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Cognitive neuroscience and the spike frequency modulation (SFM) theory for neural signaling systems

Although signaling mechanisms of the nerves systems have been intensively studied at the neurologic level, there is a lack of a mathematical model at the higher level in order to explain the aggregated essence of neural signaling theory in cognitive neuroscience and neuroinformatics. It was recently discovered in the author's lab that all neural signals such as those of the association, sensory and motor neurons, in both the central and peripheral nerves systems (CNS/PNS), can be unified by a neural signaling theory known as spike frequency modulation (SFM). SFM is a rigorous mathematical model for unifying neural signal transformation supported by experimental data and empirical observations in neurology. The SFM theory provides a formal explanation on neural information representation, transmission, processing, memorization and retrieval based on both the time-divided signaling system and the space-divided CNS and PNS pathways. It reveals a fundamental neurological mechanism for enabling high-level cognitive processes of the brain such as those of sensing, perception, action, knowledge expression, thinking, problem solving and decision making.

Biography

Yingxu Wang is a Professor of cognitive informatics, brain science, and denotational mathematics and President of International Institute of Cognitive Informatics and Cognitive Computing. He is a Fellow of ICIC, Fellow of WIF (UK), PEng of Canada, and Senior Member of IEEE and ACM. He has been Visiting Professor at Oxford, Stanford, UC Berkeley and MIT. He received a PhD in Computer Science from the Nottingham Trent University in 1998 and has been a Full Professor since 1994. He is the Founder of IEEE International Conference series on Cognitive Informatics & Cognitive Computing since 2002. He has published 430+ peer reviewed papers and 30 books. He has presented 32 invited keynote speeches in international conferences. He is the recipient of dozens of international awards. He is a top 2.5% scholar worldwide according to Research Gate.

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