BCI SMART WHEELCHAIR USING SSVEP

Research, Innovation & Creativity Exhibition

ABSTRACT

Brain computer interface (BCI) system empowers command over external device by retrieving brain waves and making an interpretation of them into machine instructions. The process involves three stages; initiating with data acquisition followed by signal processing lastly wheelchair control framework. The EEG signals are obtained using SSVEP technique from the scalp and post-processing to the signals are performed. There is a total of 4 signals (12Hz, 13Hz, 14Hz and 15Hz) are used to control the movement of wheelchair in four directions (forward, backward, turn right and left). The wheelchair is finally controlled with the commands deciphered from the data acquired by bio-electrodes. The outcomes approved the proficiency of our BCI framework to control different bearings of wheelchair.

PROBLEM STATEMENT

1. Paralyzed Patients required an assistant to move from one place to another place.
2. Conventional wheelchairs available in the market required the effort of patients himself to move the wheelchair manually or through control via joystick.

OBJECTIVES

1. To **develop a smart wheelchair with** BCI – based control system using Bluetooth communication module.
2. To capture the EEG data as the control signal for the movement of BCI wheelchair using **SSVEP technique.**

IMPACT TO SOCIETY

The investigation and prototype development would enlighten the **government and industrial to promote BCI** based assistive devices that will cater the society for making life better and easy in spite of varied disabilities.

CONCLUSION

1. **A smart wheelchair with BCI – based** control system using Bluetooth communication module has been successfully fabricated.
2. Four frequencies have been identified for the four movement of direction which include **forward, backward, turn left and turn right** using SSVEP technique.

GRANT

Industrial grant (MINDMATICS - UTM)
R.J130000.7651.4C584
BCI-actuated Smart Wheelchair System
Contract Research DTD

REFERENCES

[1] Eduardo Quiles, Javier Dadone, Nayibe Chio and Emilio García. (2022). Cross-Platform Implementation of an SSVEP-Based BCI for the. *Sensors*, 1-23.

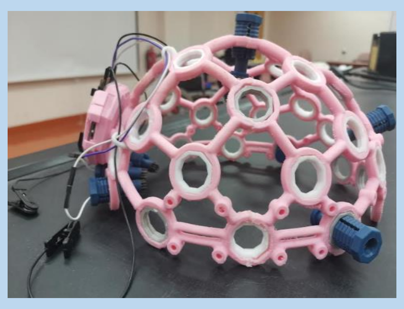
[2] Surej Mouli, Ramaswamy Palaniappan, Emmanuel Molef and Ian McLoughlin. (2020). In-Ear Electrode EEG for Practical SSVEP BCI. *Technologies 2020*, 1-12.

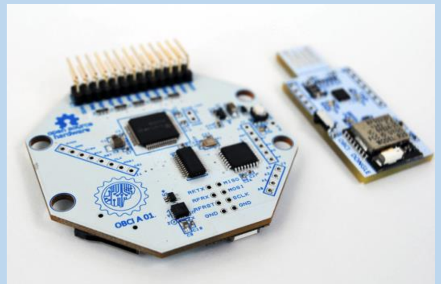
METHODOLOGY

Hardware

Module 1


Dry EEG Comb Electrode

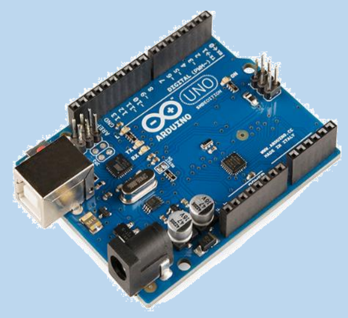

Ultracortex Mark IV EEG Headset

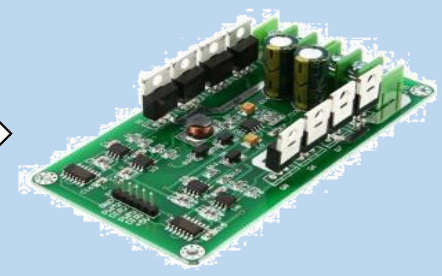

Cyton (OpenBCI board)


Laptop / Tablet

Module 2

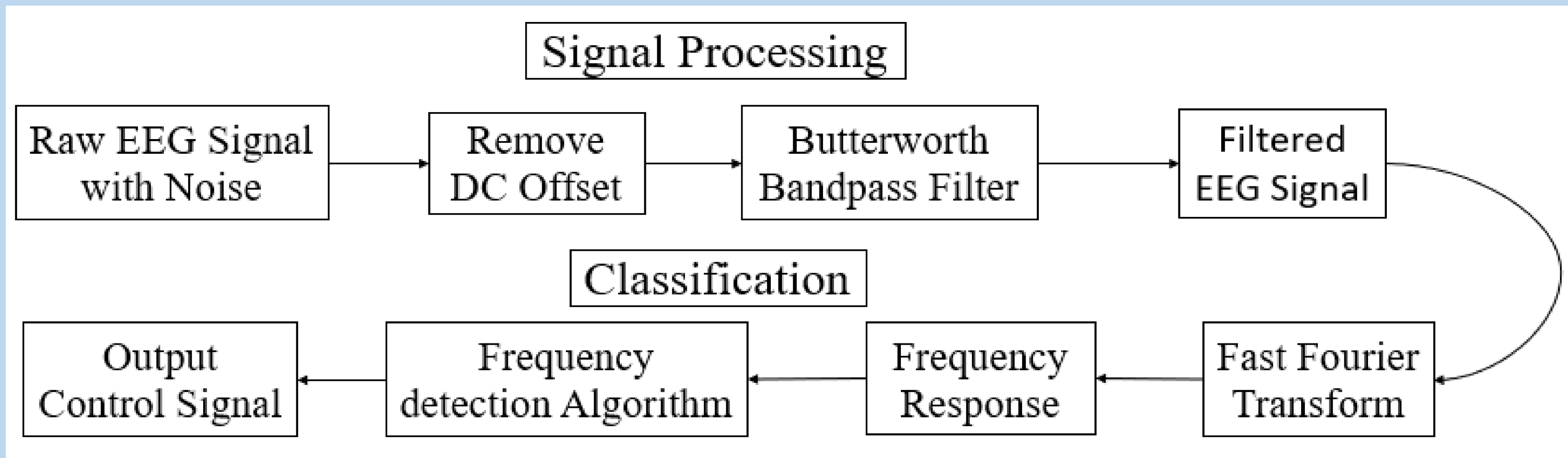

HC-05 Bluetooth Module


Arduino Uno


Motor Driver


Wheelchair

Software



RESULT AND DISCUSSION

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