CRCNS.org th-1 data description
Version 0.7 (July 7, 2015)

The data set contains recordings made from multiple anterior thalamic nuclei, mainly the antero-dorsal (AD) nucleus, and subicular areas, mainly the post-subiculum (PoS), in freely moving mice. Thalamic and subicular electrodes yielding high number of the so-called Head-Direction (HD) cells were likely to be located in the AD nucleus and the PoS, respectively. Electrode placement was confirmed by histology.

The data was obtained during 42 recording sessions and includes responses of 720 neurons in the thalamus and 357 neurons in the PoS, in seven animals while they foraged for food in an open environment (53- x 46-cm). Three animals were recorded simultaneously in the thalamus and the PoS (21 sessions). In the four other animals, electrodes were implanted in the anterior thalamus and in the pyramidal layer of the CA1 area of the hippocampus but only to record Local field Potentials (LFPs). The raw (broadband) data was recorded at 20kHz, simultaneously from 64 to 96 channels. The raw data was processed to extract the LFPs and detect spikes.

File format and session info.
Files for each session are stored in separate compressed tar file (tar.gz) using the same format specified for the CRCNS.org hc-2 and hc-3 data sets. (https://crcns.org/files/data/hc2, https://crcns.org/files/data/hc3).
However, there are some differences:
- states.SWS/REM/Wake files are in seconds, not EEG/LFP samples as in hc-3
- We added a ".pos" file which gives Red (X,Y) Blue (X,Y) (four column matrix) in centimeters after smoothing and interpolating the position from the orignial ".whl" file.
- ".ang" files give the orientation of the animal head in radians (in the range [0 2pi]). 0 radian indicates that the animal is heading rightward in the reference frame given in the whl/pos files
In "pos" and "ang" files, -1 values indicate that LED detection failed. If one of the two LEDs was not detected, a position value is still given but not a head orientation (which requires two LEDs).

Information about each session are stored in an xml files in each compressed tar file. These xml files can be loaded into ndmanager (http://neurosuite.sourceforge.net/).
An inventory of what brain regions were recorded from in each session is given in file: crcns_th-1_session_info.xlsx, which is also in the docs directory for the data set.

Raw data
Raw broadband data for some of the sessions is also included in the data set. These are in directories with name having suffix "–raw". (e.g. `Mouse12-120806-raw`, `Mouse12-120809-raw`, `Mouse12-120810-raw`). Within each –raw directory are compressed .dat files containing the raw data, and a tar.gz file with suffix, "-raw-info.tar.gz" which contains."xml", ".whl" files corresponding to the raw data files, and a file (with name having suffix "-behaviors.txt") that lists the corresponding behavior (Sleep or Maze exploration) for each recording file.

The total duration for the concatenated raw recordings is in general SHORTER than the clustered because the raw data does not include some extra recordings that were done for other purposes. But, because spikes are sorted on the concatenated session that includes these extra recordings, they are all contained in the clustered data (data files not in the '-raw' directory. Time 0 of the clustered data is time 0 of the first recording session (filebasename-01.dat). In other words, the extra recodings not included here were ALL done AFTER the last uploaded raw data file

recording. This is important if someone wants to compare spike sorting with those provided in the th-1 dataset.

The following publication is based on this dataset and should be consulted for details of the experiments:

Internally organized mechanisms of the head direction sense. Peyrache A, Lacroix MM, Petersen PC, Buzsaki G, *Nature Neuroscience.* 2015
http://www.nature.com/neuro/journal/vaop/ncurrent/full/nn.3968.html

How to cite the data
If you publish any work using the data, please cite the publication given above and also cite the data set using the following: -

Peyrache, A., Buzsáki, G. (2015). *Extracellular recordings from multi-site silicon probes in the anterior thalamus and subicular formation of freely moving mice.* CRCNS.org. http://dx.doi.org/10.6080/K0G15XS1

How to get started.
Review the spreadsheet to select a session of interest. Scripts which could be useful for working with the data are available with the hc-2 data set. (Available in the downloads at: http://crcns.org/data-sets/hc/hc-2/). The ndmanager program (referenced above) would be useful for viewing and working with the data.

Questions and answers about the data set are available in the FAQ on the CNCRS website (https://crcns.org/forum/using-datasets/826607085)