Applied Vibrotactile Systems

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Vibrotactile stimuli are vibrations that can be felt through the sense of touch. They are commonly used in haptic systems and assistive technologies. This project explores the various potential applications of vibrotactile stimuli, particularly language and information transmission which can be immensely beneficial for people with visual or hearing impairments. A hand-shaped prototype containing eight eccentric rotating mass (ERM) motors was built to represent Braille letters using vibrotactile stimuli. This served as a proof of concept to test how easily vibrotactile letter patterns could be learned and recognized. The 12-minute experiment that was conducted was based on earlier research on vibrotactile Morse code. In the experiment, the participant learned vibrotactile patterns for six letters in learning and testing phases and then identified words made from those letters. The results were analyzed using accuracy measurements and a confusion matrix. The overall accuracy achieved was 76.47%, with a highest accuracy of 83.33% from 3 to 6 minutes. The precision for class "A" was 62.5%. Considering limitations such as the momentary restriction to self-experimentation, the results are positive and suggest that vibrotactile letter systems can be learned in a short time, contrary to what results with Vibratese showed, however, optimization is required. Ongoing work is focused on improving the letter system with testing and developing a low-cost alternative to refreshable Braille displays that can also represent graphs and simple 2D images through vibrotactile stimuli. Focus will then shift to applications beyond language transmission. The prototype may need to be updated.

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