Brede Wiki: Neuroscience data structured in a wiki

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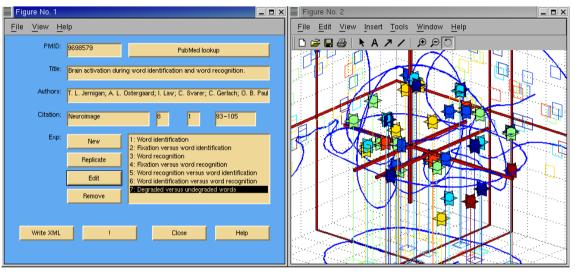


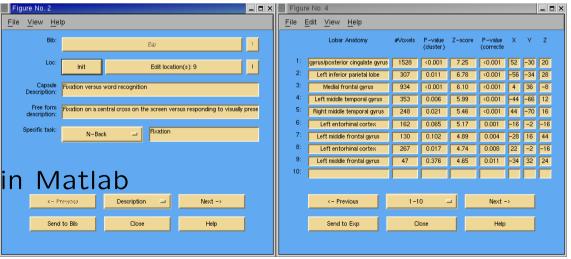






Background: The Brede Database





database with results from published neuroimaging studies as well as ontologies for, e.g., brain regions and brain function Nielsen (2003).

Data stored in XML available on the Web

Data entered in graphical user interface programmed











Background: The Brede Database on the Web

WOEXT: 23. Face recognition. Processing of face images.



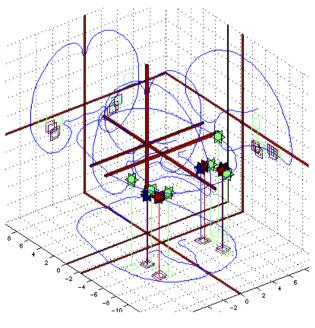
WOEXT: 126 Visual object recognition WOEXT: 23 Face recognition

Experiments:

- Face visual object. Visual objects: Faces versus building. WOEXP: 11.
 I Levy; U Hasson; G Avidan; T Hendler; R Malach. Center-periphery organization of human object areas. Nat Neurosci 4(5):533-9, 2001. PMID: 11319563. WOBIB: 5.
- 2. Photographs of faces versus houses and chairs. Conjunction between passive viewing and delayed match-to sample of gray-scale photographs versus scramble deductives and faces versus houses and chairs, with matching choice indicated by pressing a button with the right of left thumb. WOEXP: 91.

 A. Ishai; L. G. Ungerleider; A. Martin; J. V. Haxby. The representation of objects in the human occipital and temporal cortex.. J Cogn Neurosci 12 Suppl 2:35-51, 2000.

 PMID: 11506646. FMRIDCID: 2-2000-1113D. WOBIB: 28.
- Front-face. Line drawings of front face versus line drawings of tumblers. WOEXP: 123.
 U. Hasson; T. Hendler; D. Ben Bashat; R. Malach. Vase or face? A neural correlate of shape-selective grouping processes in the human brain. J Cogn Neurosci 13(6):744-53, 2001.
 PMID: 11564319. FMRIDCID: 2-2001-111P8.
 WOBIB: 36.



Presentation on the Web

Off-line meta-analysis and generation of indices and visualization in static HTML.

Interactive search on coordinates from Web page or within a image analysis program (Wilkowski et al., 2009).











- Difficult to add new information.
- Difficult to do incremental additions.











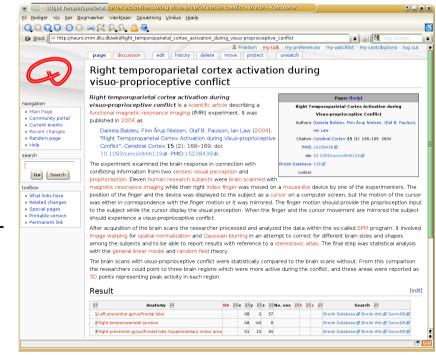
Problems

- Difficult to add new information.
- Difficult to do incremental additions.

Solution?

Wiki with structured data

Brede Wiki = MediaWiki templates + Extraction + SQL + Neuroscience











Principles of the Brede Wiki

Template use simple so it is easy to convert data all template instantiations to an SQL representation: No wiki formating in field values, non-nested templates, lower case field names (a one-to-one mapping of MediaWiki templates and ontology classes).

