The Wikification of the Brede Database

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April 1, 2008

Abstract

Wikipedia is presently among the top-ten visited web-sites and there are now over 10 million articles across the different language editions. Templates and categories in Wikipedia allow the editors to put structure on the information in Wikipedia. This kind of content can be extracted from Wikipedia and analyzed offline. Structured information may also be added automatically to Wikipedia from other web-based databases. Furthermore, specialized wikis inspired by the idea of the semantic web forms the so-called semantic wikis, where information is kept structured. I will show examples of my analysis of scientific information on Wikipedia's structured content and show some of my initial efforts in adding wiki-functionality to the Brede Database — or Brede functionality to Wikipedia.

Wikis and Wikipedia

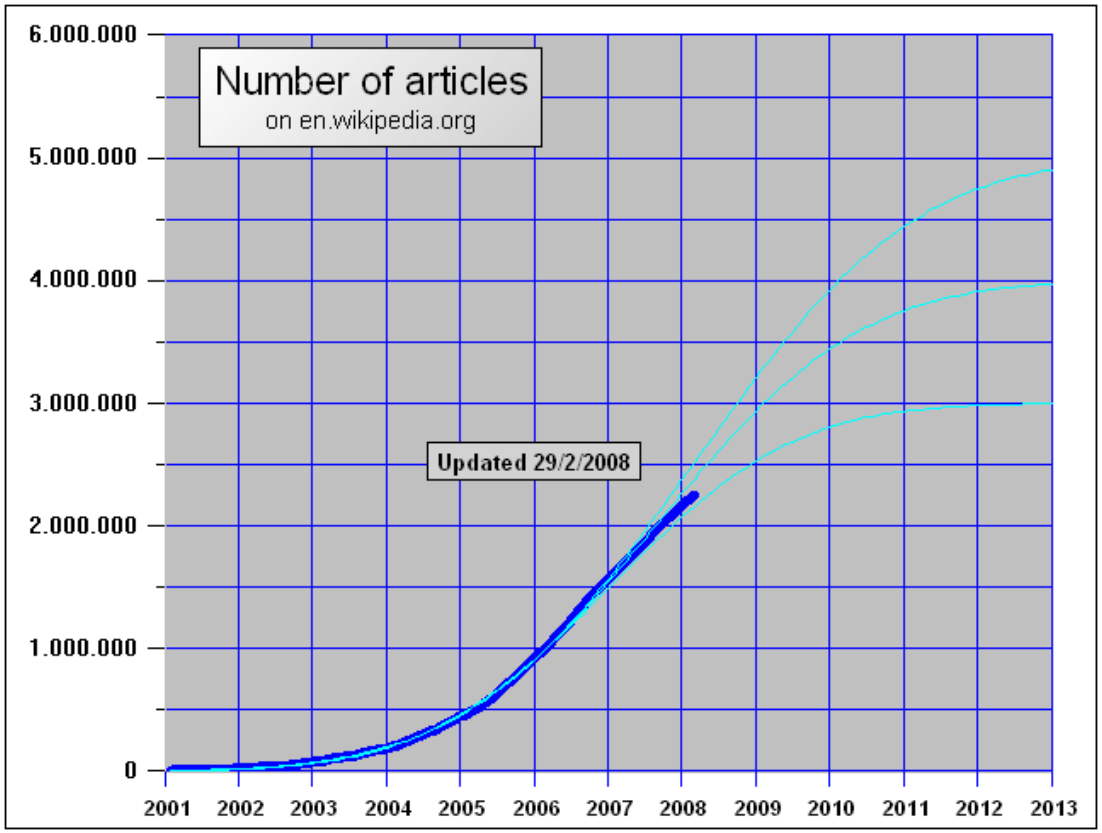


Figure 1: Growth in the number of articles on the English Wikipedia. From the Wikipedia article *Wikipedia:Modelling Wikipedia's growth*.

The wiki-idea with Internet-based shared and easy editing started by Ward Cunningham in the middle of the nineties (Leuf and Cunningham, 2001).

Wikipedia started in 2001 and experienced expontial growth in the beginning.

According to Alexa Wikipedia is presently on the top-ten over most visited web-sites.

Structured content in Wikipedia

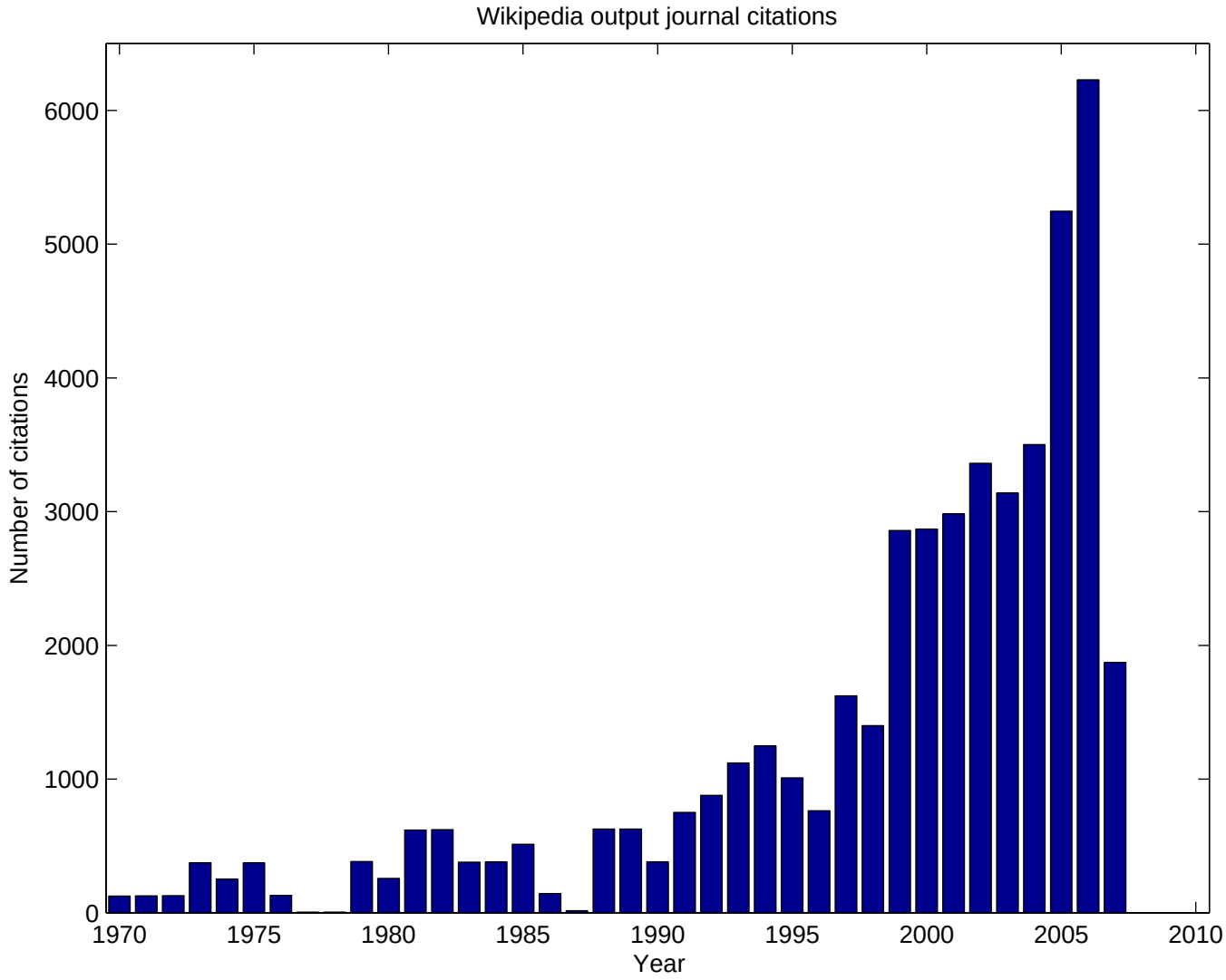
The content in Wikipedia may contain structured information, e.g., scientific citations:

```
{{cite journal|author=Filipek PA, Accardo PJ, Baranek GT ''et al.''
|title=The screening and diagnosis of autistic spectrum disorders
|journal=J Autism Dev Disord |date=1999 |volume=29 |issue=6
|pages=439--84
|doi=10.1023/A:1021943802493|pmid=10638459}}
```

