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Rodent Brain Navigator: database and atlas system for microscopy and imaging data

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Rodent Brain Navigator is a highly structured relational database system for archiving, retrieving, viewing, and analysing multiple categories of microscopy and imaging data in standardized brain atlas space. The system is based on the J2EE Sun Microsystems standard and runs on Oracle application (Oracle 10g) and database (Oracle 9i) servers. The present version is prepared for serial section data, typically consisting of mosaic images covering complete histological sections through the rat and mouse brain. Routines for entry of volumetric data, collected with microscopic MR or small animal PET, are currently being developed. Images are registered to series of standard stereotaxic mouse or rat brain atlas diagrams, uploaded in the system by the user. Images from experimental animals, to be entered in the system, should therefore primarily be from sections cut at an angle comparable to one of the standard atlas series. Section images are anchored to the nearest corresponding atlas section, and the 2-D coordinate grid of the atlas section is in turn stepwise anchored to the experimental section image using landmarks and architectonic boundaries as references. Extensive metadata, describing the experimental animal, the extracted tissue blocks, the histological sections, and the microscopy data acquisition procedures, are uploaded together with the primary section image data. *Queries* are based either on the metadata (e.g., presence of molecules or markers) or on spatial coordinates. Queries for structure names will be available in future versions. Search entries may be combined and reiterated. *Results* are shown as lists of section images sorted by experimental animal. The user then selects all, or subsets of the section images that were retrieved, for display in 2-D viewers. The viewers provide either side-by-side inspection of experimental images and atlas diagrams, or comparison of multiple experimental images. Overall, the system is suited for managing large amount of section image data collected in the context of research projects within a laboratory or a consortium of laboratories. 3-D reconstructions of the standard atlases are currently in preparation, facilitating entry of images from sections cut at an angle different from the standard coronal, sagittal, or horizontal planes. The 3-D framework contains the pial surface, ventricular system, and major structural boundaries of the brain. Finer details, such as subdivisions of a larger region, may be added to the framework depending on relevance for a given study.

The current version of Rat Brain Navigator is made available for testing, for internal use by a single laboratory, or as a basis for creating larger, shared resources of data. Rat Brain Navigator developments are supported by The Research Council of Norway. The project is one of several coupled to the INCF Norwegian National Node, hosted by the Centre for Molecular Biology and Neuroscience, University of Oslo.