Link as much as possible in the template values: Template definitions typically constructs links with $[[\{\{field\}\}\}]]$

Link to external sites whenever possible: Brede Database, BrainInfo (NeuroNames), Internet Brain Volume Database, NeuroLex, PubMed, Wikipedia, ICBM View: [http://www.ncbi.nlm.nih.gov/pubmed/{{{pubmed}}}} PubMed]









Templates of the Brede Wiki

- Non-hierarchical (one template on top of page)
 Researcher (A person), Paper (bibliographic entry), Journal.
- Hierarchical (in a taxonomy)
 Brain region, Cognitive component, Organization, Software.
- On-page single
 Subject group, Pet scanning, Mri scanning, Psychoexperimental condition, Cite journal.
- On-page multiple
 Talairach coordinate, Brain volume, Gene personality association









SQL generation: Master table

```
CREATE TABLE brede(title, template, field, fid, value)

On the Wiki page "Semantic Web" with, e.g., {{Paper | author1 = Tim | author2 = Wendy | title = Semantic Web }}

will be converted to

("Semantic Web", "paper", "author", 1, "Tim")

("Semantic Web", "paper", "author", 2, "Wendy")

("Semantic Web", "paper", "title", 1, "Semantic Web")
```











SQL generation: Secondary tables

One for each template definition

```
CREATE TABLE brede_paper(__title, _author1, _author2, _title)
```

("Semantic Web", "Tim", "Wendy", "Semantic Web")

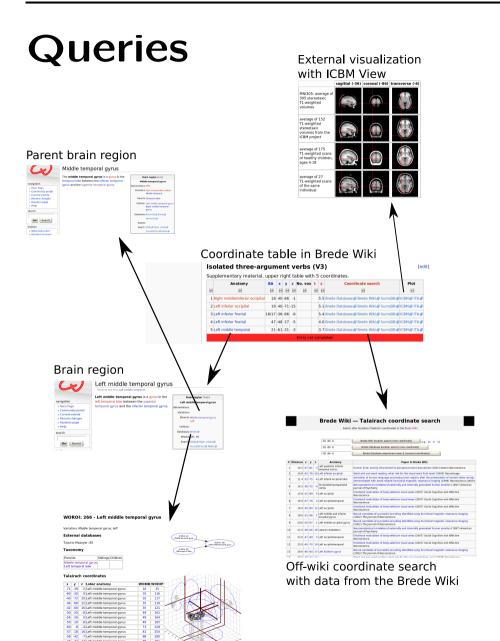
Underscores in column names avoid clash with SQL reserved words.

Table names prefixed with brede_ to avoid clash too.









Queries are possible \odot , but not within the wiki 🕾

SQLite file generated.

Query on nearby coordinates with the SQLite file and an off-wiki script.

SKOS file (Miles and Bechhofer, 2009) generated for brain region and cognitive component hierarchies from the SQLite file.

Brain region in the Brede Database









What next?

How do one reference on-page templates?

Meta-analysis with the wiki? We can do meta-analysis in a specialized wiki (Nielsen, 2008).

Automatic setup of information from other sources, like *Gene Wiki* on Wikipedia (Huss, III et al., 2008)

Is it possible with wiki editor generated queries?









The Brede Wiki available from

http://neuro.imm.dtu.dk/wiki/

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References

Huss, III, J. W., Orozco, C., Goodale, J., Chunlei, Batalov, S., Vickers, T. J., Valafar, F., and Su, A. I. (2008). A gene wiki for community annotation of gene function. *PLoS Biology*, 6(7):e175. DOI: 10.1371/journal.pbio.0060175. Description of the creation and addition of over 8000 gene articles in Wikipedia with an automated bot. Information is aggregated from Entrez Gene and a gene atlas for the mouse and human protein-encoding transcriptomes.

Miles, A. and Bechhofer, S. (2009). SKOS Simple Knowledge Organization System Reference. W3c candidate recommendation, W3C, MIT. http://www.w3.org/TR/2009/CR-skos-reference-20090317/.

Nielsen, F. Å. (2003). The Brede database: a small database for functional neuroimaging. *NeuroImage*, 19(2). http://208.164.121.55/hbm2003/abstract/abstract906.htm. Presented at the 9th International Conference on Functional Mapping of the Human Brain, June 19–22, 2003, New York, NY. Available on CD-Rom.

Nielsen, F. Å. (2008). A small wiki for personality genetics. 37th Annual Meeting on Biochemistry and Molecular Biology: Frontiers in Genomics.

Wilkowski, B., Szewczyk, M., Rasmussen, P. M., Hansen, L. K., and Nielsen, F. Å. (2009). Coordinate-based meta-analytic search for the SPM neuroimaging pipeline. In *International Conference on Health Informatics (HEALTHINF 2009)*.