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Design of a Hands-Free Interface for Object Relocation for Paralyzed Individuals

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Abstract: Almost every device we interact with relies on a physical control interface in order for the user to command the system. The current control-interfacing prevents nearly three million severely paralyzed consumers in the United States from being able to operate devices. Robotic aids are in development for object relocation. Three alternatives are available to support hands-free control: eye tracking, voice commands, or brain-computer interfacing (BCI). A simulation of "fetch-and-deliver" tasks showed six commands were necessary for platform movement, 500 for the arm, and two for the gripper. Because of this, an automated arm and gripper function is proposed. A utility vs. life-cycle cost analysis showed that BCIs have the lowest utility (0.536) Voice commands exhibited a higher utility (0.812) than the eye-tracking method (0.801). In a lifecycle cost vs. utility analysis, the voice-command method was shown to be half the cost of the eye-tracking method.

Keywords: Human-Machine Interaction, Robotic Aid, Control Interface