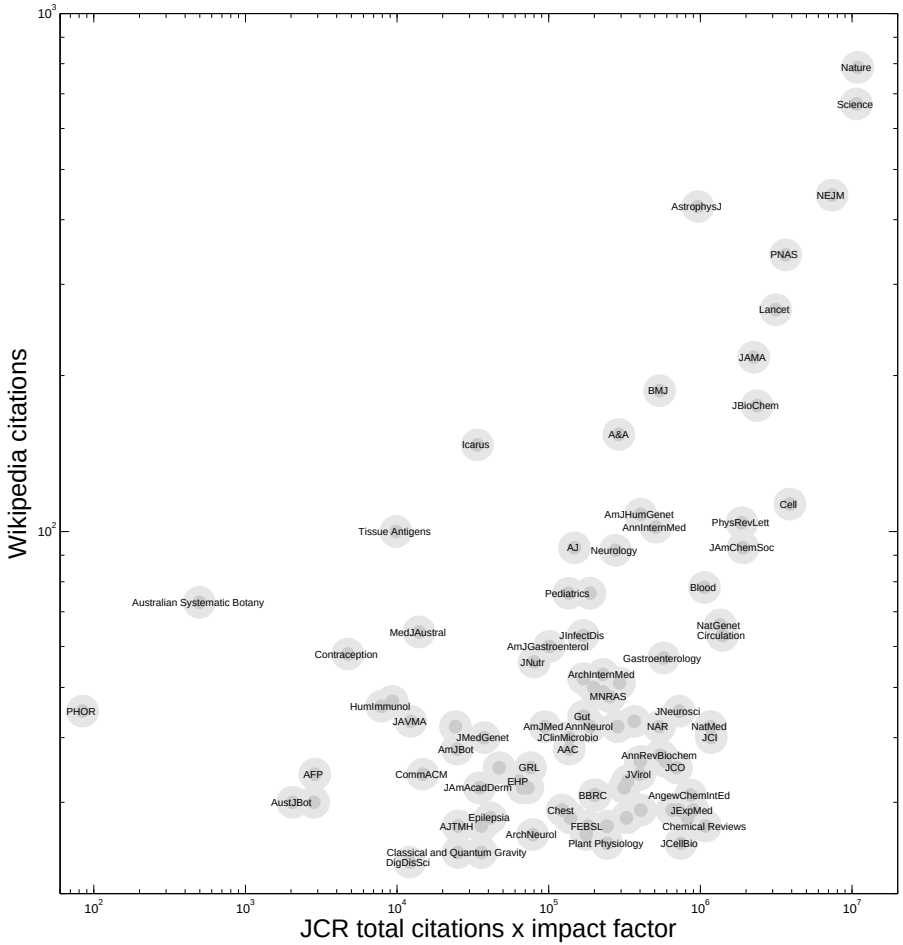
Or Proteins:

```
{{protein
|Name=5-hydroxytryptamine (serotonin) receptor 2A
|caption= |image= |width= |HGNCid=5293 |Symbol=HTR2A
|AltSymbols=HTR2 |EntrezGene=3356 |OMIM=182135 |RefSeq=NM_000621
|UniProt=P28223 |PDB= |ECnumber= |Chromosome=13 |Arm=q |Band=14
|LocusSupplementaryData=-q21}}
```

