Eye-controlled Wheelchair: A Low-cost Open Source Hard- and Software System Allowing Independent Mobility for People with Severe Disabilties

Stoetzer, Myrijam

Foltin, Paul

Spinal cord injuries (SCI) or illnesses like ALS or MS cause disabilities that make people dependent on a wheelchair and in their etiopathology are robbed of any movement at all. Our project gives these disabled people back some freedom to move independently again – using their eyes only. Our goal was to construct a wheelchair that can be steered only by the movement of one eye developing an open source, low-cost approach, since 50% of the people suffering from SCI are not adequately insured. Therefore we chose to start with a hand driven wheelchair we motorized ourselves instead of a powered one. Two windscreen wiper motors from the trash provide the thrust needed and an Eyetracker we built ourselves using a normal webcam, a safety glasses frame and 3d-printed parts is responsible for providing close-up images of one eye to the embedded hardware platform. It is a Raspberry Pi2b that provides processing power to filter the video frame-by-frame using a cascade of 4 filters to extract the position of the pupil. Depending on the direction of the gaze – up, down, left, right – a speech synthesis reads the direction out. It has to be confirmed by twitching a cheek muscle for safety reasons – the wheelchair does not follow unintended eye-movements. We attached the motors to the wheelchair and constructed attachment wheels to drive the main wheels using 3d-printing. In conclusion everything works well and the total budget needed is below $200.

Awards Won:

Second Award of $2,000

Sigma Xi, The Scientific Research Honor Society: Intel ISEF Best of Category Award of $5,000