

***Abstract: Electroencephalogram (EEG) Based Brain-Computer Interface: Invariant Spatio-Spectral Feature Extraction Algorithm***

Hohyun Cho, Minkyu Ahn, Sung Chan Jun\*  
*School of Information and Communications, Gwangju Institute of Science and Technology,  
Gwangju, South Korea  
scjun@gist.ac.kr*

**Abstract**

To achieve an efficient brain-computer interface (BCI), various feature extraction methods have been developed. Among them, the common spatial pattern (CSP) method and its variants have been used. It has been reported that the common spatio-spectral pattern (CSSP) method incorporating simple spectral information performs better than CSP. However, like CSP, CSSP is less robust to the non-stationarity of EEG. This motivates us to propose invariant CSSP by adding a noise suppression term to the Rayleigh coefficient of CSSP. We evaluated the classification performance of this invariant CSSP through a comparative test with the empirical data of 52 subjects. To investigate how our proposed method is invariant to noise (eye blinking) and works during real-time processing, we performed two simulation studies on 10 representative subjects whose data have exact discriminative features. The proposed method — invariant CSSP — outperformed the CSP, iCSP, and CSSP algorithms.

**Acknowledgement**

This work was supported by an NRF grant (NRF-2010-0006135) and the PLSI supercomputing resources of KISTI.