Year of publication of cited journal article



Analysis of scientific citations

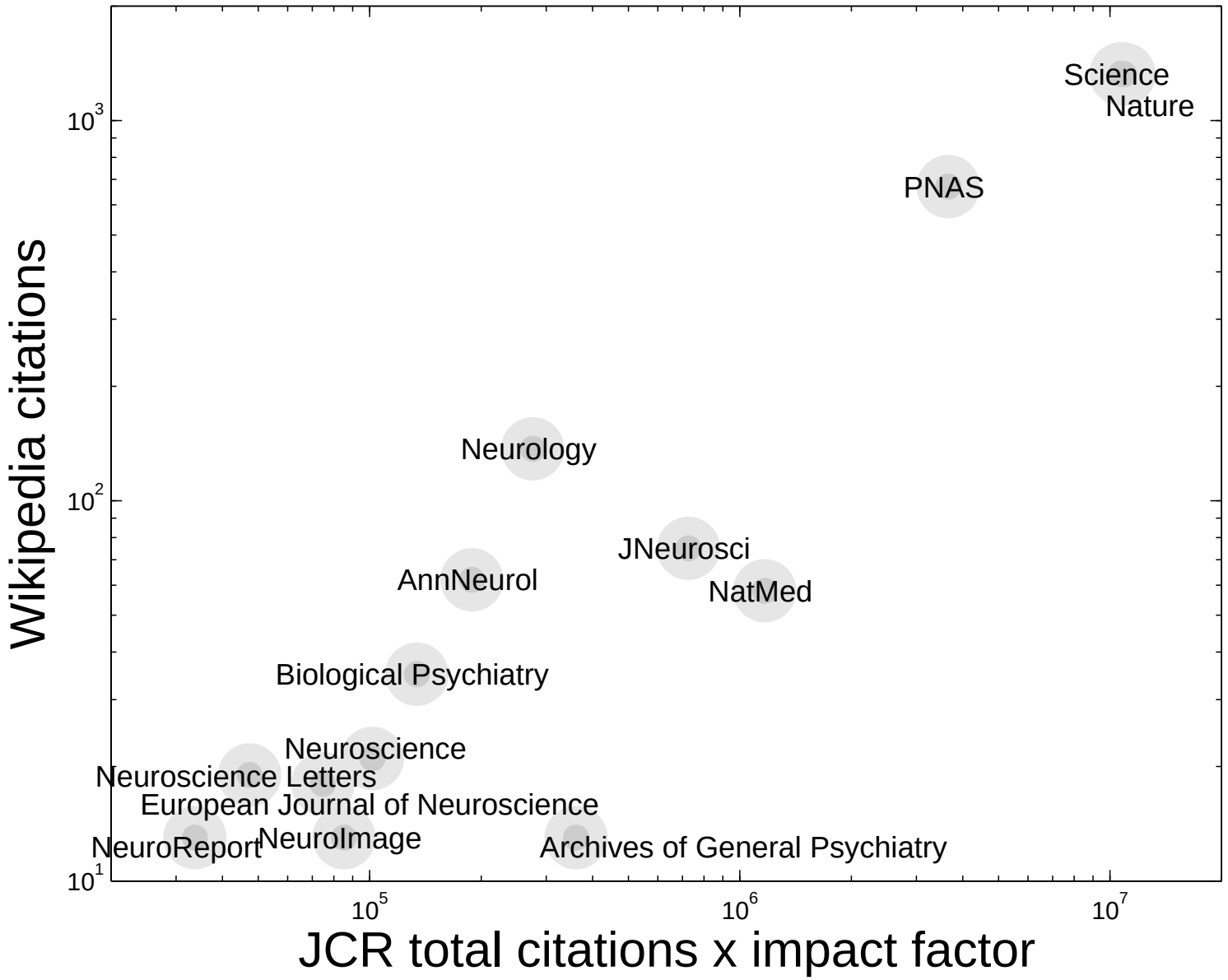


Scientific citations from Wikipedia to journals

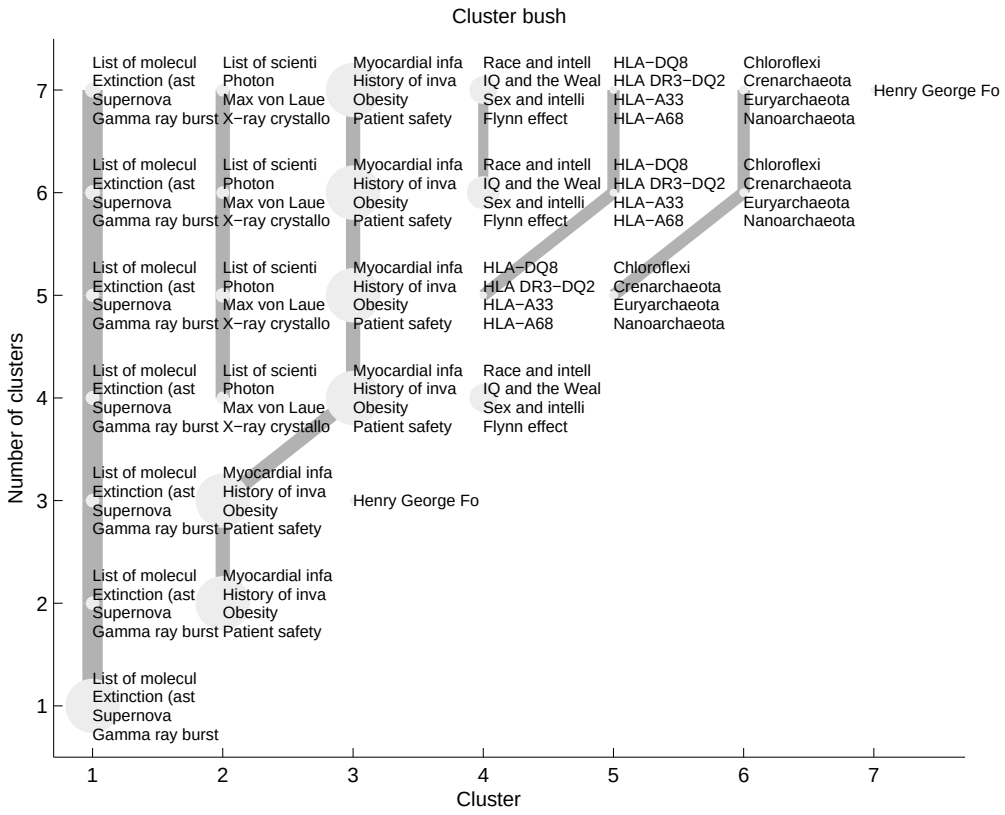
Comparison against *Journal Citation Reports* from *Thomson Scientific*

The *Nature* and *Science* journals are the most cited from Wikipedia.

The product between total citations and impact factor showed good correlation with the Wikipedia citation count (Nielsen, 2007).


Science
Nature
PNAS
Neurology
JNeurosci
AnnNeurol
NatMed
Biological Psychiatry
Neuroscience
Neuroscience Letters
European Journal of Neuroscience
NeuroReport
NeuroImage
Archives of General Psychiatry
10^3
10^2
10^1
10^5
10^6
10^7
Wikipedia citations
JCR total citations x impact factor

