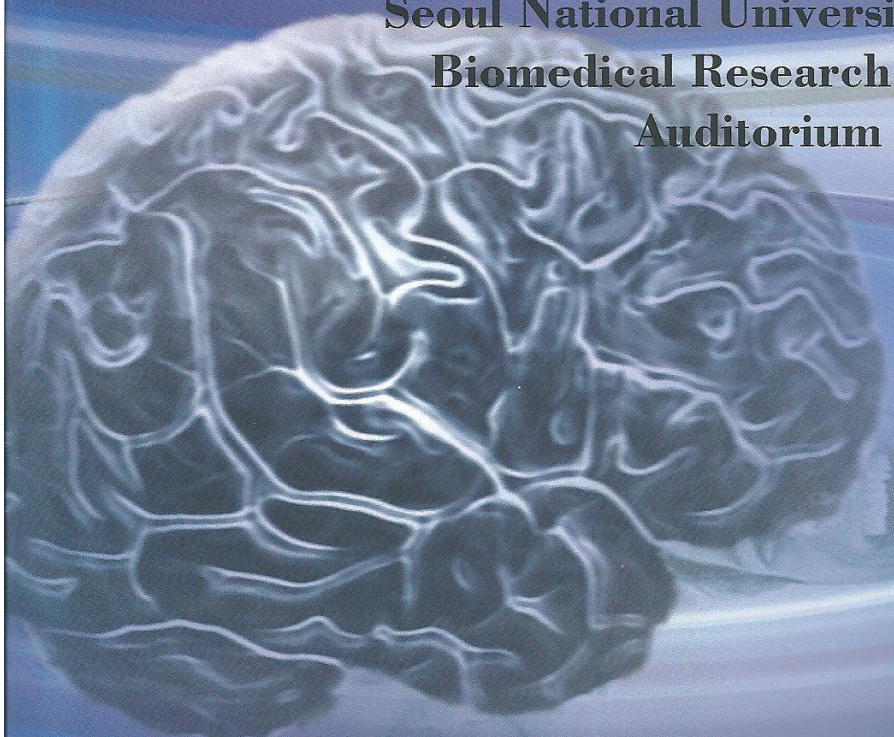
The 5th Annual Meeting of Korean Society for Computational Neuroscience

Main Theme: Emotion

Program and Abstracts

August 28, 2013
Seoul National University Hospital
Biomedical Research Institute
Auditorium



Korean Society for Computational Neuroscience
Sponsored by Asia Pacific Center for Theoretical Physics (APCTP)

[Program]

Opening	
09:00 – 10:00	Registration
10:00 – 10:10	Opening Remarks
Focused Session on Emotion I	Chair: Sung-Phil Kim (Korea Univ.)
10:10 - 11:00	June-Seek Choi (Korea Univ) Computational approaches to fear-induced defensive response selection
11:00 - 11:10	Coffee Break
Focused Session on Emotion II	Chair: Jee Hyun Choi (KIST)
11:10 - 11:40	Sang Hee Kim (Korea Univ.) Cognitive control of emotion
11:40 - 12:10	Minho Lee (Kyungpook Natl. Univ.) Incremental emotion understanding in a movie clip
Lunch / Poster Session (12:10 - 14:30)	
General Session I	Chair: Hyungtae Kook (Gachon Univ.)
14:30 - 15:20	Se-Bum Paik (KAIST) On the Origin of Functional Maps in Visual Cortex
15:20 - 15:35	Woochang Lim (Daegu Natl. Univ. of Education) Effect of Small-World Connectivity on Sparsely Synchronized Cortical Rhythms
15:35 - 15:50	Won Sup Kim (Chungbuk Natl. Univ.) Resting state dynamics of human brain from the resting state EEG
15:50 - 16:10	Coffee Break
General Session II	Chair: Kiwoon Kwon (Dongguk Univ.)
16:10 - 17:00	Moo K. Chung (Univ. of Wisconsin) Large scale multimodal brain network construction in abused children
17:00 - 17:30	Jeehyun Kwag (Korea Univ.) Inhibitory neural network-dependent modulation of neural codes
17:30 - 17:45	Dongmyeong Lee (KIST) Noise-induced anti-correlated slow fluctuations in networks of neural populations
17:45 - 18:00	Kiwoon Kwon (Dongkuk Univ.) Numerical Methods for Diffuse Optical Tomography
Society Meeting (18:00 - 18:30)	

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Effect of Small-World Connectivity on Sparsely Synchronized Cortical Rhythms

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Fast cortical rhythms with stochastic and intermittent neural discharges have been observed in electric recordings of brain activity. For these sparsely synchronized oscillations, individual neurons fire spikings irregularly and sparsely as Geiger counters, in contrast to fully synchronized oscillations where individual neurons exhibit regular firings like clocks. We first consider random networks of fast spiking Izhikevich interneurons, and study emergence of the fully and the sparsely synchronized states in the parameter plane of the synaptic inhibition strength and the noise intensity. Fast sparsely synchronized states of relatively high degree are found to appear when both inhibition and noise are sufficiently strong. However, random networks are non-economic ones because appearance of short-range and long-range connections are equally probable. To solve the network economy problem, we investigate the effect of small-world synaptic connectivity on emergence of sparsely synchronized cortical rhythms by varying the probability p of rewiring from short-range to long-range connection in the Watts-Strogatz small-world network which interpolates the regular lattice (p=0) and the random graph (p=1). When passing a small threshold p_{th}, sparsely synchronized population rhythms are found to emerge in small world networks with predominantly local connections and rare long-range connections. With further increase in p, the degree of population synchrony becomes higher, while the axon ``wire length" of the network increases. At an optimal value p_{op}, there is a trade-off between the population synchronization and the wiring economy, and hence an optimal cortical rhythms showing sparse synchronization is found to occur at a minimal wiring cost in an economic small world network.

Key words: Sparsely-Synchronized Cortical Rhythm, Small-World Connectivity