МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
ХАРКІВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ
РАДІОЕЛЕКТРОНІКИ

МАТЕРІАЛИ 25-го МІЖНАРОДНОГО МОЛОДІЖНОГО ФОРУМУ

«РАДІОЕЛЕКТРОНІКА ТА МОЛОДЬ У XXI СТОЛІТТІ»

20-22 квітня 2021 р.

Том 1

КОНФЕРЕНЦІЯ «ЕЛЕКТРОННА, ЛАЗЕРНА ТА БІОТЕХНІЧНА ІНЖЕНЕРІЯ»

Харків 2021

УДК 621.38+621.373.8+573.6](06)

25-й Міжнародний молодіжний форум «Радіоелектроніка та молодь у XXI столітті». Зб. матеріалів форуму. Т. 1. – Харків: ХНУРЕ. 2021. – 192 с.

В збірник включені матеріали 25-го Міжнародного молодіжного форуму «Радіоелектроніка та молодь у XXI столітті».

Видання підготовлено факультетом електронної та біомедичної інженерії Харківського національного університету радіоелектроніки

61166 Україна, Харків, просп. Науки, 14
тел./факс: (057) 7021397

E-mail: mref21@nure.ua

EEG-BASED BRAIN CONTROL INTERFACES WITH MOBILE ROBOT

Abdrabou Mohamed Hawari, Elsaka Khalid Mamdouh
Scientific supervisor –Assistant of BME Dep. Kravchuk O.
Kharkiv National University of Radio Electronics, BME Department,
14, Nauka Ave, Kharkov, Tel (057)-702-13-64
E-mail: mokhamed.abdrabu@nure.ua

This paper describes the development of a brainwave-controlled wheelchair.

Robots have been not only widely used in industry but also gradually entering into human life. It can provide a support for disabled people in daily and professional life; however, these special interfaces do not work for some severely disabled people with illnesses such as amyotrophic lateral sclerosis (ALS), multiple sclerosis (MS), or strokes. Disabled people want to be in charge of their motion as much as possible even if they have lost most of their voluntary muscle control.

Brain-computer interfaces (BCIs) were developed to address this challenge. BCIs are systems that can bypass conventional channels of communication (i.e., muscles and speech) to provide direct communication and control between the human brain [1].

The main objective of this project is to construct a wheelchair, directly it can be controlled by the brain without requires for any physical feedback as controlling input from the user. The method using (BCI) which enables direct communication between the brain and the electrical wheelchair. The best method for recording the brain's activity is the electroencephalogram (EEG). EEG signal is also known as brainwaves signal

Modifying the electrical wheelchair is required for this project. The electronic circuits include the microcontroller and motor driver. The connections of the electronic boards are connected.

The whole BCI system consists of several devices with using special headsets to laptop or PC with Windows operating system and electrical wheelchair with a microcontroller (Fig 1) [3].

BCI is a direct communication between the brain and a device that enables signals from the brain to direct some external activity from the brain that captured and transmitted to control the external device, which in this case is the electrical wheelchair as shown in (Fig 2) [2].

a) b)

Figure 1. – a) The proposed cloud model [1] and b) Block Diagram of Brainwave Controlled [2]

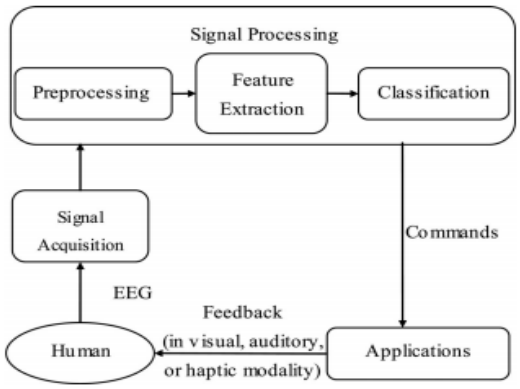

Figure 2. – Schematic of the main BCI components [1]

Conclusion. To summarize, the main idea of this project is to construct an electrical wheelchair that can be directly controlled by the brain of the user. using device that is used for capturing the EEG signal is the special headset with transmit it via Bluetooth to PC (software), the EEG signals are processed and converted into mental commands. This project is contributes a new and effective solution for the physically disabled people or the patients who suffered from neuromuscular disorder to regain their mobility [1-3].

References

1. Electroencephalography [electronicresourse] accessmode:(PDF) EEG-Based Brain-Controlled Mobile Robots: A Survey (researchgate.net). 10.12.2021 y. – Title from the monitor.

2. Половенко К. Г. Масштабный анализ электроэнцефалограмм на основе вейвлет-преобразований с базисной функцией Добеши / К. Г. Половенко // Прикладная радиоэлектроника : науч.-техн. журн. – Х. : ХНУРЭ, 2011. – Т. 10, № 1 – С. 15–21.

3. Половенко К. Г. Применение метода вейвлет-анализа для определения аномальных участков на электроэнцефалограмме человека / К. Г. Половенко // Бионика интеллекта : науч.-техн. журн. – Х. : Изд-во ХНУРЭ, 2010. – Вып. 3 (74). – С. 105–108.