Clustering of Wikipedia data



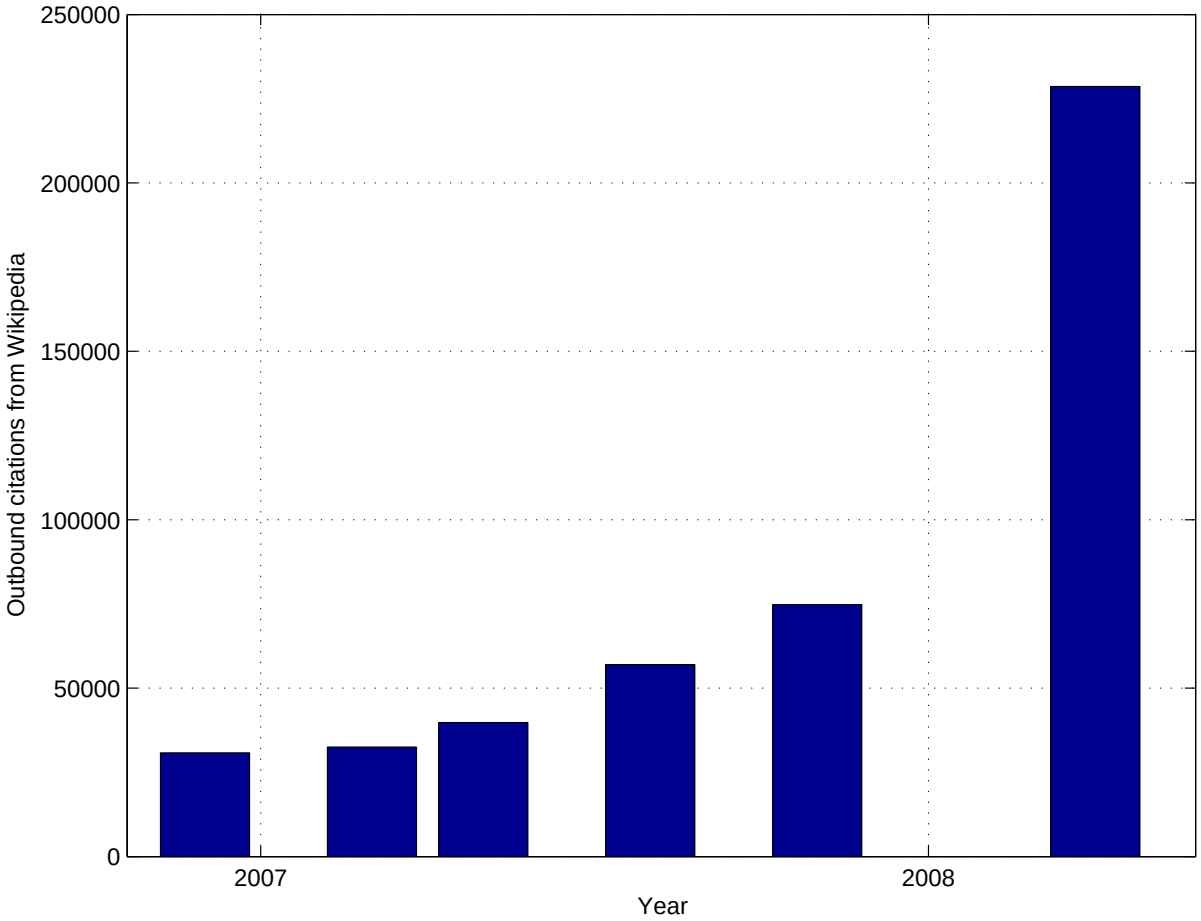
Clustering of citations from Wikipedia articles to scientific journals from a October 2007 dump.

Data matrix (Wikipedia article $\times$ journal)

Non-negative matrix factorization with increasing number of clusters (components) (Nielsen et al., 2005)

Clusters related to astrophysics, medicine, intelligens, immunology, bacteria, . . .

Growth in citations from Wikipedia . . .



The use of the `cite journal` template has increased since 2006.

Over the new year 2007/2008 a bot adds numerous pages for proteins with a lot of scientific citations expanding the number of citations from 74,776 citations in the October 2007 dump to 228,593 in the March 2008 dump.

Most cited journals in March 2008

Citations	Journal name
16739	The Journal of Biological Chemistry
12779	PNAS
8772	Genome Research
7561	Nature
4007	Nature Genetics
3928	Genomics
3689	Science
3511	Gene
3380	Biochemical and Biophysical Research Communications
3043	Molecular and Cellular Biology
2975	Cell
2261	The EMBO Journal

Table 1: Most cited journals from Wikipedia in the 12th March 2008 dump.

Clusters in the new dump

Cluster	Wikipedia hub articles	Authoritative journals
'Cancer'	RBL2	Oncogene
	MYB	Cancer Research
	ERG (gene)	Int. J. Cancer
	EPS8	Gene & Development
'Immunology'	DNA vaccination	The Journal of Immunology
	CCL21	The Journal of Experimental Medicine
	HLA-DQ8	Tissue Antigens
	HLA-DQA1	Eur. J. Immunol.
'Blood'	Acute myeloid leukemia	Blood
	Serpin	British Journal of Haematology
	CEBPE	The Journal of Clinical Investigation
	CD34	The Journal of Experimental Medicine
'Virology'	Papillomavirus	The Journal of Virology
	HHV Infected Cell ...	Virology
	Poliovirus	Journal of Molecular Biology
	RELB	AIDS Res. Hum. Retroviruses

Table 2: The top Wikipedia hubs articles and authoritative journals with respect to clusters from a non-negative matrix factorization with twenty clusters.

Other type of analysis. Preliminaries

Construct binary matrix $\mathbf{X}(\text{articles} \times \text{authors})$ with 1 indicated an edit.

Excluding usernames matching "bot" and documents beginning with "Wikipedia".

Exclude articles with less than three different authors.

Danish Wikipedia: $\mathbf{X}(12774 \times 3149)$ with density 0.0025

Some kind of normalization? The results may depend on the exact kind.

Again non-negative matrix factorization (Lee and Seung, 2001) — one of the algorithms "off the shelf" in the Brede Toolbox (Nielsen and Hansen, 2000).

Wikipedia clustering. Some cluster example

Danish Kings: Christian 3., Christoffer 1., Erik Klipping, Frederik 1.

