DEVELOPMENT OF A BCI-BASED SYSTEM FOR LOCKED-IN SYNDROME SUFFERERS USING A MUSE BRAIN SENSING HEADBAND

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

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ABSTRACT

DEVELOPMENT OF A BCI-BASED SYSTEM FOR LOCKED-IN SYNDROME SUFFERERS USING A MUSE BRAIN SENSING HEADBAND

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The purpose of this thesis work is to exploit Muse brain sensing headband to develop a BCI-based system particularly for Locked-In Syndrome patients. The headband is connected to a computer via Bluetooth connection and its data is transmitted through UDP socket. The BCI-based system is in the form of user interface application equipped with a computer cursor which is controlled by the headband. Several features are established in the system and are chosen based on the needs of the patients. The system is controlled by utilizing the EOG signal and accelerometer data from the headband, as well as EMG signal for the cursor clicking action.At first, the desired cursor control mechanism is by using thought words EEG signal which are pre-processed through a low pass filter, but it cannot be applied because of the headband's electrodes location which does not correspond to the correct brain segment. The cursor control accuracy result using both control mechanisms, when overall system is run, are 70% at the worst and 100% at the best for the eye control mechanism and 80% at the worst and 100% at the best for the head control mechanism, yet, these results are based not on LIS patients, it is based on healthy individuals.

Keywords: Locked-in syndrome, Muse headband, BCI, EEG, EMG, EOG, user interface.

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DEDICATION

I dedicate this thesis to God,

My parents and my sister,

My lecturers, especially to Dr. Rusman Rusyadi, B.Eng., M.Sc.,

All of my friends,

And all BCI researchers and developers around the world.

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