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Amplitude and Frequency Resolution for Motional Stimulation

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ABSTRACT

Past research on artificial tactual communication devices has focused almost exclusively on displays that provide low-amplitude, high-frequency stimulation. Included among such displays are tactile aids based on small vibrators. In contrast, some of the most successful natural tactual communication methods (e.g., Tadoma and tactile signing) exploit large-amplitude, low-frequency motional stimulation that can be applied normal and/or tangential to the skin surface. The perceptual qualities of these two types of stimulation may be quite different, in part because some kinds of motional stimulation potentially engage proprioceptive/kinesthetic mechanisms. The present research is directed at characterizing psychophysical performance with motional stimulation, with the ultimate aim of developing more effective tactual displays. Initial work is focused on measuring the ability to discriminate amplitude and frequency differences for large amplitude (up to 2 cm), low frequency (1 to 32 Hz) sinusoidal displacements. Stimuli are being delivered to the fingerpad of the index finger using a position-controlled servomotor. Results will be compared (a) to those obtained for similar tasks, but at lower amplitudes and higher frequencies, to determine if performance exhibits any abrupt changes as stimulation proceeds along the motional-to-vibratory continuum, and (b) to static measurements of joint-angle resolution that are also being made in our laboratory.