

ABSTRACT

In recent years, the advent of the so-called silicon probes has made it possible to homogeneously sample spikes and local field potentials (LFPs) from a regular grid of cortical recording sites. In principle, this allows inferring the laminar location of the sites based on the spatiotemporal pattern of LFPs recorded along the probe, as in the well-known current source-density (CSD) analysis. This approach, however, has several limitations, since it relies on visual identification of landmark features (i.e., current sinks and sources) by human operators – features that can be absent from the CSD pattern if the probe does not span the whole cortical thickness, thus making manual labelling harder. Furthermore, as any manual annotation procedure, the typical CSD-based workflow for laminar identification of recording sites is affected by subjective judgment undermining the consistency and reproducibility of results. To overcome these limitations, we developed an alternative approach, based on finding the optimal match between the LFPs recorded along a probe in a given experiment and a template LFP profile that was computed using 18 recording sessions, in which the depth of the recording sites had been recovered through histology. We show that this method can achieve an accuracy of 79 μm in recovering the cortical depth of recording sites and a 76% accuracy in inferring their laminar location. As such, our approach provides an alternative to CSD that, being fully automated, is less prone to the idiosyncrasies of subjective judgment and works reliably also for recordings spanning a limited cortical stretch.

USAGE NOTES

Source code and data file for the article authored by Matteucci, Riggi and Zoccolan on a new automated method to infer the laminar position of recording sites of a silicon probe on the basis of stimulus-evoked LFP patterns.

These files provide the core code needed to apply the proposed method to a new dataset as well as the original data processed in the article “A template-matching algorithm for laminar identification of cortical recording sites from evoked response potentials” by Giulio Matteucci, Margherita Riggi and Davide Zoccolan. A detailed description of their content is provided in the companion file "Readme_for_Matteucci_et_al_source_code_and_data.pdf".

FILES

- Matteucci_et_al_source_code.7z
- Matteucci_et_al_source_data.7z
- Readme_for_Matteucci_et_al_source_data.pdf

REFERENCES

This dataset is supplement to doi: <https://doi.org/10.1101/749069>

KEYWORDS

LFPs, primary visual cortex, VEPs, cortical layers, extracellular silicon probes