Neuroinformatics in Invertebrate: Neuromodeling of insect sensory motor system

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Understanding the brain mechanisms controlling animal behavior in natural environment is one of the principal aims in neuroethology. As one approach directed towards this goal is to rebuild neural systems by modeling and simulation, we are working on the reconstruction and simulation of neuronal circuits in the silkworm moth brain and to reveal the design principles of the brain by focusing on this simple model system. We are examining to integrate their morphological profiles with a standard brain based on whole brain and single neuron data in our database, BoND (Kazawa et al., 2008) and IVB-PF (Ikeno et al., 2008). As a first step of our study, we are constructing a detailed standard brain map, focusing on whole brain shape and key regions, such as the antennal lobe (AL), the lateral accessory lobe (LAL) and the central body (CB) (Haupt et al., 2010). Neuronal morphologies in the brain are reconstructed from confocal images and registered on the map. We will provide a simulation environment of neurons and networks based on their morphological properties. The strength of synaptic connections between neurons is estimated by measuring the overlap volume of the arborizations of neuritis.