystem that coherently connects robot task planning , the human, robot and IoT

Instant Registration between SLAM based AR Systems [C.10] — *Published at UIST 2018*

- Instantly estimating relative 3D locations of two SLAM systems without sharing maps
- Allowing users to quickly establish a collaborative AR environment to work with other persons or mobile robots

Spatially Mapping IoT Devices Within Augmented Scenes [C.8] — *Published at CHI 2018*

- Estimating the 3D locations of distributed smart things using a SLAM based AR device and UWB distance measurement units
- Developing a distance based localization algorithm based on Multidimensional Scaling (MDS)
- Allowing users to rapidly map the smart things and perform spatial-aware interactions with them in AR scenes

A Mixed Reality Ready Modular Robotics System [C.7, c.5] — *Published at TEI 2018*

- Design of modular DIY robotics kit embedded with assembly awareness
- Multi-modal mixed-reality interactions enabling assembly and iteration guidance, and customization of complex tasks

3D Design Ideation Within Augmented Reality World [C.5] — *Published at TEI 2017*

- Dimensionally Consistent Design by re-purposing physical objects or use them as spatial reference
- Visually Coherent Design by referencing the physical world for texturing

Embedded User Interface Technology — *Purdue*

Customizable Soft Sensor [C.6 J.2] *Published at UIST2017*

- Real-time continuous contact sensing by performing Electrical impedance tomography (EIT) on a soft sensor
- A user friendly fabrication process with piezoresistive carbon-filled elastomer and a customization toolkit
- A hybrid machine-learning & heuristics approach to enable multi-modal sensing

Embedded 3D Input Using Magnetic Sensing Techniques [C.3, C.4, c.2] *Published at TEI2016, UIST2016*

- Method to achieve 3D position tracking between a magnatometer and a permanant magnet
- Self-contained 3D input device for mobile devices
- Providing customizable UIs by attaching magnets to plain objects and enabling instant interactions

Finger Worn Fabrics with Multimodal Sensing [C.2, J.1, c.1] *Published at TEI2015, J. Pervasive Computing*

- Single-layer smart textile capable of multimodal sensing to capture finger bending and pressing
- Investigation on micro finger gestures for dynamic and eyes-free environments

Robotics *Purdue, UFL*

Robotic Exploration and Mapping of Smart Indoor Environments *Submitted to ICRA 2019*

- A method to automatically explore and map a smart environment where UWB-IoT devices are distributed
- A navigation pipeline that drives a robot to a target globally and then refines the object localization locally for manipulations

Over-painting Circuits on Surfaces of 3D Objects[C.9, c.6] *Published at CHI2018, DIS2018*

- A workflow for common users to author functions to passive daily objects by attaching embedded electronics
- 4-DOF over-painting machine to draw conductive paths on object surfaces
- A design environment supporting users to customize functions, generate surface circuits, and interface with the painting machine

A Reconfigurable and Foldable Locomotive Robot [C.1] *Published at IROS2014*

- Design of a reconfigurable robot with foldable modules inspired by Origami
- Kinematic and dynamic modeling, control algorithm development for a redundant actuation system

Dynamic and Non-linear Control of Electromagnetic Proximity Operation [T.1] *Master Thesis*

- Introducing electromagnetic force and torque into docking/assembly and proximity operations for spacecrafts
- Modeling and control of the non-linear and coupled system

Teaching Experience

Product and Process Design *Purdue*

Leading Teaching Assistant & Project Coach *2014, 2015, 2016 Spring*

- Opportunity determination through inspiration, ideation, and implementation using design thinking frameworks.
- Concept generation, product definition, prototyping and design verification.

