

Advancement on the theory of spike frequency modulation in Neuro-Informatics:

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Abstract

Neuroinformatics is a trans-disciplinary field that studies the neurological models and neural representations of internal information in the brain by Neuro-computing methodologies and denotational mathematics. It investigates neural information transmission, processing, memorization, retrieval, fusion and their engineering applications in cognitive systems, brain-inspired systems, cognitive computing and computational intelligence. There were different perceptions on whether neural signals of human nerves systems are digital (discrete) or analogue (continuous). The latest neural signaling theory known as Spike Frequency Modulation (SFM) explains that the mathematical model of neural signal transformations is unified in the form of SFM as digital signals, which is supported by both experimental data and empirical observations in neurology, neurophysiology and brain science. The SFM theory provides a formal explanation of the time-divided signaling mechanism for internal information transformation and the space-divided signaling pathways for semantics representations in the central/peripheral neural systems. It reveals the neurological foundation of higher level cognitive processes of the brain such as those of sensing, perception, action, knowledge expression, thinking, learning, problem solving and decision making. It is recognized that although the external detections of neural signals in brain-machine interfaces are analogue, they are merely a demodulation (DS-FM) of internal spike signals as an effect of the integration of the discrete time series or the sum of a set of Fourier components in the time domain.

Received: June 15, 2022; **Accepted:** June 23, 2022; **Published:** June 30, 2022

Biography

Yingxu Wang is Professor of Cognitive Informatics, Brain Science and Denotational Mathematics. He is President of International Institute of Cognitive Informatics and Cognitive Computing (IIC). He has held Visiting Professor

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