

The 6th International Conference on Cognitive Neurodynamics (ICCN2017)

PROGRAM & ABSTRACT BOOK



Edited by
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POSTER SESSIONS (1-6)

Posters will be displayed during the whole Meeting at the Salon Puerta de Sevilla. Please, hang your poster at the indicated number. Poster presenters should be available at the indicated time for the six poster sessions.

P1. *An electrophysiological approach to the study of the claustrum: Recording claustral neurons in alert behaving rabbits.* M. Mar Reus-García*, A. Gruart, J.M. Delgado-García.

P2. *Structure and dynamics of self-organized neuronal network with an improved STDP rule.* Rong Wang, Ying Wu, Mengmeng Du, Jiajia Li.

P3. *A pseudo-neuron device and firing dynamics of their networks similar to neural synchronizing phenomena between far distant field in brain.* T. Yano, Y. Goto, T. Nagaya, I. Tsuda, S. Nara.

P4. *Effect of spike-timing-dependent plasticity on stochastic spike synchronization in an excitatory neuronal population.* Sang-Yoon Kim, Woochang Lim.

P5. *Study of dynamic mechanism for rhythmic transition of glial-neuronal network.* Mengmeng Du, Ying Wu*.

P6. *Changes in phase synchronization of EEG during development of symbolic communication systems.* M. Fujiwara, T. Hashimoto, G. Li, J. Okuda, T. Konno, K. Samejima, J. Morita.

P7. *Ratbutton: a user-friendly touchscreen presentation software.* C. Andreu-Sánchez*, M. A. Martín-Pascual, A. Gruart, J.M. Delgado-García.

P8. *Differences in perceiving narratives through screens or reality.* M.A. Martín-Pascual*, C. Andreu-Sánchez, J. M. Delgado-García, A. Gruart.

P9. *Behavioural and brain activity modulation through neurofeedback training using electroencephalography.* T. Kimura, J. Okuda.

P10. *Complexity of heart rate as a value of behavioral complexity.* A.V. Bakhchina*.

P11. *Changes in brain activity during instrumental behaviour after additional learning in rats.* Vladimir Gavrilov.

P12. *Cortical and subcortical activities for food and social interactions with rats.* F. Rocha-Almeida*, A.R. Conde-Moro, J.M. Delgado-García, A. Gruart.

P13. *Role of inhibitory control processes in decision-making procedures.* J. A. García-Moreno*, C. Andreu-Sánchez, M. Á. Martín-Pascual, J. M. Delgado-García, A. Gruart.

P14. *Spectral power and maturational frequency-coupling differences between attention deficit and controls children and adolescents.* Elena I. Rodríguez-Martínez, Brenda Y. Angulo-Ruiz, Antonio Arjona-Valladares, Francisco J. Ruiz-Martínez, Jaime Gómez-González, Carlos M. Gómez*.

P15. *Behavioral working memory development in attention deficit children and adolescents. Classification by linear discrimination analysis.* Elena I. Rodríguez-Martínez*, Antonio Arjona-Valladares, Francisco J. Ruiz-Martínez, Manuel Morales, Jaime Gómez-González, Carlos M. Gómez.

EFFECT OF SPIKE-TIMING-DEPENDENT PLASTICITY ON STOCHASTIC SPIKE SYNCHRONIZATION IN AN EXCITATORY NEURONAL POPULATION

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Abstract: We consider an excitatory population of subthreshold Izhikevich neurons which exhibit noise-induced spikings. This neuronal population has adaptive dynamic synaptic weights governed by the spike-timing-dependent plasticity (STDP); the synaptic weights vary via a Hebbian plasticity rule depending on the relative time difference between the pre- and the post-synaptic spike times. In the absence of STDP, stochastic spike synchronization (SSS) between noise-induced spikings of subthreshold neurons was previously found to occur over a large range of intermediate noise intensities through competition between the constructive and the destructive roles of noise. Here, we investigate the effect of additive STDP on the SSS for various values of the rewiring probability p in the Watts-Strogatz small-world neuronal network which interpolates between the regular lattice with high clustering ($p=0$) and the random graph with short average path length ($p=1$) via random uniform rewiring. A "Matthew effect" in synaptic plasticity is found to occur due to a positive feedback process. Good synchronization gets better via long-term potentiation (LTP) of synaptic weights, while bad synchronization gets worse via long-term depression (LTD). As a result, a step-like rapid transition to SSS occurs by varying the noise intensity, in contrast to the relatively smooth transition in the absence of STDP. Furthermore, a "plateau" of SSS with nearly same degree is formed within the range of the SSS. Emergence of LTP and LTD of synaptic weights are investigated in details through microscopic studies based on both the distributions of time delays between spike times of the pre- and the post-synaptic neurons and the pair-correlations between the pre- and the post-synaptic IISRs (instantaneous individual spike rates). Finally, a multiplicative STDP case depending on the synaptic weights is also studied and compared with the above additive STDP case (independent of the synaptic strengths).