Introduction to Mech. Engr. Design, Innovation, and Entrepreneurship *Purdue*

Teaching Assistant & Lab Lecturer *2014, 2015 Fall*

- Applying engineering principles to open-ended problems; Mathematically model and analyze engineering systems

Academic Service

Program Committee CSCW 2018 Poster
Review SIGCHI UIST 2018, ISWC 2018 TEI 2016-2018, SUI 2016, IDC 2017-2018, CSCW 2017, HRI 2018, ECIS 2018, NIME 2018
Review Other VRST 2016, IROS 2017, VR 2018, ECIS 2018, Euro-Haptics 2018
Volunteer UIST 2015

Technical Skills

Applied Machine Learning Linear Regression, K-Means, Gaussian Mixture Model, SVM, CNN(improving)
Hardware Prototyping Embedded System, Wireless Communication, CAD/CAM, Hands-on Fabrication
Application Prototyping NDK, Java, Unity, C/C++, Java, C#, MATLAB
Computer Vision & Graphics OpenCV, Point Cloud Library, OpenGL, Interactive 3D Modeling
Sensing Techniques Magnetic Sensing, Capacitive Sensing, IMU, Ultrasound/UWB based distance measuring
User-Centered Design Elicitation Study, Qualitative and Quantitative Evaluation, Statistical Analysis

Honors & Awards

Jun. 2018	**Honorable Mention**, ACM SIGCHI Conference on Designing Interactive Systems (DIS)	*Hong Kong, China*
May. 2017	**1st Place**, Additive Manufacturing Hackthon from Dassault Systèmes	*Chicago, U.S.A*
Nov. 2016	**3rd Place**, MIT-China Innovation and Entrepreneurship Forum Business Plan Competition	*Boston, U.S.A*
Sep. 2016	**Finalist**, Silicon Valley Innovation & Entrepreneurship Forum Business Plan Competition	*San Francisco, U.S.A*
Nov. 2015	**1st Place**, ACM User Interface Software and Technology Symposium Best Poster Award	*Charlotte, U.S.A*
May. 2011	**Outstanding Achievement**, University of Florida	*Florida, U.S.A*

Publications

Thesis & Journal & Major Conferences (**Peer-Reviewed**)

T.1 **K. Huo**, "Dynamics and nonlinear control of electromagnetic docking/assembly and proximity operations", *University of Florida* M.S., Thesis, 2012.

J.1 S. Yoon, **K. Huo**, and K. Ramani, "Wearable textile input device with multimodal sensing for eyes-free mobile interaction during daily activities", *Pervasive and Mobile Computing* 33, 17-31, 2016.

J.2 S. Yoon, **K. Huo**, and K. Ramani, "MultiSoft: Soft Sensor Enabling Real-time Multimodal Sensing with Contact Localization and Deformation", *Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)* Sep 18, 145, 2018.

C.11 Y. Cao, **K. Huo**, Z. Xu, F. Li, W. Zhong, and K. Ramani, "V.Ra: An In-Situ Visual Authoring System for Robot-IoT Task Planning with Augmented Reality", *Proceedings of the 2019 DESIGNING INTERACTIVE SYSTEMS (**DIS 2019**)* (**25%** Acceptance Rate, , 2019.

C.10 **K. Huo**, T. Wang, L. Paredes, A. Villanueva, and K. Ramani, "SynchronizAR: Instant Synchronization for Spontaneous and Spatial Collaborations in Augmented Reality", *Proceedings of the 31st Annual Symposium on User Interface Software and Technology (**UIST 2018**)* (**22.5%** Acceptance Rate), , 2018.

C.9 T. Wang, **K. Huo**, et al., and K. Ramani, "Plane2Fun: Augmenting Ordinary Objects with Interactive Functions by Auto-Fabricating Surface Painted Circuits", *Proceedings of the 2018 DESIGNING INTERACTIVE SYSTEMS (**DIS 2018**)* (**25%** Acceptance Rate), **Honorable Mention**, p. 1095, 2018.

C.8 **K. Huo**, Y. Cao, S. Yoon, Z. Xu, G. Chen, K. Ramani, "Scenariot: Spatially Mapping Smart Things Within Augmented Reality Scenes", *Proceedings of the 2018 CHI Conference on Human Factors in Computing Systems (**CHI 2018**)* (∼ **25%** Acceptance Rate), Paper 219, 2018.

C.7 Y. Cao, Z. Xu, T. Glenn, **K. Huo**, K. Ramani, "Ani-Bot: A Mixed-Reality Modular Robotics System", *Proceedings of the 12th International Conference on Tangible, Embedded, and Embodied Interaction (**TEI 2018**)* (**28%** Acceptance Rate), , 2018.

