Tactile Vision: A Low-Cost Haptic Interface for Image Perception in Visually Impaired Users

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Haptic feedback technology offers innovative ways for visually impaired individuals to interact with their surroundings. Current solutions, however, are often prohibitively expensive and lack portability. This project aims to develop a low-cost, portable haptic feedback system using a touchscreen interface coupled with vibration intensity modulation. The prototype integrates a Raspberry Pi, a touchscreen, and a haptic motor. Depth maps generated via deep learning algorithms translate depth data into grayscale images, where pixel brightness controls vibration intensity. Brighter pixels trigger stronger vibrations, enabling users to perceive nearby objects through tactile feedback. Testing revealed limitations in human perception of vibration frequency and range, requiring future optimization of motor response curves. Collaboration with the North Estonian Blind Association provided critical insights, such as incorporating a vibrating stylus for precision. Despite the limitations in human perception of vibration frequency and range, which were brought out in testing, the system’s low cost and compact design demonstrate viability for real-world use.

Awards Won: