Design and Experience Tactile Symbols using Continuous and Motion-Coupled Vibration

Nihar Sabnis[1][0000−0002−3160−251X], Dennis Wittchen[1,2][0000−0002−6190−1799], Gabriela Vega[1][0000−0002−3487−5505], Courtney N. Reed[1,3][0000−0003−0893−9277], and Paul Strohmeier[1][0000−0002−7442−2607]

[1] Max Planck Institute for Informatics, Saarland Informatics Campus, Saarbrücken, Germany
{nsabnis,dwittche,gvega,pastrohm}@mpi-inf.mpg.de
[2] Dresden University of Applied Sciences, Dresden, Germany {wittchen}@htw-dresden.de
[3] Institute for Digital Technologies, Loughborough University London, London, UK
{c.n.reed}@lboro.ac.uk

Abstract. One application area of vibrotactile haptics has been to create abstract tactile symbols, such as notifications, which requires user's interpretation. The other area is the rendering of realistic material interactions, such as friction, which provide embodied experiences to the users. The abstract symbols are rendered using continuous vibration, whereas vibration coupled to user motion is used to elicit embodied experiences. In our research, we explore how embodied experiences can be used for symbolic mediation, i.e.: how can we use these two vibration types to design hybrid tactile symbols? In this demo, we invite visitors to explore a set of such hybrid tactile symbols created by experts in a user study [1]. We further invite visitors to design tactile symbols themselves using a graphical user interface and experience them on a set of tangible user interfaces. We expect the demo to take 3–5 minutes.

Keywords: Tactile Symbols · Symbol Design · Motion-coupled vibration.

1 Hands-on demonstration setup

Figure 2 illustrates the setup needed for the demo. Visitors will be able to experience the symbols for warning, reassurance, ecstasy and disengagement, designed by the haptic experts from our previous study [1]. Additionally, visitors can design their own symbols using the GUI Figure 1-(a), which allows switching between continuous (for abstract symbol design) and motion-coupled (for friction rendering) vibration while assigning and modifying vibration parameters of frequency, amplitude, waveform and duration. For motion-coupled vibration, visitors will also be able to select the number of pulses to be played over the sensor range. The TUI Figure 1-(b), consisting of sliders and knobs, can be used to experience the pre-designed symbols by experts and the symbols designed by themselves Figure 1-(c). A short video of the system: `https://drive.google.com/file/d/1EiHsBWV7iFKWzzpxknhWhiudZVEejHZj/view?usp=sharing`.

