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회보

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후원

Kos 한국물리학회
The Korean Physics Society
FG-01 [13:00-13:15]
Heat transistor behavior of harmonic chain / Kim Tae-Kyung

FG-02 [13:15-13:30]
Total Cost of Operating an Information Engine / Uim Jong-In, HINRICHSEN Haye1, KWON Chul-am1, PARK Hyung-yu1,2,3,4, IAS, University of Waterloo, 1,2,3,4

FG-03* [11:30-11:45]
Optimal Tuning of Information Engine via Harmonic Potential / PAK, Jong-Min, LEE Jae Sung1, NOH Jae Dong1, Department of Physics, University of Seoul, 1
School of Physics, Korea Institute for Advanced Study, 2

FG-04 [11:45-12:00]
Voter model on a coevolving network / YI Su Do, BAEK Seung Ki, KIM Beom Jun1, Department of Physics, Pukyong National University, 1Department of Physics, Sungkyunkwan University, 2Department of Physics, Pukyong National University.

FG-05 [12:00-12:15]
Bursty dynamics and its effect on spreading / JooByungye8(POSTECH, Pukyong National University)

FG-06* [14:15-14:30]
Various transition natures in heterogeneous core contact process / CHONG Won, KIM Tae-Hyung

FG-07 [15:00-15:15]
Anomalous Diffusion of Single-molecules in Living Cells: at the Interface of Biology and Statistical Physics / Jeong-Hwan Yi (School of Physics, Korea Institute for Advanced Science)

FG-08 [15:30-15:45]
Chemo taxis and haptotaxing random walkers having directional persistence / Yoo Seong, Kang Tae-Gyu, Kang Min-Ho, Pukyong National University

FG-09 [15:45-16:00]
Matchmaker, Matchmaker, Make Me a Match: Migration of Populations via Marriages in the Past / LEE Sang Hoon1, HANCON Robyn1, ABRAMS Daniel2, LIM Bum Jun3, PORTER Mason4, Department of Energy Science, Sungkyunkwan University. 1Department of Physics, University of Gothenburg. 2Department of Engineering Sciences and Applied Mathematics, Northwestern University. 3Department of Physics, Sungkyunkwan University. 4Mathematical Institute, University of Oxford.

FG-10 [16:00-16:15]
Traveling-wave solution of evolutionary dynamics in a one-dimensional trait space / LEE Mi Jin, KIM Beom Jun, BAEK Seung Ki1, Department of Physics, Sungkyunkwan University. 1Department of Physics, Pukyong National University.

FG-11 [16:15-16:30]
Preferential game engagement based on the reputation in prisoners’ dilemma game / Bae Yihun, Jeong Yee, Sim Hee Jin, ChungEun University, 2National University of Seoul, 2Sungkyunkwan University (Sungkyunkwan University 1Department of Physics, Pukyong National University.

FG-12 [09:00-09:15]
Transformation of microtubules into inverted tubulin tubules triggered by a tubulin conformation switch / Hwang Se-Hun (KAIST)

FG-13 [09:15-09:30]
Global and Modular Sparse Synchronization in Small-World Clustered Networks of Inhibitory Fast Spiking Inhibitory Interneurons / UIM Woongchul, KIM Sang-Yoon1,2,3,4, Davu National University of Education. 1Department of Science Education, 2Computational Neuroscience Lab.
Effect of Inter-Modular Connection on Fast Sparse Synchronization in Clustered Small-World Neural Networks

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Abstract

We consider a clustered network with small-world sub-networks of inhibitory fast spiking Izhikevich interneurons, and investigate the effect of inter-modular connection on emergence of fast sparsely synchronized rhythms by varying both the inter-modular coupling strength $J_{\text{inter}}$ and the average number of inter-modular links per interneuron $M_{\text{syn}}^{(\text{inter})}$. In contrast to the case of non-modular networks, two kinds of sparsely synchronized states such as modular and global synchronization are found. For the case of modular sparse synchronization the population behavior reveals the clustering structure, because the intra-modular dynamics of sub-networks make some mismatching. On the other hand, in the case of global sparse synchronization, the population behavior is globally identical, independently of the cluster structure, because intra-modular dynamics of sub-networks make perfect matching. We use a realistic cross-correlation modularity measure, representing the matching-degree between the instantaneous sub-population spike rates of the sub-networks, and examine whether the sparse synchronization is global or modular. Depending on its magnitude, the inter-modular coupling strength $J_{\text{inter}}$ seems to play “dual” roles for the pacing between spikes in each sub-network. For large $J_{\text{inter}}$, due to strong inhibition it plays a destructive role to “spoil” the pacing between sparse spikes, while for small $J_{\text{inter}}$ it plays a constructive role to “favor” the pacing between spikes. Through competition between the constructive and destructive roles of $J_{\text{inter}}$, there exists an intermediate optimal $J_{\text{inter}}$ at which the pacing degree between spikes becomes maximal. In contrast, the average number of inter-modular links per interneuron $M_{\text{syn}}^{(\text{inter})}$ seems to play a role just to “favor” global communication between sub-networks. With increasing $M_{\text{syn}}^{(\text{inter})}$, the degree of effectiveness of global communication increases monotonically. Furthermore, we employ the realistic whole- and sub-population order parameters, based on the instantaneous whole- and sub-population spike rates, to determine the threshold values for the synchronization-unsynchronization transition in the whole- and sub-populations, and the degrees of the global and modular synchronization are also measured in terms of the realistic statistical-mechanical whole- and sub-population spiking measures defined by considering both the occupation and the pacing degrees of the spikes. It is expected that our results have important implications for the role of the brain plasticity which refers to the brain’s ability to change its structure and function by modifying the strength or efficacy of synaptic transmission.