2025 IEEE World Haptics Conference (WHC)
Suwon Convention Center, Suwon, Korea
July 8 ~ 11, 2025

EmbodyCraft: A Haptic Playback System fo Sharing and Reflecting on Craft Skills

Yufan Zhu[1], Mitsubori Nichika[1], Hyuga Suzuki[2], Takumi Nishimura[2], Naoki Nanba[2], Youichi Kamiyama[1], Arata Horie[1,3], Yoshihiro Tanaka[2] and Kouta Minamizawa[1]

I. Abstract

We present EmbodyCraft, a haptic playback system designed to facilitate the exploration of craft skills through tactile cue derived from muscle activity and fingertip vibrations. The system employs FeelTech Wear [1], a wearable haptic device equipped with rotational skin-stretch actuators and vibrotactile motors, to convey sensory cue recorded from muscle contractions and contact vibrations.

Fig. 1. Conceptual Representation: A potter recording muscle activities and fingertip vibration with video, then re-experiencing the tactile cues generated by these data.

Traditional craft practices often rely on visual and verbal cues, neglecting tactile sensations that convey essential skill nuances. EmbodyCraft addresses this gap by capturing muscle activity through Force Myography (FMG) sensors and contact dynamics through accelerometers, transforming these signals into tactile stimuli that facilitate embodied reflection.

The system consists of three core components: a forearm-mounted FMG module, SenseFuse™, a fingertip vibration recording module, and a haptic display, FeelFuse™, both developed by commissure Inc. Muscle activities data is collected using eight FSR sensors (FSR402, Interlink Electronics), evenly distributed around the forearm and sampled at 240 Hz using an XIAO ESP32C3 microcontroller. Fingertip vibrations are captured via three-axis accelerometers (2302B, Showa Measuring Instrument) embedded in a rubber glove, recorded at 48 kHz with 32-bit float resolution.

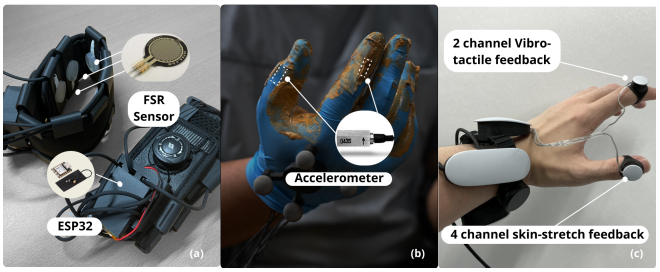

Fig. 2. (a) FMG device (b) Accelerometer (c) Haptic display Feeltech Wear [1]

FMG signals are downsampled to 60 Hz to align with video frame rates and smoothed using Gaussian filtering. Accelerometer signals undergo low-pass filtering and amplitude normalization to mitigate noise. These data streams are synchronized using a sharp clap sound and subsequently mapped to skin-stretch and vibrotactile actuators in the FeelTech Wear device, providing users with tactile cues that represent muscle intensity and contact dynamics during playback.

Through this tactile interface, users can either revisit their own skill execution or experience another's data, supporting reflection on force application, movement patterns, and interaction with materials. This multimodal approach addresses the gap between visual and tactile perception in craft practice, creating opportunities for embodied reflection through tactile cues, enhancing awareness of embodied techniques through haptic cue.

References

[1] R. Umehara, H. Taguchi, A. Horie, Y. Kamiyama, S. Sakamoto, H. Ishikawa, and K. Minamizawa, "Feeltech wear: Enhancing mixed reality experience with wrist to finger haptic attribution," in *ACM SIGGRAPH 2024 Emerging Technologies*, ser. SIGGRAPH '24. New York, NY, USA: Association for Computing Machinery, 2024. [Online]. Available: https://doi.org/10.1145/3641517.3664395

*This demonstration is supported by the JST Moonshot R&D Program "Cybernetic Being" Project (Grant number JPMJMS2013), the Japan Association of Traditional Craft Production Regions, and its member company, Pottery Studio Ikutouen.

[1]Graduate School of Media Design, Keio University, Yokohama, Japan. e-mail: (hsu-zhu, mitsubori, kamiyama, a.horie, kouta)@kmd.keio.ac.jp

[2]Electrical and Mechanical Engineering, Nagoya Institute of Technology, Nagoya, Japan. Email: {h.suzuki.924, t.nishimura.502, n.namba.454}@stn.nitech.ac.jp, tanaka.yoshihiro@nitech.ac.jp

[3]commissure Inc, Tokyo, Japan