Countries: Portugal, Slovenien, Polen, Tyskland, Belgien, Estland

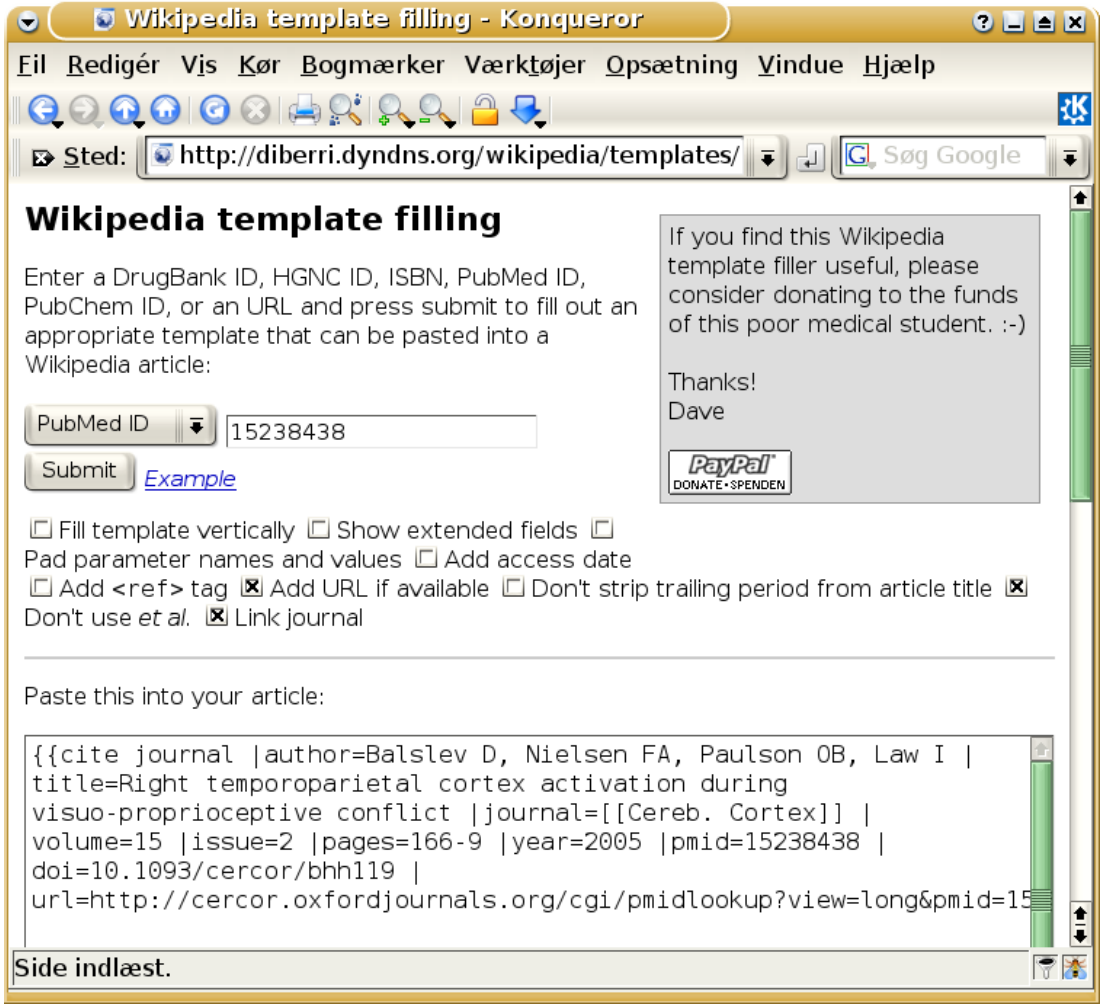
2006: Skabelon:Aktuelle begivenheder 2006, FC København, Fodbold, Tour de France, Lordi, VM i fodbold 2006, Muhammed-tegningerne, Michael Rasmussen

Danish munipalities and counties: Roskilde Amt, Birkerød Kommune, Frederikssund Kommune

Years: 2003, 2001, 2004, 2005

Discussion: Bruger diskussion:User#1, Bruger diskussion:User#2, Jesus fra Nazaret, Kristendom, Anders Fogh Rasmussen, Diskussion:Dansk Folkeparti,Diskussion:Muhammed-tegningerne, Kreationisme

Building of template instances



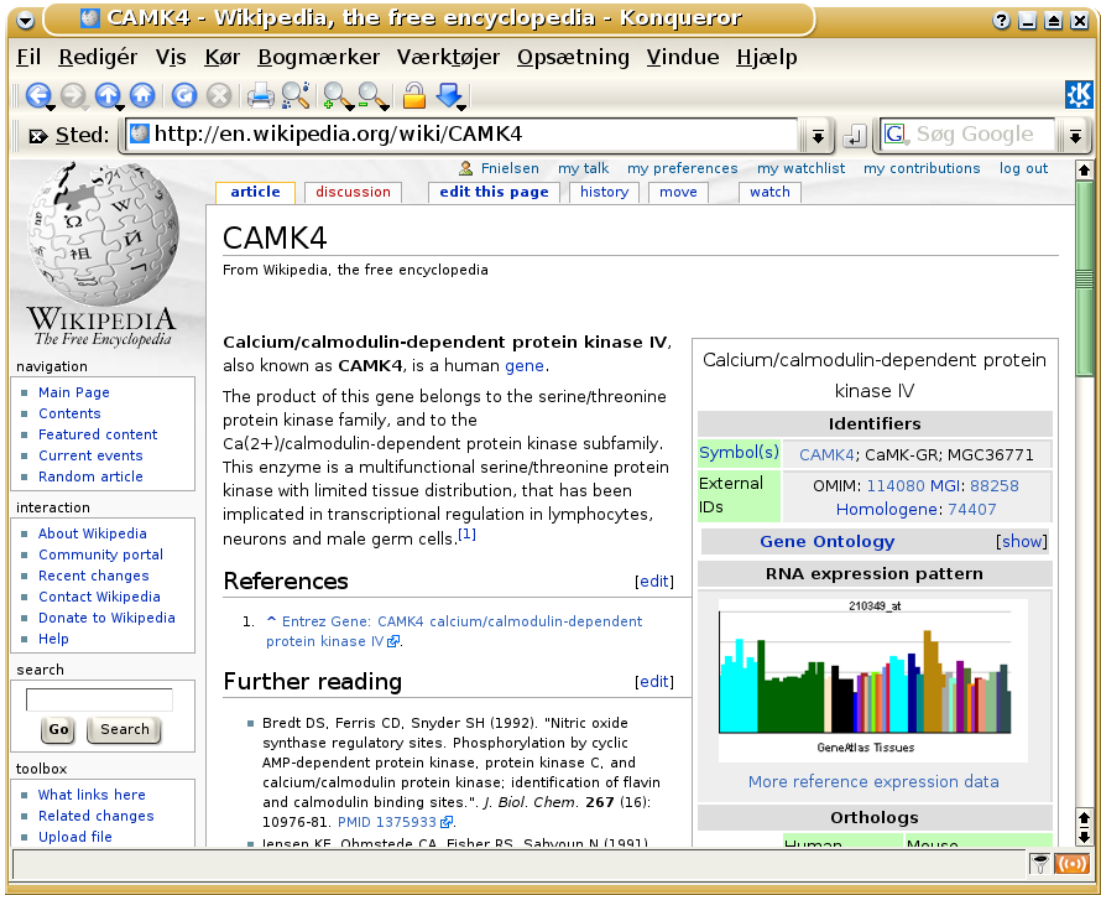
There exist tools that helps with the construction of Wikipedia templates.

For scientific journal articles in Wikipedia:

Zotero reference manager, a plugin to the Firefox web-browser

"Wikipedia template filling", a web-service

Construction with bots



Protein Box Bot builds pages with proteins and may update whole or part of the page based on other databases. It builds an "Infobox", abstracts and citation information.

"Assisted editing" /validation (Iorio and Zacchiroli, 2006)

"Can we link it"

Figure 2: Wikipedia article for gene where all information has been entered via a bot.

Large-scale databasing Wikipedia templates

Subject	Predicate	Object	
?player	currentclub	?club	[-]
?player	clubnumber	11	[-]
?player	countryofbirth	?country	[-]
?club	capacity	>40000	[-]
?country	population_estimate	>10000000	[-]

[+]

If you think your query can be useful for others, *please share*:

Label | Save query

Click on a column header to sort results on this page.

