



Engineered Biomimicry

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Engineered Biomimicry: Chapter 2. Noise Exploitation and Adaptation in Neuromorphic Sensors



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Despite the fact that current micro-nano fabrication technology has reached integration levels at which ultra-sensitive sensors could be fabricated, the sensing performance (bits per Joule) of synthetic systems remain orders of magnitude inferior to those seen in neurobiology. Even though several biological marvels have offered as inspirations for different types of neuromorphic sensors, the main focus of the designs has gone to faithfully replicate the biological features, without considering the constructive part of noise. For example, the filiform locks in crickets operates at fundamental limits of noise and energy efficiency. In manmade sensors, gadget and sensor sound are typically considered nuisances, whereas in neurobiology noise has been shown to be a computational aid that enables sensing and procedure at fundamental limitations of energy efficiency and functionality. learning. Our focus is normally on two types of noise exploitation principles, specifically, (a) stochastic resonance and (b) noise shaping, which are unified within a framework known as ?? In this chapter, we describe a few of the important sound exploitation and adaptation principles observed in neurobiology and how they could be systematically used for designing neuromorphic sensors. As a case study, we describe the application of ? Another example may be the auditory sensor in the parasitoid fly *Ormia ochracea* that can precisely localize ultra-faint acoustic signatures regardless of the underlying physical limitations. learning for the design of a miniature acoustic source localizer, the performance of which matches that of its biological counterpart (*O. ochracea*).



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