システム情報工学研究科修士論文概要

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専 攻	知能機能システム 専攻	著者氏名	Alexsandr Igorevitch Ianov

指導教員氏名　山海 嘉之

論文題目

Development of a Portable High Resolution EEG Monitoring System
(携帯型高解像度EEG計測システムに関する研究)

論文概要

Recording brain activity is becoming an important step when evaluating and optimizing neuro-rehabilitation methods and providing communication and assistance methods for fully disabled patients. For such uses full-time brain monitoring is ideal. However, current brain monitoring technologies lack portability, spatial resolution, responsiveness and versatility. In this paper we propose a small scale portable prototype for high resolution EEG monitoring that covers the entire scalp. The prototype is composed of 112 monitoring channel electrodes and 7 reference electrodes. The electrodes are connected together in a flexible grid. The electrode elastic grid is fixed in a shape adjustable, link based mechanical headgear. Four experiment to test the capabilities of the prototype were performed.

The first experiment consisted of monitoring the frontal lobe when applying visual stimulus using a lamp. When the lamp was on weak alpha waves were detected. The second experiment consisted of monitoring the frontal lobe when doing a strobe experiment. During the experiment strong beta waves were detected. The third experiment consisted of monitoring the entire motor cortex while moving the right hand. On full relaxation mode strong mu-rhythm signals were detected. While moving the right hand mu-rhythm signals above the left motor cortex area, responsible for controlling the right hand, were weakened. The fourth experiment consisted of monitoring the visual cortex when applying visual stimulus using a flickering screen with varying frequencies. Brain waves above the visual cortex matched the flickering frequency.

All the experiment results matched known brain activity phenomena demonstrating basic monitoring capabilities of the prototype. In future research we plan to use this device to develop brain machine interface applications for fully-disabled patients and patients in rehabilitation.

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審査員	(大学名 職名)	(学位)	(氏名)
主査	筑波大学 システム情報工学研究科	工学博士	山海 嘉之
副査	筑波大学 システム情報工学研究科	博士(工学)	葛岡 英明
副査	筑波大学 システム情報工学研究科	Ph.D. Mechanical Engineering	堀 憲之