http://www.neuroinformatics2012.org/abstracts/abstract.2012-04-20.8908501672

Projectome: Set up and testing of a High Performance Computational Infrastructure for processing and visualizing neuro-anatomical information obtained using confocal ultra-microscopy techniques

Filed under: Neuroimaging

Ludovico Silvestri (LENS), Alessandro Bria (UCBM), Leonardo Sacconi (LENS), Anna Letizia Allegra Mascaro (LENS), Maria Chiara Pettenati (ICON), Sanzio Bassini (CINECA), Carlo Cavazzoni (CINECA), Giovanni Erbacci (CINECA), Roberta Turra (CINECA), Giuseppe Fiameni (CINECA), Valeria Ruggiero (UNIFE), Paolo Frasconi (DSI - UNIFI), Simone Marinai (DSI - UNIFI), Marco Gori (DiSI - UNISI), Paolo Nesi (DSI - UNIFI), Renato Corradetti (Neuroscience - UNIFI), Giulio Iannello (UCBM), Francesco Saverio Pavone (ICON, LENS)

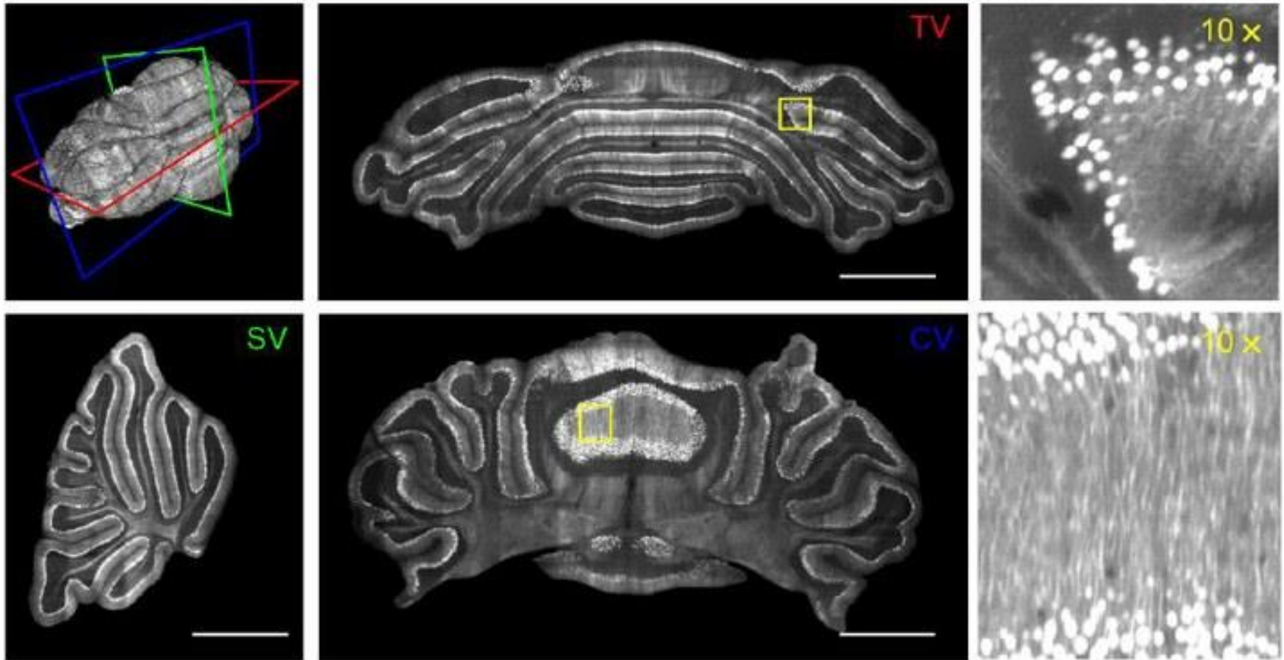
In Projectome we set up an IT infrastructure to share both neuroscience data as well as high performance computational applications. Data handled in Projectome are mouse brain images obtained using conf-u [1], a confocal ultra-microscopy technique in which selectively labeled neurons are imaged by light-sheet based microscopy [2][3] with micron-scale resolution. Data obtained from an experiment conducted on a mouse brain (1 cubic cm) might be of a range of 1 Terabyte, or more. Specific processes have been implemented in a Projectome Tooolkit in order to allow: 1) fully automated 3D Stitching capability starting from acquired raw data and 2) semi-automatic extraction of some morphological characteristics (eg. neurons localization) [1][4].

The implementation plan of the project consists of two phases: phase I, in which the core data management functions are set up and phase II in which the data mining, knowledge extraction and visualization features
are implemented.

Projectome is running the final part of phase I: both raw and processed data as well as elaboration algorithms are made available through a dedicated storage and computational infrastructure operated by CINECA, the largest Italian computing center [5]. Data sets originated from the European Laboratory of Non-linear Spectroscopy LENS [6] are transferred to CINECA using high performance protocol (i.e. GridFTP) and successively stored using iRODS data grid [7]. The setup of a Workflow Management System for the execution of Projectome Toolkit applications is being implemented using UNICORE [8].

[1] Silvestri, Bria, Sacconi, Iannello and Pavone, Confocal ultramicroscopy: micron-scale neuroanatomy of the entire mouse brain (2012). Submitted paper
[2] Dodt et al., Ultramicroscopy: three-dimensional visualization of neuronal networks in the whole mouse brain, Nat Methods (2007)
[3] Keller and Dodt, Light sheet microscopy of living or cleared specimens, Curr Opin Neurobiol (2011) –

REVIEW
[4] Bria, Silvestri, Sacconi, Pavone and Iannello, Stitching Terabyte-sized 3D images acquired in confocal ultramicrocopy, IEEE International Symposium on Biomedical Imaging (ISBI 2012), Barcelona, Spain, 2-5 May, 2012
[5] http://www.cineca.it/en
[6] http://www.lens.unifi.it/
[7] iRODS (Integrated Rule-Oriented Data System) https://www.irods.org/
[8] UNICORE (Uniform Interface to Computing Resources) http://www.unicore.eu/



Cerebellum from a P10 L7-GFP mouse
Total volume 73 mm3, voxel size 0.8×0.8×1 µm3, acquisition time ≈ 24 h (1.3 MegaVoxels/s)
Scale bars: 1 mm.

Preferred presentation format: Poster

Topic: Neuroimaging