

# Jom (Pornthep) Preechayasomboon

[pornthep.com](http://pornthep.com)

[pmthp@uw.edu](mailto:pmthp@uw.edu) - [linkedin.com/in/pornthep](https://www.linkedin.com/in/pornthep)

.....

Seattle, WA

## Summary

PhD in Mechanical Engineering graduate with extensive experience in research and development for human-computer interfaces and devices from hardware design, fabrication, rapid prototyping, firmware development, system integration, user studies to end-user software. Highly motivated to push the frontiers of interaction for virtual and augmented reality. Seeking full-time research positions in haptics, robotics, and related fields.

## Education

### Ph.D. in Mechanical Engineering

Dissertation Topic: Improving Wearable Devices for Virtual Reality using Soft Robotics

Advisor & Committee Chair: Eric Rombokas, Ph.D.

Summer 2022 | University of Washington | Seattle, WA

### M.S. in Mechanical Engineering

June 2018 | University of Washington | Seattle, WA

### B.Eng. in Mechanical Engineering

July 2015 | Chulalongkorn University | Bangkok, Thailand

## Research and Professional Experience

### Research Scientist | Reality Labs Research, Meta | Redmond, WA

Sep 2022 – Present

- Wearable haptics research

### Research Assistant | Rombolabs, University of Washington | Seattle, WA

May 2017 – Aug 2022

- Supervisor: Eric Rombokas, Ph.D.
- Developed soft robotic actuators and control algorithms for real-time adjustment of fit for wearable devices to maintain adequate sensing for EMG (electromyography)
- Developed EMG data collection armbands for hand-tracking based interactions in virtual reality
- Developed Bricklayer: a perceptual study experiment framework for Unity (*see Notable Projects*)
- Developed novel methods of fabrication for soft robotics and 3D printing that enables complex internal structures while reducing overall weight and increasing strength (*see Notable Publications*)
- Investigated methods for simultaneous sensing and actuating in soft robotic actuators using recurrent neural networks (*see Notable Publications*)

### External Research Collaborator | Reality Labs, Meta | Redmond, WA

Jun 2020 – Dec 2021

- Improved hardware, software, and firmware, and disseminated documentation for Chasm (haptic actuator)
- Co-authored publication and prepared VR demonstration for Chasm at the CHI 2020 conference, received honorable mention for Best Paper award
- Developed haptic experiences for novel haptic devices and hardware prototypes in the Unity Engine
- Developed hardware prototypes for novel dielectric haptic actuators
- Developed APIs for the Unity Engine for novel pneumatic haptic devices, allowing researchers to rapid prototype haptic experiences

### Research Intern | Reality Labs Research, Meta | Redmond, WA

Apr 2019 – Sep 2019

- Conceptualized, designed, and built Chasm, a miniature screw-based haptic actuator capable of rendering multimodal haptic feedback (shear force and low-frequency vibrations)
- Developed firmware for Chasm that features USB HID communication and PID control that allows for haptic rendering at very low latencies (1 ms)
- Built novel haptic feedback APIs (C++) for rapid prototyping Chasm with the Unity game engine
- Conducted psychophysical studies for Chasm in use cases for rendering shear force on the fingerpads and head

- Developed Unity Engine VR demonstration for Chasm in a marker-like form-factor that showcases fingerpad shear force rendering to simulate force, stiffness, weight, and textures.

**Research Engineer | Biomechanical Design and Manufacturing Laboratory** | Bangkok, TH Aug 2015 – Aug 2016

- Developed a machining pipeline and tooling to manufacture tight-tolerance (sub-5-micron) spherical roundness for hip femoral head prosthetic implants from tough-to-cut materials (Cobalt-Chromium)
- Designed hot forging tooling (die and cutter) for manufacturing femoral stem prosthetic implants
- Mentored undergraduate students for their senior projects (design, mechatronics, and machining)

## Notable Publications

“Chasm: A Screw Based Expressive Compact Haptic Actuator”

P. Preechayasomboon, A. Israr, M. Samad, 2020, ACM CHI 2020, Honolulu, Hawaii, USA

Honorable Mention for Best Paper Award

“Haplets: Finger-Worn Wireless and Low-Encumbrance Vibrotactile Haptic Feedback for Virtual and Augmented Reality”

P. Preechayasomboon, E. Rombokas, 2021, Frontiers in Virtual Reality, Haptics

“Negshell casting: 3D-printed structured and sacrificial cores for soft robot fabrication”

P. Preechayasomboon, E. Rombokas, 2021, PLOS One

“Sensuator: A Hybrid Sensor–Actuator Approach to Soft Robotic Proprioception Using Recurrent Neural Networks”

P. Preechayasomboon, E. Rombokas, 2021, Actuators, MDPI

## Notable Presentations

**Paper Presentation, Podium, ACM CHI 2020**, Honolulu, Hawaii, USA (*Virtual*)

Chasm: A Screw Based Expressive Compact Haptic Actuator

**Paper Presentation, Podium, IEEE RoboSoft 2019**, Seoul, South Korea

ConTact Sensors: A Tactile Sensor Readily Integrable into Soft Robots

## Notable Projects

**Bricklayer** | framework for driving perceptual studies in the Unity Engine | [github.com/prnthp/experiment-structures](https://github.com/prnthp/experiment-structures)

- Bricklayer is used to drive many of the perceptual studies, psychophysics experiments, and data collection for human-subjects research done at the Rombolabs
- Bricklayer utilizes Unity’s Scene hierarchy to construct state machines that run in repeated sequences, enabling researchers to drag-and-drop to re-organize sequences and trials for experiments

**Development of an Electric Prosthetic Hand with an Anti-Slip Tactile System** | Senior Project | Chulalongkorn University

- Developed a novel tactile sensor capable of slip detection based on a magnetic displacement sensor embedded in a hyper-elastic elastomer
- Designed and CNC machined a robotic prosthetic hand based on a brushless DC motor and a novel sliced bevel gear design

## Technical Skills

**Development** | C#, C++, C (embedded systems), Unity Engine, Android (libraries), Python, MATLAB, git/hg, Keras

**Software** | SolidWorks, Catia, LabVIEW, Eagle, Altium Designer, ANSYS (Structural & Fluent)

**Embedded Systems** | Nordic nRF (ESB & BLE), Cypress PSoC, Teensy/Arduino, PCB design, debugging (J-Link), motor drivers, motion controllers, piezo drivers, haptic controllers, PID control, loadcell amplifiers, capacitive sensing, electromyography, analog front end, USB HID

**Hardware Development** | Haptic device design and prototyping, systems integration, data acquisition, mechanical testing, tooling, characterization

**Prototyping** | 5-axis CNC machining, FDM & SLA 3D printing, soldering, laser cutting, water jet cutting, advanced molding and casting, welding