



- 2022.10 제40권 제2호
- Bulletin of the Korean Physical Society
- 한국물리학회 회보

2022년 창립 70주년 기념 가을학술논문발표회 및 제98회 정기총회

KPS 70th Anniversary and 2022 Fall Meeting

일시 : 10월 18일(화) ~ 21일(금)

장소 : 부산 BEXCO

[C10-st] Complex Systems I

2022. 10. 20 Thursday 09:00~10:48

Room: 110

좌장 : 김범준 성균관대학교

Chair: KIM Beom-Jun (Sungkyunkwan University)

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C10.01 (초) [09:00 - 09:24]

High order network analysis on academic trajectories of faculty / LEE Eun^{*1},
SPOON Katie² (¹Scientific Computing, Pukyong National University, ²Computer Science, University of Colorado at Boulder, USA)

C10.02 (초) [09:24 - 09:48]

Hypergraph modeling and its applications on real-world / YI Sudo^{*1}, **LEE Deok-Sun**¹ (¹School of Computational Sciences, KIAS)

C10.03 [09:48 - 10:00]

Machine learning approach for percolation: global information / OH Soo Min^{1,2}, **CHOI Kwangjong**², **KAHNG Byungnam**^{*2,3} (¹Laboratory for Information & Decision Systems, MIT, USA, ²Center for Theoretical Physics, Seoul National University, ³Department of energy engineering, KENTECH)

C10.04 [10:00 - 10:12]

Scale-dependent landscape of semi-nested community structures of 3D chromosome contact networks / **BERNENKO Dolores**¹, LEE Sang Hoon^{*2}, **STENBERG Per**³, **LIZANA Ludvig**¹ (¹Department of Physics, Umeå University, Sweden, ²Department of Physics, Gyeongsang National University, ³EMG, Umeå University, Sweden)

C10.05 [10:12 - 10:24]

Firing Activities of The Single Cells in The Basal Ganglia Controlling Motor Movement / **KIM Sang-Yoon**¹, LIM Woochang^{*1} (¹Daegu National University of Education)

C10.06 [10:24 - 10:36]

Scaling and variation of the wealth distribution in the generalized exchange process / LEE Hyun Gyu¹, **LEE Deok-Sun**^{*1} (¹Computational Sciences, KIAS)

C10.07 [10:36 - 10:48]

The anatomy of Kakaobank financial networks / KYEONG Sunghyon^{*1} (¹Bigdata Analytics, Kakaobank Corp.)

Firing Activities of The Single Cells in The Basal Ganglia Controlling Motor Movement

KIM Sang-Yoon ¹, LIM Woochang, ^{“1}

¹Daegu National University Of Education

wclim@icn.re.kr

Abstract:

The basal ganglia (BG) are group of subcortical nuclei located at the base of the forebrain. One of their main functions is control of voluntary motor movement. The striatum (which is the largest component) is the primary input to the BG, receiving sensorimotor information from the cerebral cortex. Spiny projection neurons (SPNs) with D1 and D2 dopamine (DA) receptors constitute a major population of primary inhibitory striatal neurons. The globus pallidus internal segment (GPi) / substantia nigra pars reticulata (SNr) is the output nucleus of the BG, projecting its inhibitory output to the thalamus. Voluntary motor movement is made via balance between the direct and the indirect pathways from the striatum to the GPi/SNr: direct pathway (D1 SPNs → GPi/SNr) and indirect pathway (D2 SPNs → GPe → STN (subthalamic nucleus) → GPi/SNr). The DA from the substantia nigra pars compacta (SNC) modulates the D1 and D2 SPNs differently; it excites the D1 SPNs (facilitating the direct pathway), while it inhibits the D2 SPNs (suppressing the indirect pathway). For construction of our spiking neural network for the BG, we first study firing activities of the single cells in the Izhikevich neuron models for the DA-modulated D1 and D2 SPNs (input cells), the GPi/SNr (output) cells, and the intermediate GPe and STN cells (related to the indirect pathway).

Keywords:

Motor movement, Basal ganglia, Firing activity, Izhikevich neuron model