

Noise down, neuron signals up

August 15 2012

Biomedical engineer Muhammet Uzuntarla from Bulent Ecevit University, Turkey, and his colleagues present a biologically accurate model of the underlying noise which is present in the nervous system. The article is about to be published in *European Physical Journal B*. This work has implications for explaining how noise, modulated by unreliable synaptic transmission, induces a delay in the response of neurons to external stimuli as part of the neurons coding mechanism.

Neurons communicate by means of electrical pulses, called spikes, exchanged via synapses. The time it takes for [brain cells](#) to first respond to an external stimulus with an [electric signal](#)—commonly referred to as first-spike latency—is of particular interest for scientists. It is thought to carry much more neural information than subsequent serial spike signals.

The authors analysed the presence of noise in the nervous system detected through changes in first-spike latency. The noise is due to the synaptic bombardment of each neuron by a large number of incoming excitatory and inhibitory spike inputs. Previous attempts at noise modeling used a generic bell-shaped signal, referred to as a Gaussian approximation. Now, Uzuntarla and his colleagues have devised a noise model that is closer to the biological reality.

They showed there is a relation between the noise and delays in spike signal transmission. The latter is caused by unreliable synapses that do not always transmit the signal, because their chemical-based signalling does not always work. Yet, the authors also demonstrated that synaptic unreliability can be controlled.

To do so, they identified two factors that could be tuned influencing the noise, namely the incoming excitatory and inhibitory input signalling regime and the coupling strength between inhibitory and excitatory [synapses](#). Ultimately, the authors concluded, modulating these factors could help [neurons](#) encode information more accurately.

More information: M. Uzuntarla et al. (2012). Controlling the First-Spike Latency Response of a Single Neuron via Unreliable Synaptic Transmission, *European Physical Journal B*; [DOI 10.1140/epjb/e2012-30282-0](#)

Provided by Springer

Citation: Noise down, neuron signals up (2012, August 15) retrieved 25 April 2024 from <https://phys.org/news/2012-08-noise-neuron.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.