

# **The Vocal Joystick: Voice-based Continuous Control of Electro-mechanical Devices**

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The Vocal Joystick (VJ) system is a novel voice-based assistive technology for amputees and individuals with motor impairments. The VJ system can recognize both verbal and non-verbal vocalizations along with other continuous vocal characteristics such as pitch, loudness, and vowel quality. VJ then maps them to parameters useful for controlling mouse cursor movement and other applications within a computing system.

The key benefit of the VJ system is its immediate processing of continuous vocal input, meaning that the user's variations in intent are processed instantaneously and continuously, and are reflected immediately in the user interface. In this talk, we describe in detail the VJ system and the research underlying its creation. In particular, we overview the rationale behind the design of the VJ engine itself. We discuss the challenges of designing a mapping from vocalic effort (which has no inherent spatial information) to a domain where user intent about spatial information exists (e.g., 2-dimensional mouse position). We describe how the idea of mouse acceleration can be extended to the vocalic domain. We discuss how machine learning methods have been used and advanced in the VJ system. In particular, we present new rapid adaptation algorithms for discriminative classifiers (e.g., SVMs and Neural Networks), and adaptation sample complexity bounds, both of which have been developed with the VJ system in mind. And lastly, we will demonstrate several applications of the VJ system, including generic mouse control in a WIMP system, web browsing, voice drawing, voice-controlled video games, and a voice-controlled robot.