Results: 10

10 results found in 17.720s

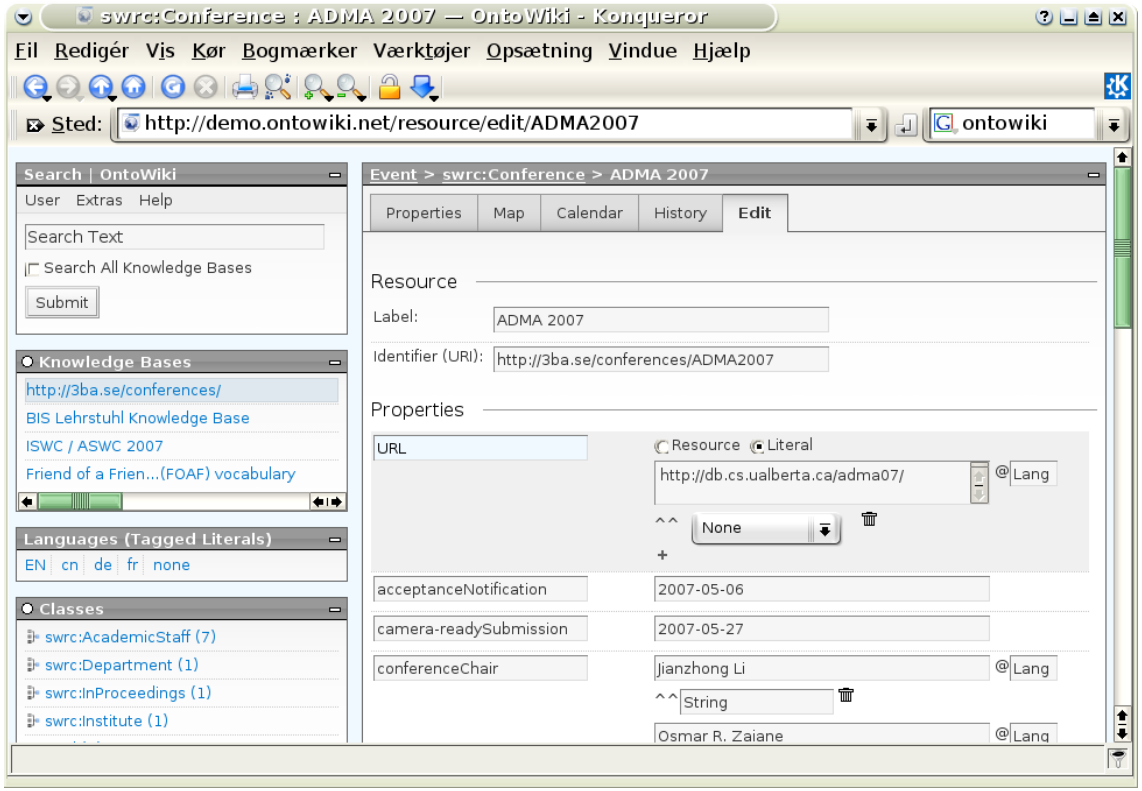
Nr.	?player	?club	?country	>40000	>10000000
1	Cicinho	Real Madrid	Brazil	80354	187560000
2	Gonzalo Fierro	Colo-Colo	Chile	62000	16432674
3	Lukas Podolski	FC Bayern Munich	Poland	69901	38536869
4	Mark González	Liverpool F.C.	South Africa	45362	47432000
5	Michael Thurk	Eintracht Frankfurt	Germany	52000	82438000
6	Ramón Morales	Chivas de Guadalajara	Mexico	72480	107784179

DBpedia: Extract templates from Wikipedia and put them in a database (Auer and Lehmann, 2007; Auer et al., 2008)

Basic datatype is a triple.

DPpedia is presented on the web with search interface: SPARQL, "Leipzig query builder"

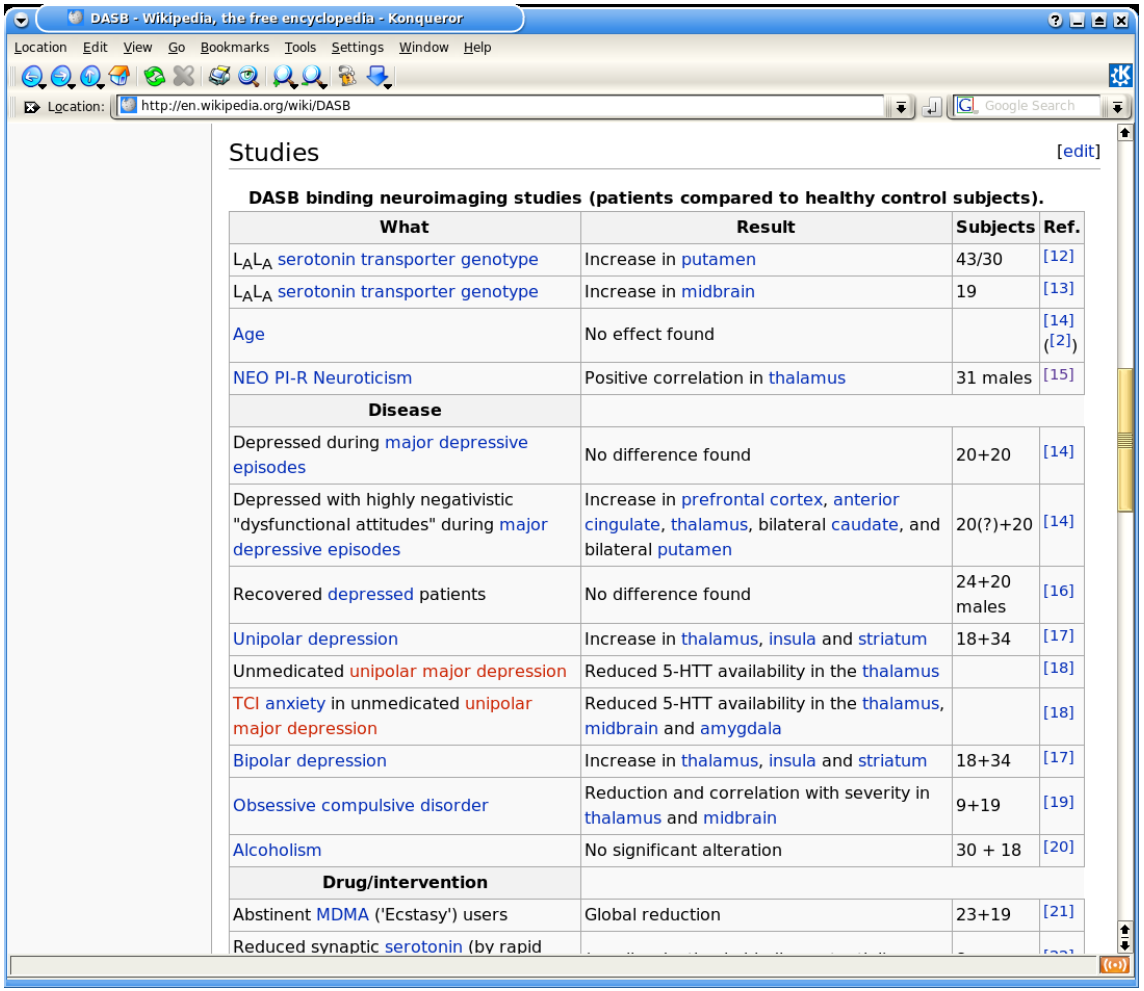
Scientific and semantic wiki



Example question: "What are the hundred world-largest cities with a female mayor?"

