Expoziția Internațională Specializată
INFOINVENT 2023

CONTRIBUTIONS REGARDING THE USE OF NEURAL HEADSET FOR ARTIFICIAL ARM CONTROL

PhD.Student Sebastian Daniel ROȘCA
PhD.Habil.Professor Monica LEBA

UPET-6/2021

ABSTRACT

The BCI based on neural interface headset is able to reproduce conscious thoughts of the user using electroencephalography principle to convert brain signals into binary code to be understood by the computer or by a microcontroller with real-time operating system. Due to BCI training it can be created a database with all mental patterns of each user resulted from each mental command imagined in part, that corresponds to a certain revolute motion of kinematic joint of an 3D printed robotic upper limb prosthetics used for medical purpose or in manipulation of dangerous substance.

KEYWORDS

Brain-computer interface
Arm prosthesis
Brain signals

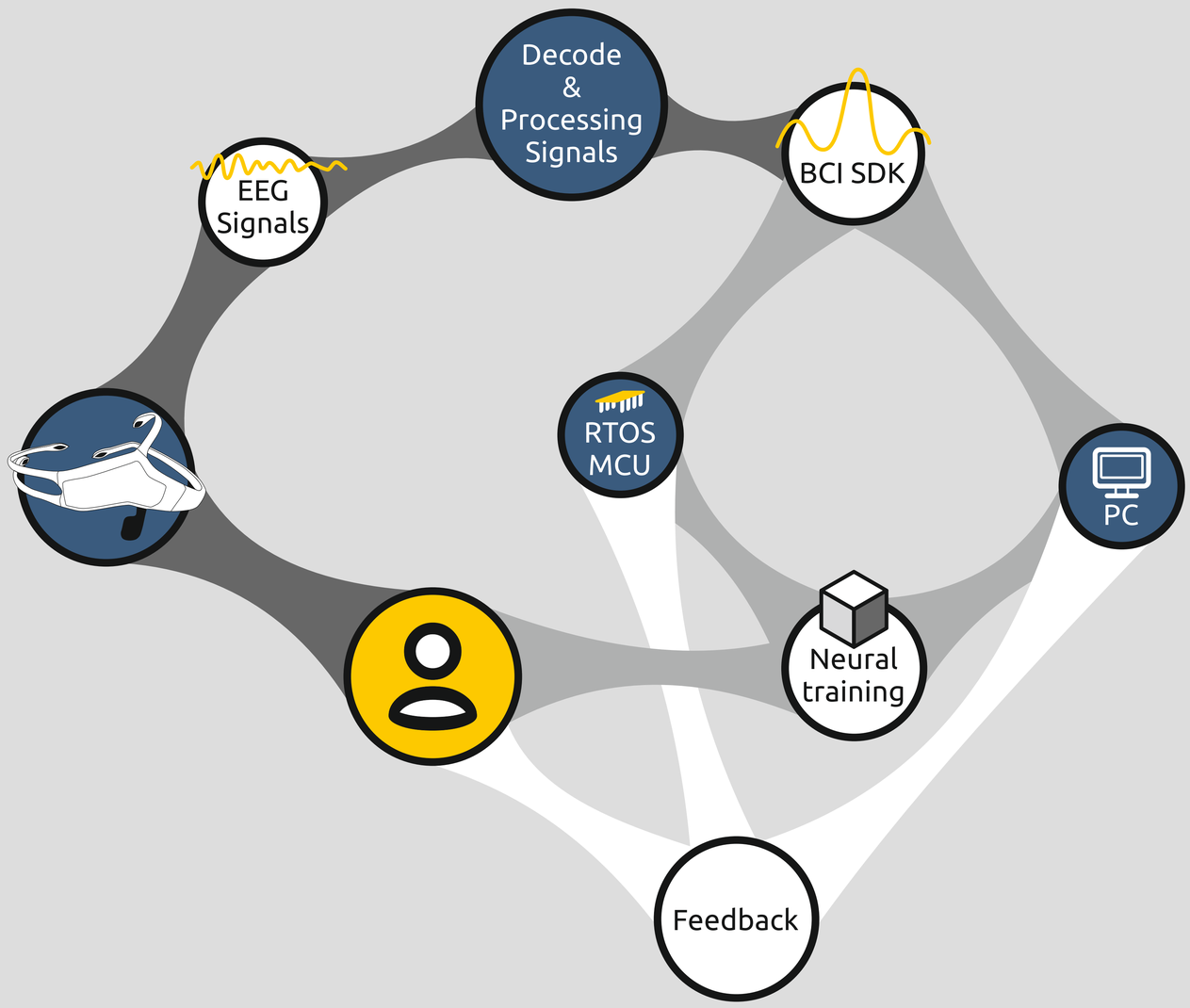
CONTACT

Monica Leba
Universitatea din Petroșani
monicaleba@yahoo.com
0736-980.865
www.upet.ro

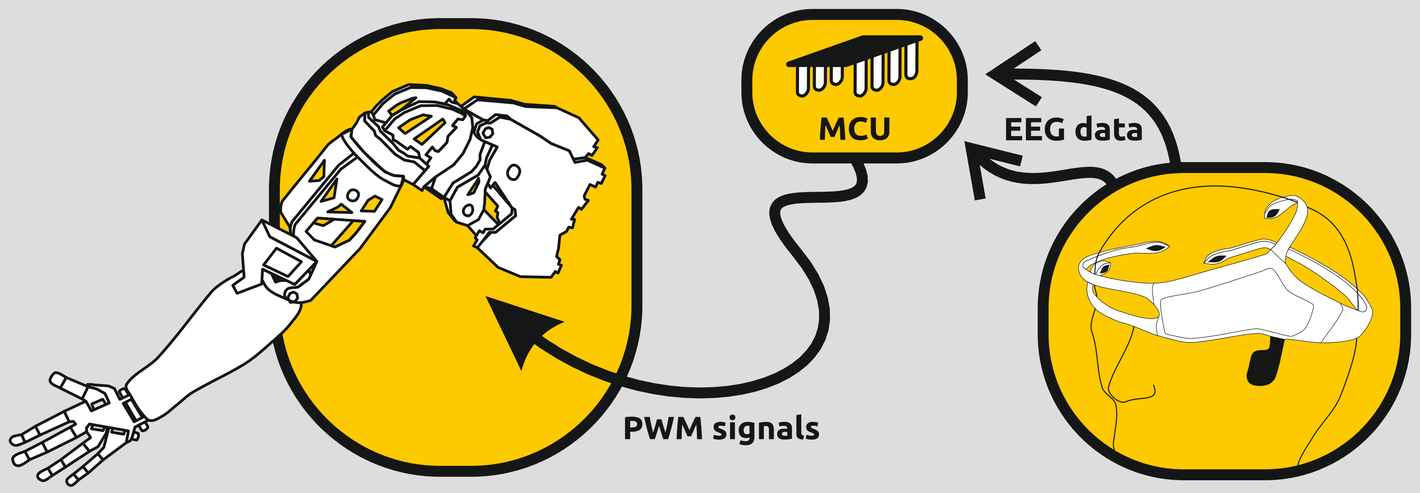
INTRODUCTION

The BCI interface uses the principle of electroencephalography to reproduce the conscious thoughts of a user, in binary code, to control a robotic prosthesis. The brain computer-interface represents a novelty technology with a major impact factor in civil, medical and military applications. In medical field, especially in activities that imply rehabilitation of patients with neurological disease such as stroke or in case of amputation of upper limb, this technology is able to provide users a high level of comfort, safety and freedom based on the unique way of control of medical devices by replacing physical control with direct brain control.

The functional block diagram of the electroencephalogram signal acquisition and processing system is shown in the figure below:



Using the brain-computer interface a mapped database is created with all the trained mental models. Each intentional reproduction of these acts as a motion trigger for a preset sequence that is transmitted via a wireless connection by the neural headset through the BCI interface to actuate each kinematic coupling of revolution of the prosthesis based on the system presented below:



RESULTS

Through brain-computer interface (BCI) a user can control complex movements of a prosthesis learning up to four classes of mental tasks through a BCI training session in an average time of 30 minutes. The proposed solution also offers a high degree of data security because the actuation of the prosthesis involves the analysis of brain models that are unique to each patient.