1.1 Technical requirements

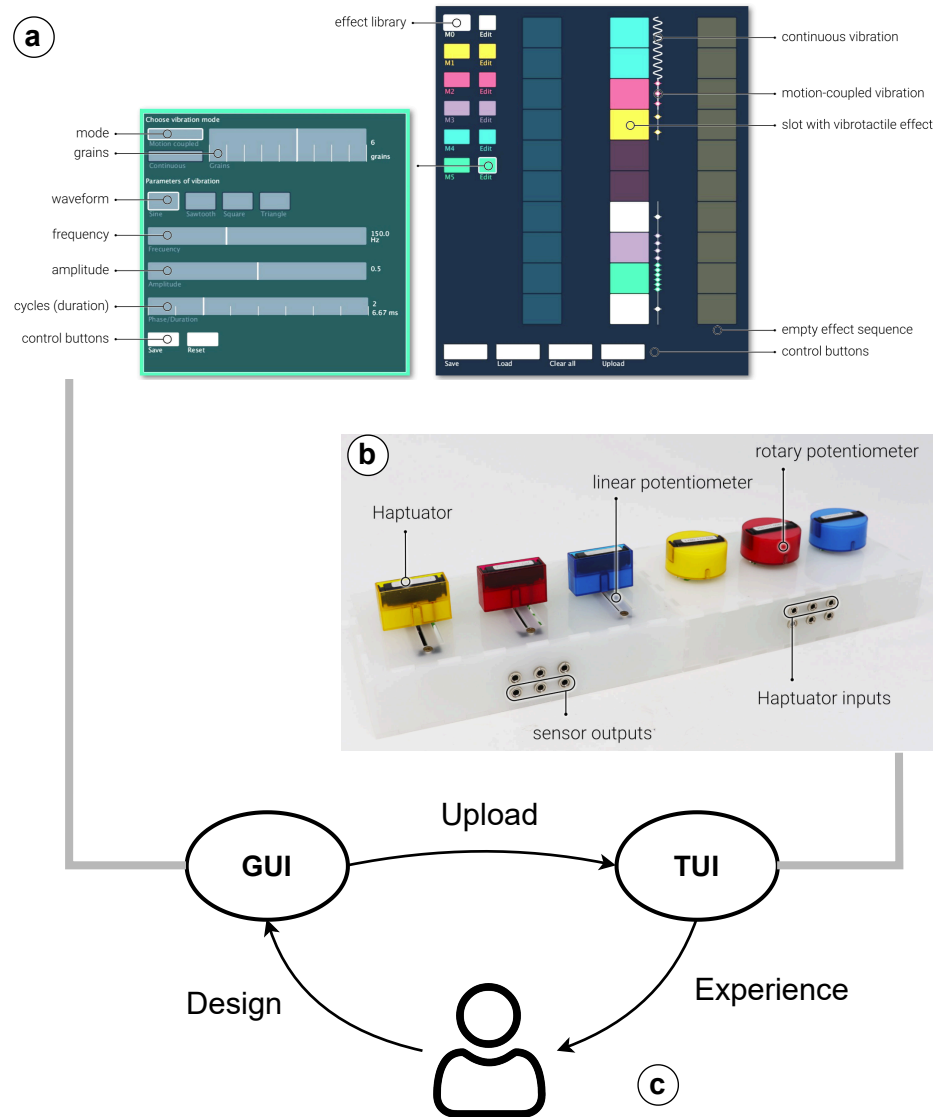– Table with two chairs, for visitors of the demo

Fig. 1. (a) GUI to design tactile symbols has two windows – one to parameterize vibrotactile effects (left), and another to create sequences of these effects. (b) Tangible User Interfaces - sliders and knobs - to experience the designed tactile symbols. (c) Process diagram to design and experience tactile symbols using the GUI and TUI.

- Desktop monitor (plus power cable)
- At least 2 power outlets
- Space for poster (and poster stand, if available)

We will bring our own of the following, but it will be helpful if we can have a backup:
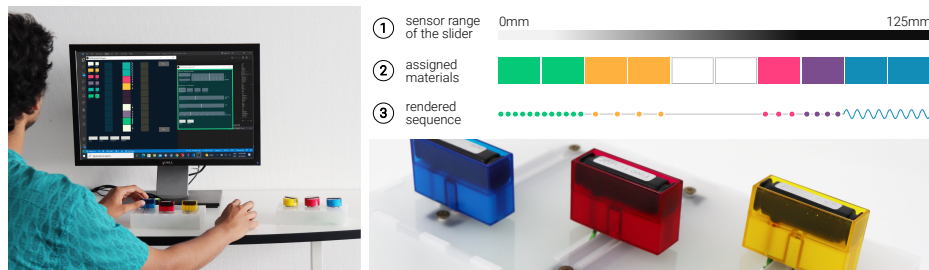
- USB mouse
- HDMI cable for the desktop monitor above

Fig. 2. A mockup of the demo (left). Visualization of the designed tactile symbols over the slider range (right).

References

1. Nihar Sabnis, Dennis Wittchen, Gabriela Vega, Courtney N. Reed, and Paul Strohmeier. Tactile symbols with continuous and motion-coupled vibration: An exploration of using embodied experiences for hermeneutic design. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems*, pages 1–19, 2023.