"Minimizing Haptic Hardware in Wearable Devices"

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Wearable haptic devices present many challenges in actuator selection and design. In addition to providing a sufficiently strong signal to be easily felt by the user, the actuators must also not encumber the user's motion. These limitations motivate our research towards providing complex haptic signals using minimal hardware. We approach this problem from two directions by using haptic illusions and by creating novel actuators that can provide multiple haptic sensations simultaneously. Haptic illusions seek to fool our sense of touch into thinking we are feeling something different than what is being displayed by taking advantage of the inexactness of our perception. In our research, we employ haptic illusions to allow small, lightweight actuators to create sensations that would normally require actuators that are impractical for a wearable device. I will discuss two haptic illusions and their uses: asymmetric vibrations for generating ungrounded forces and sequential indentation for creating lateral motions. I will also present our work in creating multi-modal hardware, which allows for complex haptic sensations using minimal actuator size and weight.