EyeMove: Using Electrooculography to Provide Mobility for the Disabled

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The goal of this engineering project was to investigate and design an affordable system capable of controlling an electric wheelchair with ocular tracking. Based on electrooculographic (EOG) signals captured through electrodes around the vicinity of the eyes, motors can be controlled to move in corresponding directions. According to available literature, quadriplegics and individuals with severe paralysis lose almost all muscular control, with the only exception being the eyes. For such people, an EOG-based wheelchair system provides the possibility of independent mobility, and hence an overall improvement in the quality of their lives. In this project, a fully functioning system using off-the-shelf components was designed and successfully implemented by retrofitting a standard wheelchair. To do so, an EOG signal acquisition system was designed, implemented, and verified under different conditions, such as varying skin textures. This system used several filter and gain stages to acquire and digitize very low-amplitude EOG signals. The digital signals were subsequently used as inputs to the Arduino UNO microcontroller, which was programmed to control the wheelchair motion using motor controllers and a switching circuit. Final project cost analysis indicated that the retrofitted wheelchair is affordable and can be implemented across the world at a lower cost than most existing independent mobility systems. Lastly, it is easy to retrofit existing wheelchair systems with the EOG based system developed within this project, reducing the cost of the system, as a new electric wheelchair is not required.

Awards Won:
Intel ISEF Best of Category Award of $5,000
First Award of $5,000
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: $20,000 Scholarship for Innovative Technology in Solving Real-World Problems