OmegaWiki, Semantic Mediawiki (Völkel et al., 2006), WikiFactory, OntoWiki (Auer et al., 2006), WikiProteins

Neuroimaging data on Wikipedia?



DASB - Wikipedia, the free encyclopedia - Konqueror

Location Edit View Go Bookmarks Tools Settings Window Help

Location: http://en.wikipedia.org/wiki/DASB

Studies [edit]

DASB binding neuroimaging studies (patients compared to healthy control subjects).

What	Result	Subjects	Ref.
L_AL_A serotonin transporter genotype	Increase in putamen	43/30	[12]
L_AL_A serotonin transporter genotype	Increase in midbrain	19	[13]
Age	No effect found		[14] ([2])
NEO PI-R Neuroticism	Positive correlation in thalamus	31 males	[15]
Disease			
Depressed during major depressive episodes	No difference found	20+20	[14]
Depressed with highly negativistic "dysfunctional attitudes" during major depressive episodes	Increase in prefrontal cortex, anterior cingulate, thalamus, bilateral caudate, and bilateral putamen	20(?)+20	[14]
Recovered depressed patients	No difference found	24+20 males	[16]
Unipolar depression	Increase in thalamus, insula and striatum	18+34	[17]
Unmedicated unipolar major depression	Reduced 5-HTT availability in the thalamus		[18]
TCI anxiety in unmedicated unipolar major depression	Reduced 5-HTT availability in the thalamus, midbrain and amygdala		[18]
Bipolar depression	Increase in thalamus, insula and striatum	18+34	[17]
Obsessive compulsive disorder	Reduction and correlation with severity in thalamus and midbrain	9+19	[19]
Alcoholism	No significant alteration	30 + 18	[20]
Drug/intervention			
Abstinent MDMA ('Ecstasy') users	Global reduction	23+19	[21]
Reduced synaptic serotonin (by rapid			

Series of values may be represent in a table: Here information from neuroimaging DASB studies.

While this representation may give an overview that can be updated incrementally by different individuals, it may not be a good representation to work with wrt. machine reading.

The Brede Database

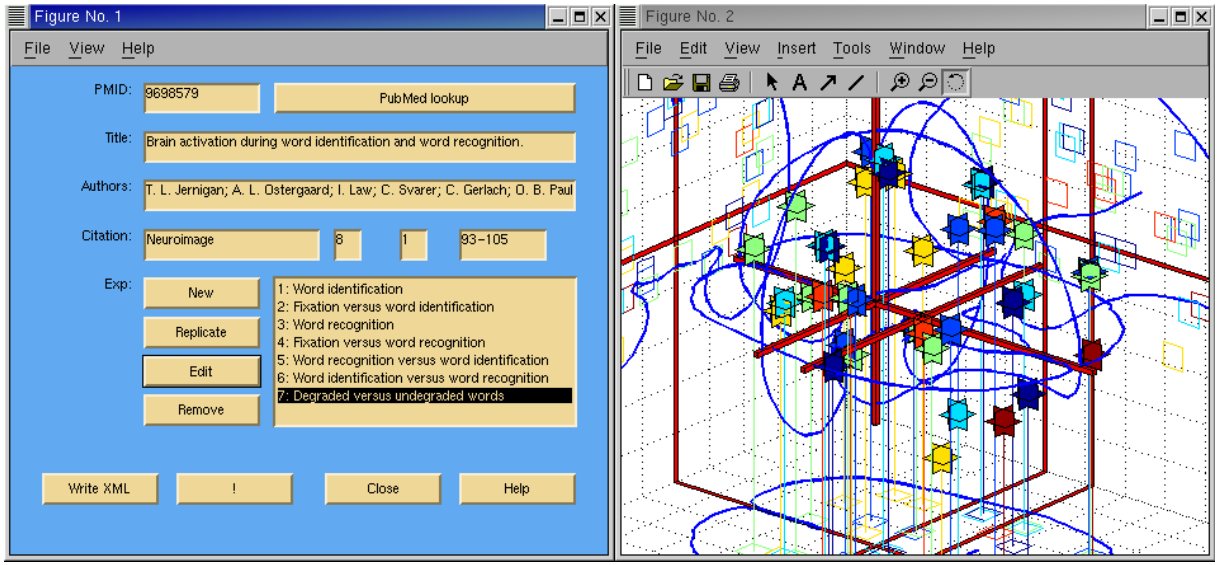


Figure 3: Screenshot of a program to entry of data.

The Brede Database presently contains information about functional neuroimaging

Using XML files for storage of data with entry function implemented in Matlab and some search facility implemented in Perl.

Brede Database in XML

```
<Bibs>
  <Bib>
    <wobib>1</wobib>
    <type>bib</type>
    <Author>
      <surname>Law</surname>
      <firstname>Ian</firstname>
      <name>Ian Law</name>
    ...
    <citation>Brain 1998 Nov;121 ( Pt 11):2189-200.</citation>
    ...
    <title>Parieto-occipital cortex activation during self-generated
      eye movements in the dark</title>
    ...
    <Exp>
      <capsuleDescription>Self-generated saccades</capsuleDescription>
      <freeFormDescription>Voluntary self-generated large-amplitude
        horizontal saccades with eyes open versus resting state with
        eyes closed</freeFormDescription>
      ...
      <Loc>
        <functionalArea>Left frontal eye field</functionalArea>
        <brodmann></brodmann>
        <zScore>4.82</zScore>
        ...
```

Extracting data from Wikipedia to matlab

With the Brede Toolbox extract cited journals from the *Altanserin* article:

```
s = brede_web_wikipedia('Altanserin');
S = brede_str_wptemplate2struct(s,'template','Cite journal');
B = brede_bib_bib2bib(S);
brede_ui_bibs(B)
```

This will bring up an Matlab GUI with bibliographic information about all the cited journals.

