Eye Connect: Using Computer Vision to Create Low-Cost Assistive Technology

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For people with limited muscular control, limb loss or upper body paralysis, human computer interfaces (HCI) have been developed to provide access to computer technology. Conventional human computer interfaces such as peripheral eye-trackers, switch interfaces and emerging BCI technology are hardware-focused and unaffordable for people from low socio-economic backgrounds. In response, I have designed Eye Connect, the first free cross-platform assistive software for those with limited muscular control, limb loss or upper body paralysis. Eye Connect incorporates the development of Innovative computer vision techniques based on a standard webcam to create two low-cost human-computer interface (HCI) systems. The software includes a motion-based HCI system that moves the mouse based on head movement. For more severe forms of paralysis, the first blink-based HCI system has also been developed, that triggers mouse movements through sequential blinks. Both systems are integrated into Eye Connect, a free suite of user-friendly software designed to provide full system control through facial feature detections. An initial trial, involving the webcam analysis of around 600 frames for every subject, found the blink detection algorithm had a 99% accuracy rate. On a 1.4 GHz Processor, the motion-based HCI system averaged a speed of 20 frames per second while the blink-based HCI system averaged 14.5 frames per second, making both real-time solutions. This verifies the technology's aptness for Muscular Dystrophy, Motor Neurone Disease and many other forms of upper body paralysis.

Awards Won: