Group 3-8

Space-Time Receptive Field of V1 Neurons

Izumi Ohzawa
Osaka University Graduate School of Frontier Biosciences

Functional micro-organization of primary visual cortex: receptive field analysis of nearby neurons.

DeAngelis GC, Ghose GM, Ohzawa I, Freeman RD

J Neurosci. 1999, 19(10):4046-4064

Representative data from our data archive published in the above study and others have been packaged and deposited in the Visiome Platform. In addition to the raw data, a data analysis application is included in the contributed package. Here we present more detailed analysis of spatio-temporal receptive field of simple cells in V1. Specifically, we examine models of constructing a direction selective simple cells from output of lower stage neurons. Results from these analyses show that the non-cortical input may be necessary to build direction-selective neurons in the cat visual cortex.

Experiments

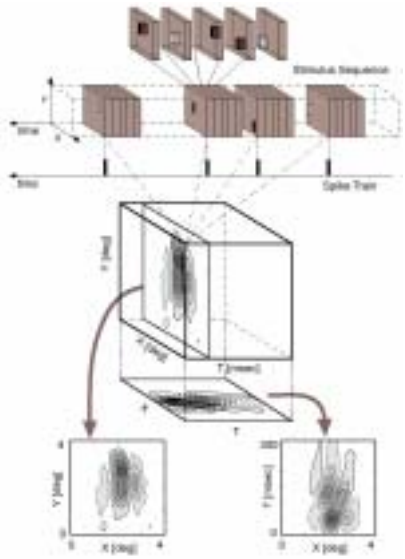


Fig.1: Spatio-temporal receptive field of simple cells are measured using a reverse correlation technique. This procedure obtains an average stimulus profile that led to spike genaration. The averaging the (x, y, t) stimulus cubes preceding all spikes generated, one obtains a spatio-temporal receptive field of a neuron. The resulting 3-dimensional data may be viewed in various cross sections, e.g., in the X-T domain (bottom right).

Raw Data Downloadable

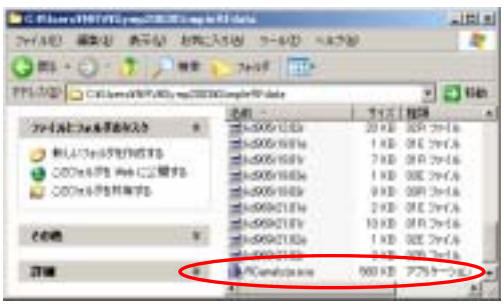
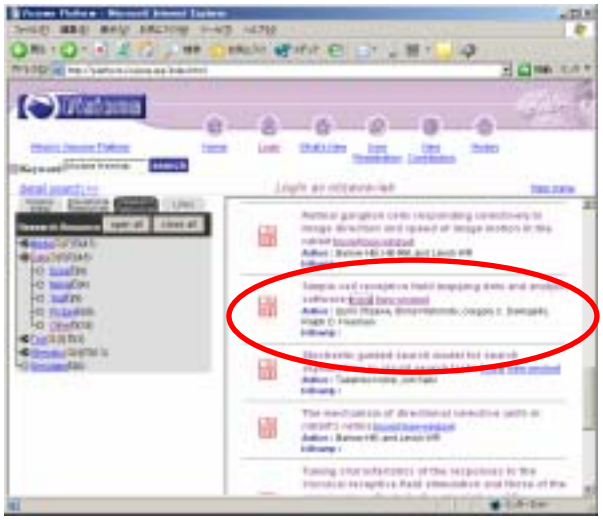


Fig.2: Experimental data containing spike occurrence times and stimulus information files are downloadable as a ZIP file.



Analysis Program Downloadable

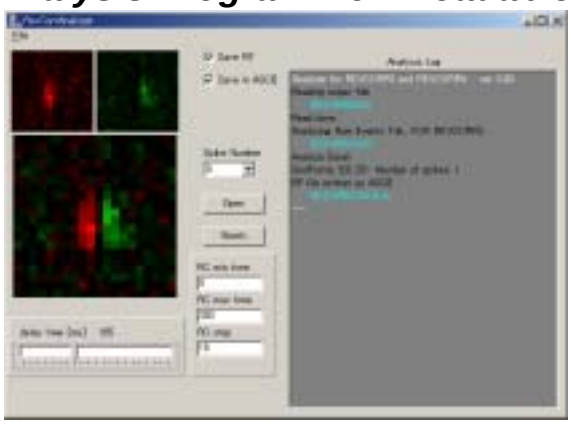


Fig.3: In the data package, show in Fig. 2, there is also an data analysis program for Windows environment for generating 3-dimensional receptive field data in the (x, y, t) domain as illustrated in Fig. 1.

Fig.4: The spatio-temporal receptive field data are written to a file in ASCII format, for use in standardard analysis packages such as Matlab.