

BCI controlled robotic arm as assistance to the rehabilitation of neurologically disabled patients

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Abstract

Brain computer interface (BCI) controlled assistive robotic systems have been developed with increasing success with the aim to rehabilitation of patients after brain injury [1] to increase independence and quality of life. While such systems may use surgically implanted invasive sensors, non-invasive alternatives can be better suited due to ease of use, reduced cost, improvements in accuracy and reliability with the advancement of the technology and practicality of use. The consumer grade BCI devices often capable of integrating multiple types of signals, including Electroencephalogram (EEG) and Electromyogram (EMG) signals, as well as basic motion based signals such as gyrosopic data. This paper summarises the development of a BCI controlled robotic system using a non-invasive BCI headset “Muse” [2] and an open source robotic arm, U-Arm [2], to accomplish tasks related to rehabilitation, such as access to resources, adaptability or home use. The resulting system used a combination of EMG and gyrosopic sensor readings to control the arm, which could perform a number of different tasks such as picking/placing objects or assist users in eating. Preliminary work was carried out to capture event driven EEG signals as alternative inputs to the controller. To avoid risks of injury while the device is being used in clinical settings, appropriate measures were incorporated into the software control of the arm. The project was a success in collaboration between the University and the East Kent Hospitals Neuro-Rehabilitation Unit, with the long term goal of testing the system in a clinical environment and up-scaling the system to larger robotic effectors.

References:

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