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Hybrid BCI Using Multimodal EEG

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ABSTRACT

This paper describes a brain computer interface (BCI) for robot application. Moving something without touching. It has always something attractive for every person, speech recognition & head movement is being the common methods. In recent technology consider imagination of people. The main thing has to control peripheral by brain activities. Electrical activity of brain is magic. A BCI system works by extracting user brain signals, applying machine learning algorithm to classify the users brain state &performing a computer controlled action. BCI systems do not require muscular movements but only brain activities; it can be used by severely disabled people. Current EEG-based brain-computer interface technologies is based on SSVEP .SSVEP is used for to control the robot to move forward, turn left, and turn right.

Keywords: Brain computer interface (BCI), Steady State Visual Evoked Potential(SSVEP), Electroencephalogram (EEG).

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I. INTRODUCTION

BRAIN computer interface (BCI) recognize signals of human brain and then transfer them into control commands for robots, computers, or machines. Since BCI systems do not require muscular movements but only brain activities. can be used by severely disabled people (e.g., blind or physically handicap person) to improve their daily lives. Current BCI technologies are mainly classified into invasive BCI and noninvasive BCI . Invasive BCI measures the activity of by extracting EEG signals and brain wave[1]. EEG (Electroencephalogram) measures EEG signals by electrodes placed on the surface of the scalp without surgery. EEG is method of measuring and recording neuro signals using electrodes placed on the scalp. EEG becoming increasingly important of brain activity and they have great potential for the diagnosis and treatment of mental and brain diseases and abnormalities.

II. LITERATURE SURVEY

A brain–computer interface (BCI), sometimes called a mind-machine interface (MMI), is a direct communication pathway between the brain and an external device. BCIs are often directed at or sensory-motor functions. Research on BCIs began at the University of California, Los Angeles under a grant from the National Science Foundation. The papers published after this research also mark the first appearance of the expression brain–computer interface in scientific literature. The field of BCI development and research has since focused primarily on neuroprosthetics applications that aim at restoring damaged hearing, movement and sight[3]. In 1924 Berger was the first to record human brain activity by means of EEG. In 1890,Polish Physiologist Adolf Beck published an investigation of spontaneous electrical activity of the brain of rabbits and dogs. In 1912 Ukrainian published first animal EEG and evoked potential. In 1911-1999 professor of biophysics at Northwestern University developed prototype of EEG.

III. METHODOLOGY

This project model aims to design a BCI system to control a service robot. An EEG amplifier is used to detect the EEG signals. EEG signals are sent to the pattern recognition module, and alpha rhythms are used as a switch to change the control command from SSVEP to motor imagery. Three SSVEP signals are responsible for the mobility task, namely, move forward, turn left, and turn right. One feet motor imagery signal is in charge of the manipulation task.

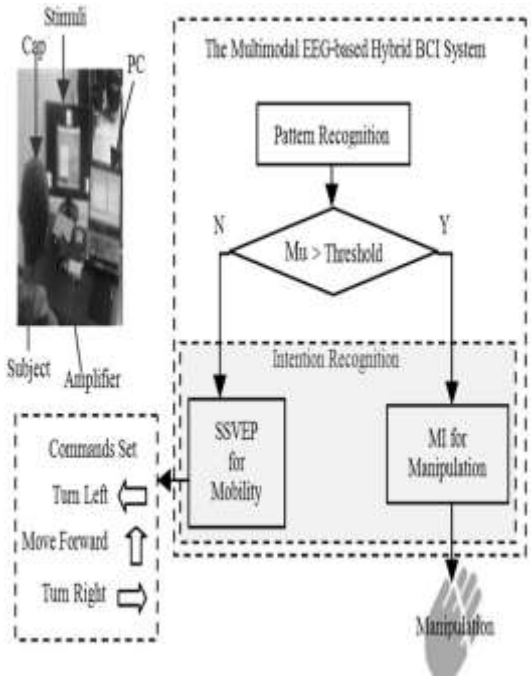

Fig. 1: Block diagram of the Hybrid BCI using multimodal EEG

This multimodal EEG-based hybrid BCI system needs to record SSVEP signals, motor imagery, and μ rhythm simultaneously. Hence, a amplifier was used to acquire the EEG signals in four standard locations (C3, C4, Cz, and O).

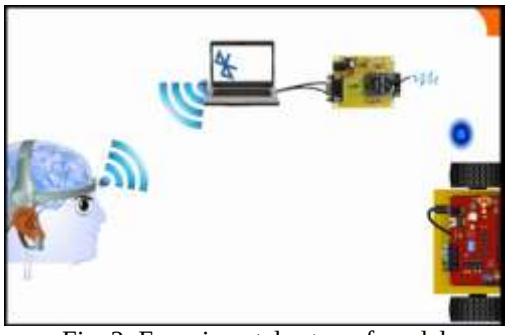

Fig. 2: Experimental setup of model

IV. RESULT

Multimodal EEG signals are utilized in this work, which used for moving robot for application. The developed hybrid BCI system is used to execute mobility task.

V. CONCLUSION

Hybrid BCI system is implemented for robotic application. By using eye blinking and Extraction of EEG signals entire system is implemented. Through incorporating the advantages of previous BCI systems, the multimodal EEG-based hybrid BCI system is proposed in this work. Considering the characteristics of evoked and the spontaneous EEG signals, this hybrid BCI system utilizes SSVEP signals.

REFERENCES

[1] Dario Assante and Claudio Fornaro "Involving graduating engineers in applying a commercial brain-computer interface to motorized wheelchair driving" 2015 IEEE Global Engineering Education Conference (EDUCON).

[2] Feng Duan, Dongxue Lin, Wenyu Li, and Zhao Zhang "Design of a MultimodalEEG-based Hybrid BCI System with Visual Servo Module" IEEE Transactions on Autonomous Mental Development,1943-0604 (c) 2015 IEEE.

[3] B.E. Swartz, E.S. Goldensohn, "Timeline of the history of EEG and associated fields," Electroencephalography and clinical Neurophysiology, vol. 106, No 2, pp. 173–176, 1998.

[4] L.F. Haas, H. Berger, "Richard Caton , "Journal of Neurology, Neurosurgery & Psychiatry" , Vol. 74, No 1, 2009.

[5] N. Birbaumer, "Just short of telepathy: can you interact with the outside world if you can't even blink an eye?", Psychology Today, May–June 2003.

[6] T.Karvinen, K.Karvinen, "Make a Mind-Controlled Arduino Robot", O'Reilly, 2011.

[7] M.Kurz, W.Almer, F.Landolt, "Brain Computer Interface", 2006.

[8] K.Crowley, A.Sliney, I.Pitt, D.Murphy, "Evaluating a Brain-Computer Interface to Categorise Human Emotional Response", IEEE 10th International Conference on Advanced Learning Technologies (ICALT), pp. 276-278, 5-7 July 2010.

[9] M.A.Garito, " Universities in Dialogue in a World without Distance", in Education Lanscapes in the 21st Century: Cross-cultural Challenges, 2010.

[10] D Assante, R Sepe, "An international cooperation experience between the International Telematic University Uninettuno and the Helwan University: the double degree in ICT Engineeing", Global Engineering Education Conference (EDUCON), pp. 1011-1017, 2011.

[11] J. Naumann, "Search for Paradise: a Patient's Account of the Artificial Vision Experiment", Xlibris Corporation, 2012.

[12] K. Guðmundsdóttir, "Improving Players Control Over The Neuro Sky Brain Computer-Interface", Research report, School of Computer Science, 2011.

[13]http://www.google.com

