
Reflections on a WYFIWIF Tool for Eliciting User Feedback

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Abstract

Designing haptic phenomena is increasingly important but difficult. Eliciting user feedback is particularly challenging. Direct means of sharing haptic sensations are limited, and the absence of unifying conceptual models for working with haptic sensations further restricts communication between designers and users. This is especially troublesome for pleasurable, affectively targeted interactions that rely on subjective user experience. In this paper, we summarize a recently-published qualitative study evaluating mHIVE, a What-You-Feel-Is-What-I-Feel (WYFIWIF) device for the direct manipulation and communication of vibrotactile stimuli. mHIVE is designed for rapid feedback and collaborative exploration, and shows promise for providing an additional, tactile mode of communication between designers and users in support of improved haptic design.

Author Keywords

Vibrotactile; design tools; user feedback; phenomenology.

ACM Classification Keywords

H.5.2 [Information Interfaces and Presentation (e.g. HCI)]: User Interfaces—Evaluation/methodology, Haptic I/O



Figure 1: Concept sketch of mHIVE, our WYFIWIF elicitation tool. A tactile modality is added to the dialogue, as both users experience the same sensation, controlled and improvised in real-time.

Introduction

Despite the progress made towards understanding haptic technologies and perception, designing a pleasant or affective haptic sensation is still challenging. As haptic technologies move into consumer devices, a greater understanding of haptics is necessary. Though the psychophysics of touch have long been examined, affective attributes remain relatively unexplored. This is despite the evidence that touch is highly connected to affect and what an individual likes [8].

Part of the challenge lies in eliciting user feedback. In contrast to other modalities, there is no consistent way for users to describe haptic or tactile sensations. We believe that this stems from touch being a local, personal sense – two people might see the same image, but can rarely touch the same object in the same way. In addition, there are barriers of access. Although anyone can pick up a pencil and draw visual concepts directly, technical knowledge is typically required to develop even basic artificial haptic sensations. Accessible haptic evaluation methods might be a way to elicit this direct feedback without intermediary verbal interpretations.

To help elicit feedback, we use a *haptic instrument*, inspired by musical instruments but producing (for example) vibrotactile sensations rather than sound (Figure 1). Haptic instruments provide real-time feedback to the user to facilitate improvisation and exploration, and produce haptic output to multiple users as a What-You-Feel-Is-What-I-Feel (WYFIWIF) interface. Our haptic instrument, mHIVE, is also designed to be accessible without technical knowledge, allowing for designers and users to both express themselves in real-time and collaboratively explore a design space. Although some of the control parameters require some

knowledge of signal processing, their effects can still be learned and explained to someone without this knowledge.

From our experiences with mHIVE, we have insights into non-verbal, tactile communication. Specifically, we found that direct communication was valuable, removing the need for participants to verbalize concepts that are difficult to articulate. However, there were specific challenges that make this type of communication difficult. We are searching for ideas of how to evaluate tactile experiences, an appropriate scenario for tactile user experience methods, and for additional application areas of the haptic instrument.

In this paper, we summarize relevant parts of a recent paper on mHIVE [13]. We focus on the potential of haptic instruments to establish a dialogue that includes a haptic modality and does not require verbalization.

mHIVE

mHIVE (mobile Haptic Instrument for Vibrotactile Exploration) is a collocated, synchronous haptic instrument that creates a shared display with dual Haptuators [15] and is operated with a single-touch tablet interface (Figure 2). We began with vibrotactile design because vibrotactile sensations are common, do not require interactive programming, are controlled through waveforms (analogous to music), and their low-level control parameters are well understood. A touchscreen allows direct manual control.

mHIVE offers real-time control of frequency, amplitude, waveform, envelope, duration, and rhythm, identified as the most important parameters for vibrotactile sensations [2, 3, 4, 5, 12]. For more details on mHIVE and the haptic instrument concept, see a recently-published full description of this study [13].

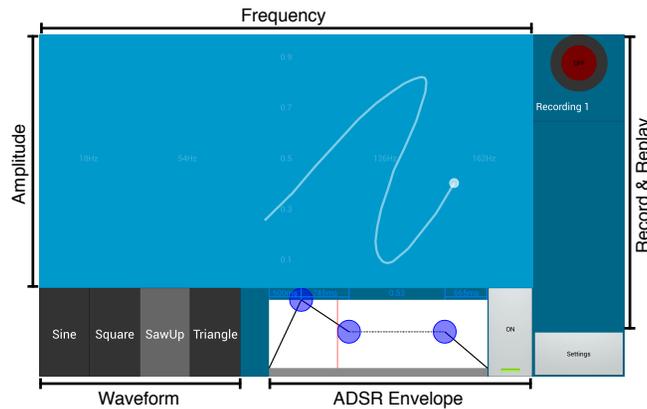


Figure 2: mHIVE interface. Primary interaction is through the amplitude-frequency view, where visual feedback is provided through a circle (current finger position) and a trail (interaction history).

