Title: Characterization of the planarian surface electroencephalogram

Authors:

Julian Keil

Lukas Lang

Jannes Freiberg

Christian Kaernbach

Abstract:

Comparative cognitive science currently strives to examine peak performance in different species. To successfully reproduce biological intelligence in artificial intelligence, it might more constructive to examine the cognitive functions of lower animals. A first step into this direction is the characterization of the ongoing electrophysiological activity. This will then allow testing activity patterns related to stimulus processing and cognition, as well as the reproduction of these patterns in artificial neural networks.

Here, we examine the neural activity of the flatworm *Schmidtea mediterranea*, whose nervous system is organized in quantitative dimensions which could be artificially reproduced right now or in the near future. Planarians have successfully survived for 800 million years, and they are the closest living relatives to the original bilateralians, the first animals with two distinct hemispheres and a well-defined movement direction. They are the first animals to develop a head with a central hub of the nervous system in the form of cerebral ganglia and thus a direct precursor of our brain.

A previous study (Aoki et al., 2009) used invasive monopole recordings in cooled planarians, and observed ongoing activity between 0.1 and 5 Hz with a power spectrum characterized by a 1/f relationship. We extend this observation by recording ongoing electrophysiological activity from noninvasive surface electrodes at room temperature. This procedure allows continuous recordings across longer intervals, and repeated recordings from the same animals without harming the animals to study changes in neural activity linked to stimulus processing and cognition.

Introduction

Description of the planarian nervous system

Comparative cognitive science currently strives to examine peak performance in different species. To successfully reproduce biological intelligence in artificial intelligence, it might more constructive to examine the cognitive functions of lower animals. A first step into this direction is the characterization of the ongoing electrophysiological activity. This will then allow testing activity patterns related to stimulus processing and cognition, as well as the reproduction of these patterns in artificial neural networks.

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Methods

Results

Discussion