IEICE Proceeding Series

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Vol. 2 pp. 348-348
Publication Date: 2014/03/18
Online ISSN: 2188-5079

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Abstract—Transmission and processing of information are crucial to realize robust cellular functions[1]. In cellular decision-making, for example, a cell has to obtain information on the current state of environment by using its stochastic sensing systems such as receptors[2]. Efficient Information flow enables a cell to respond faithfully to the environmental change, which, in turn, leads to increase of fitness advantage[3]. It is easily expected that biochemical networks with specific structures may have higher efficiency in information flow than others.

In this work, I demonstrate that inference theory and information theory can be employed to theoretically predict the network structures and dynamic properties relevant for efficiency of information flow[4, 5]. From this result, I show that efficient information flow in terms of statistics is linked to pure-noise-induced signal amplification that is different from noise-induced signal enhancement in stochastic resonance[6]. The relation between biochemical information processing and information flow will be also discussed.

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