Methods

We conducted a preliminary qualitative study, interviewing 4 participants with some experience designing haptics. We found that mHIVE supports serendipitous exploration and communication, allowing designers and users to discuss a design space together. We focus on the findings particularly appropriate to direct designer-user communication here.

In our preliminary study, we used a think-aloud protocol about the sensations the participants were experiencing to try and examine the verbal descriptions of the sensations. We combined this with an exit interview to evaluate mHIVE. Analysis was conducted with phenomenology¹, uncommon in the haptics community (excluding [11]).

¹Here we refer specifically to the psychological methodology described by Moustakas [10].

We found it to be an effective way to examine the subjective experience of using mHIVE. Because the community is still developing processes and tasks for haptic design, qualitative studies seem to be an especially appropriate way to tackle these problems.

Preliminary Findings

When interacting with mHIVE, participants frequently used deictic phrases, such as “that” and “there”, that required additional context to be understood. Reminiscent of the classic “Put That There” multimodal interaction demo [1], these phrases indicate a shared reference point was established from the haptic instrument. Participants did not have to seek for the words to describe a sensation, but could simply refer to it while the designer experienced it simultaneously. In one stand-out example, a participant even used the device so that the interviewer could successfully guess a “sleepy” sensation, immediately establishing a possible candidate for that affective state. This example-based means of communication allowed for more expressive dialogue that augmented the discussion, as conducted with the Sensual Experience Instrument (SEI) [9].

The multimodal nature of the device further reinforced the importance of non-verbal means of communication. Visualizations used by the tablet interface were particularly valuable to help participants work with tactile sensations. Because visual experiences have a shared reference point, this might be an additional avenue for the evaluation of tactile sensations. Designers might be able to use a powerful visualization to represent tactile sensations.

Unfortunately, the flexibility of directly controlling low-level parameters came with cognitive barriers. Participants found it difficult to remember what they had

tried before, and to pay attention to the output while simultaneously controlling it. While we are targeting haptic designers with our tools, giving end-users a full-fledged design tool for non-verbal communication might be ineffective. Future work on tactile evaluation methods with end-users might be best served by having users choosing examples, like tactile emoticons.

One stand-out strategy employed by all participants was onomatopoeias: “beeeoo”, “vroom”, “bsheeeooo”, “boom”, “neeeaa”, “mmmMMMmmm”, “pa pa pa pa”, “tum tum tum tum”, “tumba tumba tumba tumba”; “upward arpeggio, like, (singing with hand gestures) na na na naaaa”. These non-verbal utterances, when combined with the shared context of mHIVE, provided an intermediate representation of sensations between direct examples and verbal descriptions. Reminiscent of Watanabe et al.’s work with static materials [14], it could be that non-verbal utterances are another unexplored tool in an interaction designer’s toolkit.

When using verbal responses, participants often started with a statement of like or dislike rather than a description. Pleasant sensations often involved the ramp-in and ramp-out (“echo” or “ringing”) of the ADSR envelope, or lower-frequency sensations. Longer, higher frequency without ramp-in and ramp-out were less pleasant. Participants’ readiness to say whether a sensation was pleasant or not supports the view that touch is affective in nature, and that knowing what one likes or doesn’t like is a primary function of touch [8].

When participants did describe sensations, sound-based metaphors were very common, including hum, buzz, whistle, rumble; bell; squeaky, creak; or thumpy. Audio metaphors were still used; even the word “sounds” was used instead of “feels”: “Triangle, sounds nicer, er feels

nicer (laughing)”. This may be isolated to vibrotactile output, and might not generalize to force-feedback output. Still other descriptors were directly haptic in nature: rough, flat, sharp, round, ticklish, sharp, smooth, cat pawing, impatient foot tapping. Unfortunately, our study was too preliminary to provide detailed results on the language of haptic sensations. We plan to pursue this in future work.

Conclusion

Receiving feedback about haptic phenomena is challenging. The prominent use of deictic phrases, onomatopoeias, and whether or not participants liked a sensation suggests that we need alternative, non-verbal methods of evaluation for haptic experiences. mHIVE, a haptic instrument, is a new design tool that allows for direct haptic communication between designers and users. Because it has a WYFIWIF interface, designers and users are able to have a shared reference point for discussing tactile sensations. This approach is promising, suggesting that giving users a direct and accessible means of expression is a valuable way of eliciting feedback for concepts that are difficult to verbalize. Future work will focus on generalizing this to more complex haptic scenarios. We especially plan to make use of visual metaphors, and to try to bootstrap the shared experience to develop a verbal language that can augment non-verbal methods of communication.

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