Designing Interactions for Novel Haptic Technologies

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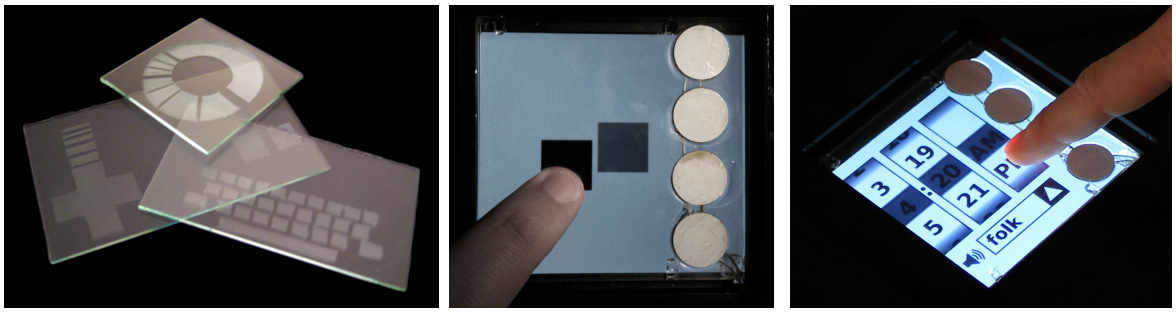

(a) **(b)** **(c)**

Figure 1. Design of interactions for a touchscreen with programmable friction at different stages: (a) low-fidelity prototypes on etched glass, (b) conceptual sketch with a haptic touchscreen, and (c) high-fidelity prototype with haptic touchscreen.

The haptics community is a great source of innovation and, after decades of research, continues to devise novel means of stimulating the sense of touch. Developing compelling applications for these innovative technologies, however, can be a significant challenge. Designing high-performance haptic hardware requires great effort and dedication, often placing novel devices out of reach of interaction researchers. Gaps in the understanding of a novel technology's psychophysics and human factors also make the design of applications difficult. A common approach is to first optimize a device's hardware design, and then methodically build up knowledge of relevant psychophysics and human factors prior to investigating applications in depth. In this talk, I will propose alternative approaches that skip ahead to the exploration of a haptic technology's interaction design space and the evaluation of its benefits to the user experience in concrete applications.

Drawing from my experience with laterotactile displays and programmable friction touchscreens, I will illustrate how rapid prototyping and user centered design can demonstrate the value of novel haptic feedback early on, justifying and guiding further investments in hardware design and human factor studies. I will focus on the design process used by a multidisciplinary team the University of British Columbia and Northwestern University to explore the value of adding programmable friction to a touchscreen's surface. This process, illustrated in Figure 1, began with an exploration of friction's value in everyday life and the implementation of low-fidelity prototypes on etched glass. It continued with the rapid prototyping of interaction concepts with a haptic touchscreen and the identification of programmable friction's most promising features. It culminated in the design and evaluation of high-fidelity prototypes integrating several of programmable friction's strengths. More recent work has finally repeated the process for a second iteration exploring the design space in the narrower context of scrolling interactions. This work is building the case for further investments in hardware design and fundamental studies of programmable surface friction.