

Branching dendrites with resonant membrane: a "sum-over-trips" approach.

Coombes S, Timofeeva Y, Svensson C-M, Lord GJ, Josić K, Cox SJ, Colbert CM (2007) Branching dendrites with resonant membrane: a "sum-over-trips" approach. *Biol Cybern* 97(2), 137-149.

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Abstract

Dendrites form the major components of neurons. They are complex branching structures that receive and process thousands of synaptic inputs from other neurons. It is well known that dendritic morphology plays an important role in the function of dendrites. Another important contribution to the response characteristics of a single neuron comes from the intrinsic resonant properties of dendritic membrane. In this paper we combine the effects of dendritic branching and resonant membrane dynamics by generalising the "sum-over-trips" approach (Abbott *et al.* in *Biol Cybernetics* 66, 49-60 1991). To illustrate how this formalism can shed light on the role of architecture and resonances in determining neuronal output we consider dual recording and reconstruction data from a rat CA1 hippocampal pyramidal cell. Specifically we explore the way in which an Ih current contributes to a voltage overshoot at the soma.

Leibniz-HKI-Autor*innen



Carl-Magnus Svensson

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doi: 10.1007/s00422-007-0161-5

PMID: 17534649