Title: Controlling robotic mechanism through brainwaves by using an open hardware platform

Karagiannis Nikolaos

ABSTRACT

Human brain is a multifunctional organ, important for the entire function of body. It is responsible for controlling the emotions and the movements, it stores and processes information and stimuli received from the external environment, as well as messages from other organs, through a vast and complex network of billions of neurons. It is the decision-making center concerning with the behavior of the individual and the vital function of other organs of the body.

For many different reasons, however, human brain disabilities can result either in total or partial inability to control the operation of the remaining structures of the body and the movement of the individual through his/hers nervous system.

The increased use of new technologies in the field of neuroscience, has led scientists to develop systems that can help people with reduced mobility, to deal with various problems arising from any possible disability of the nervous system. These systems are known as Brain Computer Interface (B.C.I) and make use of brain signals to control various devices (e.g wheelchair), robots and computer systems, bypassing the disabled part of nervous system.

The aim of this thesis is to develop a real-time B.C.I system, which controls a robotic vehicle using brain signals, based on an open hardware robotic platform and specifically the Arduino.

The reception of user's brain signal is made by using Neurosky's Mindwave Mobile. The data transfer from Mindwave Mobile to Arduino is being made wirelessly using Bluetooth protocol. Thereafter, we export all the values of the useful features of brain through the procession unit. Specifically, there is exportation of the values of the levels of attention and concentration, of brain rhythms and raw data. By filtering raw data, there is the detection of eye blinking and the recognition whether it is a simple or a double eye blink. If the eye blinking is simple, a chassis, which is controlled by Arduino, moves forward and if it is double, the chassis moves backward. Simultaneously, an ultrasound sensor, checks the distance of the chassis from a possible obstacle during the forward motion and when it becomes equal to or less than 20cm chassis stops moving.

SUBJECT AREA: Brain Computer Interface

KEYWORDS: BCI, Arduino, Mindwave Mobile, Robotics, EEG