Title: Proposals of control paradigms applied to a Brain-Controlled wheelchair

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Abstract

Several of the neurological diseases that human beings can result in severe disabilities. In some cases, people who suffer from such deficiencies lose any chance of communication with their environment, being the only possible alternative to give the brain a new channel not based on muscular activity, allowing these people to send messages and commands to the external world. The systems that allows the latter is what is known as Brain-Computer Interfaces (BCI). Their common feature is to process the brain's electrical activity for extracting information that can be used to command an external device, as for example, a wheelchair to provide them some mobility.

One of the most important limitations of these brain controlled wheelchair is to guarantee that a person can, through his mental activity, safely control the variety of navigation commands that provide control of the wheelchair: advance, turn, move back, and stop. The vast majority of the mobile robot navigation applications that are controlled via a BCI demand that the user performs as many different mental tasks as there are different control commands, worsening the classification accuracy. In order to enable an effective and autonomous wheelchair navigation with a BCI system without worsening user performance, the Brain–Computer Interface (BCI) group of the University of Málaga (UMA-BCI) proposed and later developed a new paradigm based on the discrimination of only two classes (one active mental task versus any other mental activity), which enabled the selection of four commands: move forwards, turn right, move backward and turn left. The final aim of this contribution is to show how to control a robotic wheelchair through the use of only two mental tasks. The mapping of these two mental tasks into several navigation commands allows the Brain-Controlled Wheelchair to be moved and turned in order to achieve effective navigation.

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Biography

Dr. Ricardo Ron Angevin received the Engineer of Telecommunication and Ph.D. degrees from the University de Málaga, Spain, in 1994 and 2005, respectively. In 1995, he joined the Escuela Técnica Superior de Ingenieros de Telecomunicación de Málaga, where he is an Associate Professor with the Electronic Technology Department, and he is a member of DIANA research group. He is the Manager and the Coordinator of the Andalusian regional project BRAINS (P07-TIC03310; 2018-2012) and the Spanish National projects INCADI (TEC2011-26395; 2012-2015) and LICOM (DPI2015- 67064-R; 2016-2018). His research interests include the design of Brain-Computer Interfaces and virtual reality.