

CRCNS.org hc-12 data description

Version 0.7 (Jan 17, 2017)

Extracellular recordings from monkey hippocampus
performing a virtual navigation task

Summary

The dataset is made of 189 cells recorded in the hippocampus from two Rhesus macaques. Recordings were made extracellularly with either single tungsten electrodes or 16 contact u-probes. Activity was recorded as animals were navigating via a joystick a virtual maze projected in stereo, searching for a reward. A file contains the timestamps of the action potentials, the X,Y position and camera orientation in virtual coordinates, the left and right eye X,Y coordinates, and task relevant event codes. The dataset also contains the animal coordinates in the state space graph that was developed to analyze the neural data. Each file corresponds to a recording session of approximately 40 minutes.

We provide a few Matlab scripts and documentation that allow plotting heat maps according to position, camera orientation, state space as well as raster histograms and behavior.

e.g. Results from the experiments are described in:

Gaze-informed, task-situated representation of space in primate hippocampus during virtual navigation, Sylvia Wirth, Pierre Baraduc, Aurélie Planté, Serge Pinède, Jean-René Duhamel (2017). PLoS Biology.

Conditions for using the data

These data required years of effort to collect, and it is the CNRS lab policy that anything published using these data lists as authors the persons who collected the data and the group leader under whose responsibility the data has been collected. Please contact Sylvia Wirth if you would like to discuss this (swirth@isc.cnrs.fr). The data was collected by Sylvia Wirth and Aurélie Planté, under the supervision of Jean-René Duhamel.

The data should be cited as follows:

If you publish any work using the data, please cite the publication above (Gaze-informed, task-situated representation of space in primate hippocampus during virtual navigation, Sylvia Wirth, Pierre Baraduc, Aurélie Planté, Serge Pinède, Jean-René Duhamel (2017). PLoS Biology) and also cite the data set using the following:

Wirth S, Baraduc P, Planté P, Pinède S, Duhamel JR (2017). Extracellular recordings from monkey hippocampus performing a virtual navigation task. CRCNS.org
<http://dx.doi.org/10.6080/K0R49NQV>

Methods

All the methods are fully described in the publication:

Gaze-informed, task-situated representation of space in primate hippocampus during virtual navigation, Sylvia Wirth, Pierre Baraduc, Aurélie Planté, Serge Pinède, Jean-René Duhamel (2017). PLoS Biology.

File organization

We have provided an analysis scripts folder (*scripts.tar.gz*) and a data folder (*data.tar.gz*). Size of the *data.tar.gz* file is about 3.6 GB.

Data folder

In the data folder, each file starting by 'ke' or 'sn' is a matlab object datafile containing the following fields such as in this example

file =

```
elec: [12668x1 double]
right_eye: [1x1 struct]
left_eye: [1x1 struct]
eye_times: [315576x1 double]
newallo: [1x1 struct]
camera_data: [1x1 struct]
relocation: [8 15 6.3000]
```

file.elec: times stamps of the action potentials of the neuron

file.right_eye: horizontal and vertical eye position at a resolution of 250 Hz

file.left_eye: horizontal and vertical eye position at a resolution of 250 Hz

file.eye_times: corresponds to the absolute time for the eye positions

file.newallo.codematrix: a matrix with the codes of the events in the trials. Each row corresponds to a single trial.

file.newallo.timematrix: a matrix with the timestamps of codes of the events in the trials. Each row corresponds to a single trial and corresponds to the events in the codematrix.

file.newallo.learning_curves: the probability of a correct response (middle column), upper and lower bounds (1st and 3rd columns).

file.camera_data:

columns 1-4: timestamp of the each coordinates shown in the other columns, x position, y position, orientation of the camera.

Column 5: curvilinear abscissa along (physical) maze branches (0 = center).

Columns 6 to 8: state-space coordinates (curvilinear abscissa along graph edges, and two polar coordinates).

Columns 9 to 11: next, previous, and actual transition tag in the state space graph.

Column 12: composite variable = maze tag+trial success (1st decimal)+trial number (4th decimal). See script for how to plot the coordinates.

file.relocation: anteroposterior, mediolateral and dorsoventral recording location with respect to interaural line.

Event codes in the field file.newallo.codematrix are set as follows:

40-44: identity of the starting arm, 43 is the rewarded arm.

21: start of the trial

3: joystick move forward

22: arrival at choice point

2: movement to the left

1: movement to the right

50-54: identity of the chosen arm, 53 is the rewarded arm.

11: correct trial reward given

12: error trial

23: end of the trial

Transition tags in state space graph are defined as follows:

10x: entry along branch x

2xy: 36° rotation at the end of branch x to align view to branch y

3xy: 72° rotation from facing branch x to facing branch y

40x: exit along branch x

5xy: return from end of branch x to start of branch y.

Scripts folder

(How to get started)

In the analysis script folder, we have provided a Matlab master script that can be ran on any of the files and that will plot for each cell:

- 1) a position map,
- 2) a head direction map (camera orientation),
- 3) a state space map,
- 4) a raster histogram aligned on the beginning of each trial, and
- 5) the learning curve for the behavior.

This master script function is entitled 'plot_multiple_ref_frames' and should be ran in matlab as follows:

```
plot_multiple_ref_frames('sn20110802_e1_HPC_c2_segcln', 'newallo')
```

given that the path has been set to access the functions in the folder.

The underlying scripts are provided:

- circ_ksdensity.m
- getencodetime.m
- getspikes.m
- interp1deg.m
- plot_multiple_ref_frames.m
- pol2cart.m
- polar_map_sw_r.m
- runningaverage.m
- simple_place_cell_square_script_theta_r.m
- simple_raster_to_check_file.m
- star_remapped_cell_r.m

As the files were collected over a period of 3 years, the structure of the files can vary a bit, but we provided codes to extract all the data from any of the format of the file. This is exemplified in any of the script that is ran by plot_multiple_ref_frames master script. Our script will run on any file of the database.

How to get help

To get help with the data set post any questions on the forum at CRCNS.org