

Single-units recording in hippocampus in freely moving rats

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Electrophysiology

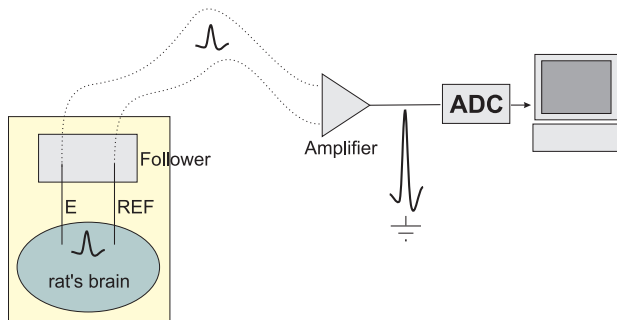
Classical techniques

- ▶ Intracellular electrophysiology
- ▶ Extracellular electrophysiology
 - ▶ Field potentials (EEG, ECoG, ECG, EMG)
 - ▶ Single-unit activity (action potentials of individual neurons)

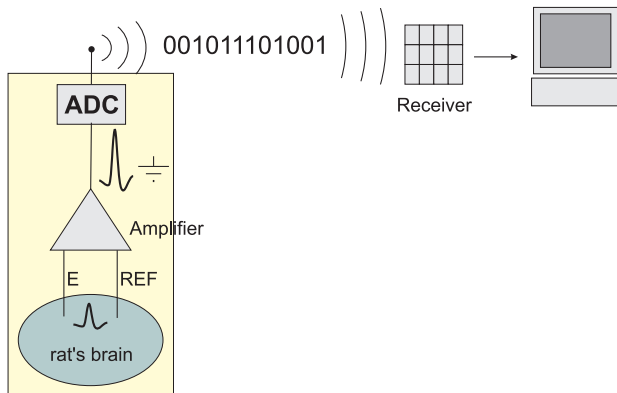
Other techniques

- ▶ Optical
- ▶ Magnetic (MEG)

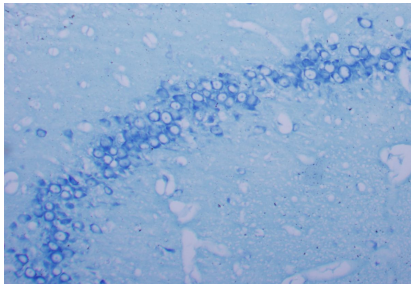
Recording of unit activity



Recording of unit activity – telemetry



How to record activity of neurons whose cell bodies are densely packed



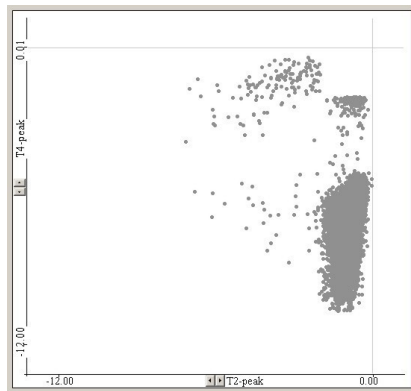
Recording of single-unit activity by means of tetrodes

A tetrode is a bundle of four electrodes.

Signal from all electrodes of a tetrode is recorded simultaneously.

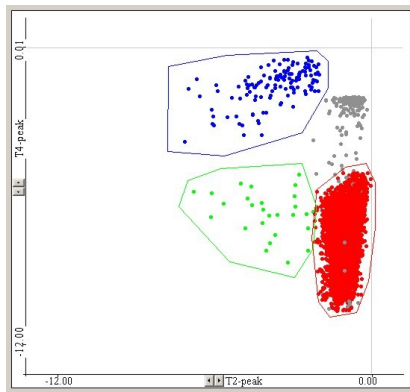
Cluster analysis

Peaks of recorded action potentials from two electrodes plotted against each other

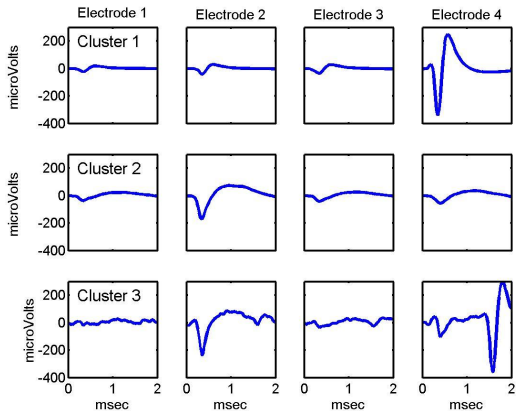
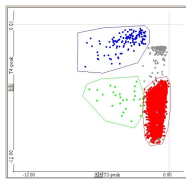


Cluster analysis

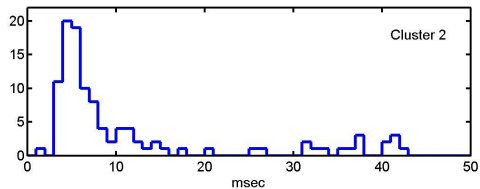
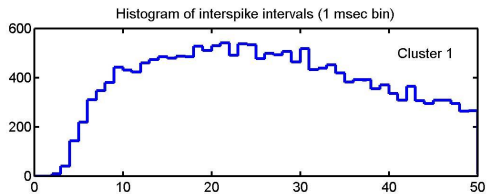
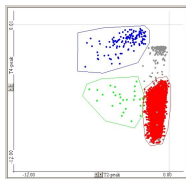
Action potentials were manually grouped into three clusters.



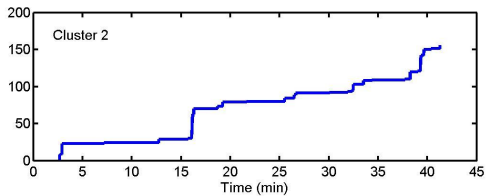
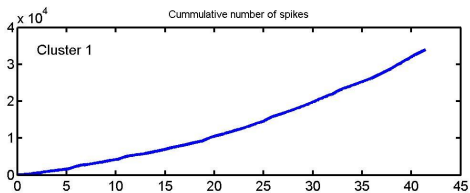
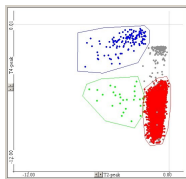
Shapes of the action potentials in the three clusters



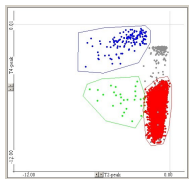
Histograms of inter-spikes intervals



Cummulative spike count



Cell types in hippocampus



- ▶ theta cell
- ▶ complex spike cell

Neural code

Neural coding

- ▶ encoding
- ▶ decoding

Neural code

- ▶ rate coding (firing rate – average over time or over several repetitions of the experiment)
- ▶ temporal coding (time to the 1st spike, firing with respect to an ongoing brain oscillation).

Cluster quality assesment

- ▶ isolation distance
- ▶ L-ratio