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· Special Topic · Characteristics, Dynamics and Control in Neuronal Disease Systems
• Preface •

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Clinical medicine and experiments have shown that electrophysiological activities on neuronal disease systems such as the epilepsy and Parkinson can exhibit the evolutions of complex dynamical behaviors and their transitions, which are closely related to the generation mechanism of neuronal diseases. Traditionally, electrophysiological activities have been analyzed from the statistical methods. Although some ideal results have been obtained, mechanisms of complex electrophysiological activities in neuronal systems cannot yet be disclosed. Dynamics modelling can help researchers to explore the mechanisms of electrophysiological activities of neuronal disease systems. By constructing reasonable physiological dynamical model, inner relation between the dynamics model and representation behaviors of the neuronal disease systems can be further studied. In addition, based on the constructed network model, we can also explore mechanisms of the evolutions of dynamical behaviors and their transitions of the initiation, propagation and termination of different kinds of the seizures. Finally, we can design the feasible control method to regulate dynamics behaviors of the seizures so as to realize the healthy neuronal firings.

To better understand nonlinear behaviors of the clinical representation on neuronal disease systems, in this special issue, a new FFR model is introduced to effectively distinguish FFREnv from FFRTFS by both combining the advantages of the two existing FFR models and simultaneously adding cellular properties of IC neurons; Based on the mean field model, seizures dynamics and the coordinated reset control of cortical-thalamic circuit are studied; Seizure dynamics in partial epilepsy is explored when stochastic noise is added; In modified GABAergic astrocyte model, results show that the GABAergic astrocyte can obstacle the antiepileptic process. We hope those typical results of this issue can pave the new way for a more comprehensive understanding of neurodynamics modelling and computational neuroscience.

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