C.6 S. Yoon, **K. Huo**, Y. Zhang, G. Chen, L. Paredes, and K. Ramani, "iSoft: A Customizable Soft Sensor with Real-time Continuous Contact and Stretching Sensing", *Proceedings of the 30th Annual Symposium on User Interface Software and Technology (**UIST 2017**)* (**22.5%** Acceptance Rate), 665-678, 2017.

C.5 **K. Huo**, Vinayak, K. Ramani, "Window-Shaping: 3D Design Ideation by Creating on, Borrowing from, and Looking at the Physical World.", *Proceedings of the 11th International Conference on Tangible, Embedded, and Embodied Interaction (**TEI 2017**)* (**27%** Acceptance Rate), 189-189, 2017.

C.4 S. Yoon, Y. Zhang, **K. Huo**, and K. Ramani, "TRing: Instant and Customizable Interactions with Objects Using an Embedded Magnet and a Finger-Worn Device", *Proceedings of the 29th Annual Symposium on User Interface Software and Technology (**UIST 2016**)* (**20.6%** Acceptance Rate), 169-181, 2016.

C.3 S. Yoon, **K. Huo**, and K. Ramani, "TMotion: Embedded 3D mobile input using magnetic sensing technique", *Proceedings of the 10th International Conference on Tangible, Embedded, and Embodied Interaction (**TEI 2016**)* (**25%** Acceptance Rate), 21-29, 2016.

C.2 S. Yoon, **K. Huo**, V. Nguyen and K. Ramani, "TIMMi: Finger-worn Textile Input Device with Multimodal Sensing in Mobile Interaction", *Proceedings of the 9th International Conference on Tangible, Embedded, and Embodied Interaction (**TEI 2015**)* (**28%** Acceptance Rate, 269-272, 2015.

C.1 W. Gao, **K. Huo**, J. Seehra, and K. Ramani, "Hexamorph: A reconfigurable and foldable hexapod robot inspired by origami", *Intelligent Robots and Systems (**IROS 2014**)* (**46%** Acceptance Rate), 4598–4604, 2014.

Magazine & Extended Abstract in Adjunct Proceedings

m.3 S. Yoon, G. Chen, K. Huo, Y. Zhang, K. Ramani, "iSoft", *interactions* 25, 14-15, 2018.

m.2 P. Shorey, et al., Sang Yoon, Yunbo Zhang, Ke Huo, Karthik Ramani, "Demo Hour", *interactions* 24, 11-12, 2017.

m.1 G. Ronchi, C. Benghi, F. Erich, M. Jazbec, A. Chacin, T. Oozu, S. Yoon, K. Huo, K. Ramani, "Demo Hour", *interactions* 23, 8-11, 2016.

c.6 T. Wang, K. Huo, et al, K. Ramani, "Plain2Fun: Augmenting Ordinary Objects with Surface Painted Circuits", *Adjunct Proceedings of the CHI 2018*, to appear, 2018.

c.5 Y. Cao, Z. Xu, T. Glenn, K. Huo, K. Ramani, "Ani-Bot: A Mixed-Reality Modular Robotics System", *Adjunct Proceedings of the 31th Annual Symposium on User Interface Software and Technology*, 119-121, 2017.

c.4 K. Huo, "Exploring Advanced Interactions for Augmented Reality: From Casual Activities to In-Situ 3D Modeling", *Proceedings of the 11th International Conference on Tangible, Embedded, and Embodied Interaction*, 725-728, 2017.

c.3 K. Huo, Vinayak, K. Ramani, "Window-Shaping: 3D Design Ideation in Mixed Reality", *Proceedings of the 2016 Symposium on Spatial User Interaction*, 189-189, 2016.

c.2 S. Yoon, K. Huo, and K. Ramani, "TMotion: Embedded 3D mobile input using magnetic sensing technique", *Adjunct Proceedings of the 29th Annual Symposium on User Interface Software and Technology*, 71–72, 2015.

c.1 S. Yoon, K. Huo, and K. Ramani, "Plex: finger-worn textile sensor for mobile interaction during activities", *Proceedings of the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing*, 191-194, 2014.