**Hands-Free Cursor Navigation for People with Paralysis**

The ability to interact with computers has become an indispensable part of modern life, enabling communication, work, education, and entertainment. However, for individuals suffering from paralysis or severe motor impairments, operating traditional input devices such as a mouse or keyboard can be an overwhelming challenge. This project addresses that gap by presenting a low-cost, vision-based, hands-free cursor control system that leverages facial and eye movements as primary input mechanisms. By eliminating the need for physical touch, the system offers an inclusive computing solution aimed at restoring independence and enabling effective digital communication for people with limited limb mobility.

The proposed system utilizes a standard webcam to continuously capture real-time video of the user’s face. Using the Dlib library, the system performs rapid and accurate face detection and facial landmark prediction, identifying key reference points such as the eyes, nose, and mouth. These landmarks are processed to determine head orientation, blink patterns, and eye gestures. Specific voluntary actions, such as winking or prolonged blinking, are mapped to mouse clicks or command triggers. The PyAutoGUI library then translates these detected gestures into precise cursor movements and clicks, ensuring smooth and responsive control. The design prioritizes affordability, portability, and ease of deployment, requiring only a webcam and open-source software—making it accessible to a wide audience without the cost of specialized eye-tracking hardware.

Beyond serving as an assistive tool for individuals with disabilities, the system opens avenues for natural human-computer interaction (HCI) applications in other fields. It can be adapted for virtual and augmented reality, hands-free industrial machine control, or environments where touch-based interaction is unsafe or impractical. By combining computer vision, machine learning-based facial analysis, and gesture-based control mechanisms, this project demonstrates how innovation can bridge the accessibility gap in technology. Ultimately, the system not only enhances autonomy for people with paralysis but also represents a forward-looking approach to inclusive, human-centered computing that prioritizes usability, cost-effectiveness, and social impact.