UNIVERSITY OF MINNESOTA
Driven to Discover℠

# Wearable haptic skin strain system

**A hook and eye architecture for attachment of skin strain actuators for haptic applications.**

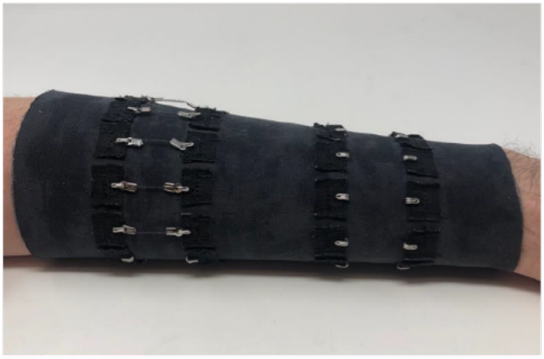

*Fig. 1: An arm sleeve with an actuation system.*

**IP Status:** PCT Pending; PCT No. PCT/US2024/022489; US Patent Pending 19/470,173

### Applications

- Virtual and augmented reality haptics
- Notification systems
- Touch sensitivity assessment
- Personalized haptic feedback

### Key Benefits & Differentiators

- **Easily repairable and scalable:** A unique hook and eye architecture allows for simple removal and replacement of individual actuators.
- **Increased user comfort:** The system uses a silicone backing to provide skin strain without relying on uncomfortable and painful skin adhesion.
- **Enhanced perceptibility:** The hook and eye design holds actuators closer to the garment's surface, improving the user's perception of the haptic feedback while preventing snagging.
- **Benefit:** Features that provide the benefit

### Technology Overview

The sense of touch is a primary way people interact with their environment, with skin strain being a key component of this experience. Haptic technologies aim to replicate this sense, but existing wearable skin strain systems often face challenges related to comfort and practicality. Many systems permanently attach actuators, making them difficult to repair and scale. Others rely on uncomfortable methods like skin adhesion, which can cause pain and irritation upon removal. These shortcomings hinder the widespread adoption and commercial viability of wearable haptic devices.

**Technology ID**
2023-241

**Category**
All Technologies
Engineering & Physical Sciences/Instrumentation, Sensors & Controls
Engineering & Physical Sciences/Materials
Engineering & Physical Sciences/Processes
Life Sciences/Biomaterials
Life Sciences/Human Health
Life Sciences/Medical Devices

**View online**

Researchers at the University of Minnesota have developed a wearable haptic skin strain system that addresses these limitations through a novel hook and eye architecture (Fig. 1). This design allows for the rapid and easy removal or replacement of actuators, improving the system's repairability and scalability. Unlike solutions that rely on skin adhesion, this system uses silicone backing to comfortably produce skin strain without sticking to the skin. By holding the actuators closer to the garment surface, this unique design also enhances the user's perception of the haptic feedback while preventing snagging, offering a more comfortable, practical.

### Phase of Development

**TRL: 4-5**

Write a sentence or a short description about development status. Use the table below to guide your phrasing.

### Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

### Researchers


- **Brad Holschuh, PhD** Associate Professor, Department of Apparel Design and Human Factors & Ergonomics
- **Robert Pettys-Baker, PhD** Assistant Professor, School of Fashion Design and Merchandising at Kent State University


### References


1. Niharikha Subash, Brad Holschuh(2025) , https://www.tandfonline.com/doi/full/10.1080/14606925.2025.2496631, https://www.tandfonline.com/journals/rfdj20