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Modeling a nervous pathway involved in touch-induced behavior

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Many animals actively touch objects in their environment and respond to them by appropriate movement sequences. Jan Ache and Volker Dürr from Bielefeld University in Germany present a model in *PLOS Computational Biology* that captures key properties of a wide variety of descending neurons that are part of an "active touch system".

Goal-directed actions require neurons that descend from the brain to lower parts of the nervous system, for example: to distribute sensory information to local modules of movement control. Stick insects actively explore the near-range environment by means of sweeping feelers, and often respond to contacts of their feelers by directed reaching movements. This requires fast and multi-facetted information to be conveyed from the brain to the legs.

In their model Ache and Dürr propose how the nervous system can encode the movement of a tactile feeler in a small but diverse population of descending neurons. Their model is validated against the coding properties of real neurons by means of their location in what the authors call the "coding space". This coding space allows the description of a more complex set of response properties by two dimensions only. The immediate comparison of real and modeled neurons within the coding space allows both the systematic investigation of the model and the tuning of particular model variants as found in the real animal.

This is a first approach towards modeling an entire descending pathway that comprises very diverse neuron types within a single, common

computational framework.

More information: Ache JM, Dürr V (2015) A Computational Model of a Descending Mechanosensory Pathway Involved in Active Tactile Sensing. *PLoS Comput Biol* 11(7): e1004263. DOI: 10.1371/journal.pcbi.1004263