There are obstables for extraction of, e.g., nested templates (templates within templates) and fields in templates with multiple entries (e.g., the author field in the `cite journal` template)

Representation of Talairach coordinates

Template arguments with integer parameters:

```
{{Talairach coordinates
  | x_1=-38 | y_1=2 | z_1=37
  | x_2= 48 | y_2=-40 | z_2 =9 | anatomy_2 =Right temporoparietal
junction
  | x_3=51 | y_3=15 | z_3=34 | functional_area_3 =[[Supplementary motor area]] }}
```

Or with a template within a template:

```
{{Talairach coordinates
  | Coordinates =
    {{Talairach coordinate | x=-38 | y=2 | z=37}}
    {{Talairach coordinate | x= 48 | y=-40 | z=9 | anatomy=Right
temporoparietal junction }}
    {{Talairach coordinate | x=51 | y=15 | z=34
      | functional_area=[[Supplementary motor area]] }} }}
```

. . . Talairach coordinates

Right Temporoparietal Cortex Activation during Visuo-proprioceptive Conflict is a scientific article describing an functional magnetic resonance imaging (fMRI) experiment. It was published in 2004:

> Daniela Balslev, Finn Årup Nielsen, Olaf B. Paulson, Ian Law (2004). "Right Temporoparietal Cortex Activation during Visuo-proprioceptive Conflict". *Cerebral Cortex* **15** (2): 166–169. doi:10.1093/cercor/bhh119. PMID 15238438.

Experiment 1 [edit]

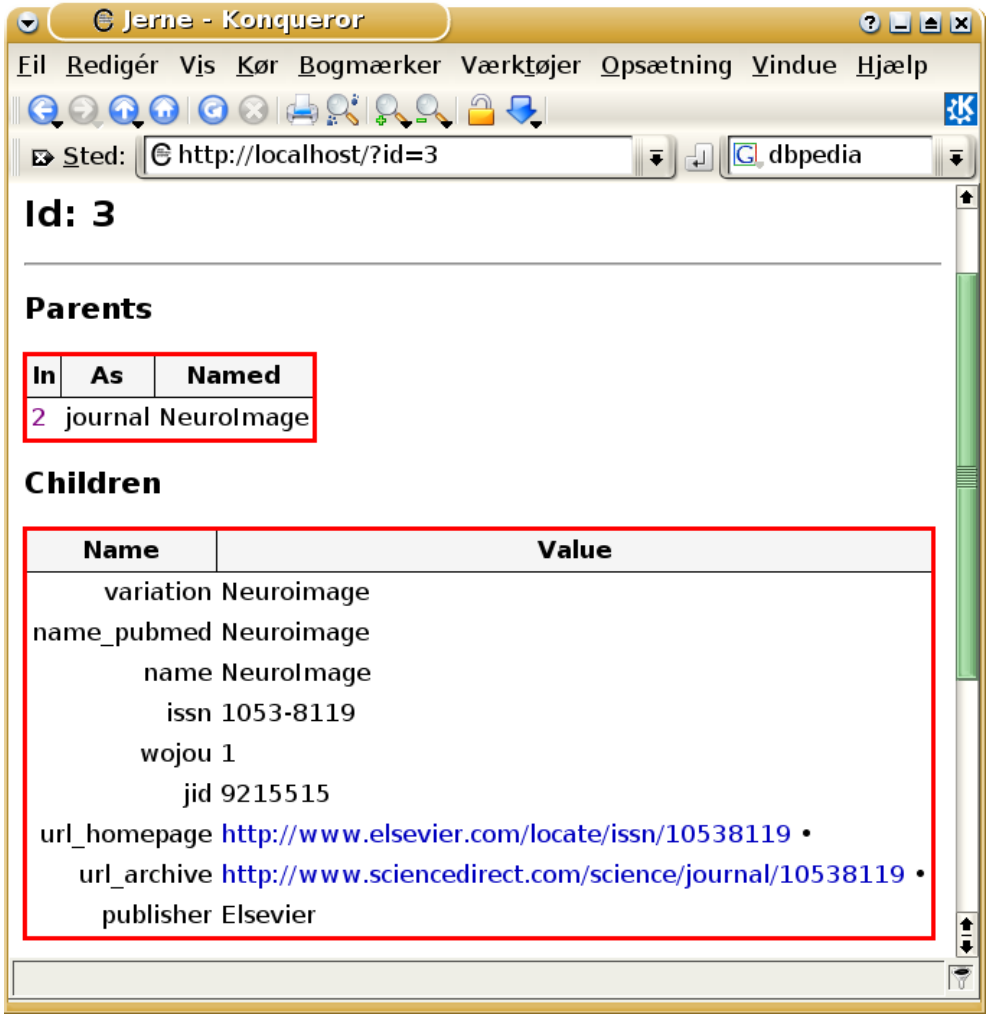
#	Anatomy	Functional area	x	y	z
1	Left precentral gyrus/frontal lobe		-38	2	37
2	Right temporoparietal junction		48	-40	9
3	Right precentral gyrus/frontal lobe	Supplementary motor area	51	15	34

The Talairach coordinates as they are rendered on a Wikipedia "Sandbox" page.

The table with Talairach coordinates is constructed from a nested template.

Figure 4: Formated Talairach coordinates in Wikipedia.

Extensible database for Brede



Extensible database: Add new fields ("columns")

Basic datatype a Quintuple: structure, field name, value, rank, link.

Will this be useful for editing and display?

Conclusion

Wiki and Wikipedia content may not only be source for “human” reading and editing but also:

Automatic adding information

Extraction of information

A source for data that may be subjected to computer-based analysis

References

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Auer, S. and Lehmann, J. (2007). What have Innsbruck and Leipzig in common? extracting semantics from Wiki content. In *The Semantic Web: Research and Applications*, volume 4519 of *Lecture Notes in Computer Science*, pages 503–517, Berlin/Heidelberg. Springer. http://jens-lehmann.org/files/2007_wiki_extraction.pdf.

Auer, S., Riechert, T., and Dietzold, S. (2006). OntoWiki — a tool for social, semantic collaboration. In Cruz, I., Decker, S., Allemang, D., Preist, C., Schwabe, D., Uschold, P., and Aroyo, L., editors, *The Semantic Web — ISWC 2006*, volume 4273 of *Lecture Notes in Computer Science*, Heidelberg/Berlin. Springer. Description of a collaborative wiki-based knowledge base where instances can be linked to classes and have properties. These properties can be, e.g., a date that may be displayed in a calendar or geographical coordinates that can be integrated with Google Map API. Users can edit the individual properties, helped by AJAX technology. The system also has versioning and some search facility. OntoWiki uses the Powl platform. This OntoWiki should not be confused with the Innsbruck OntoWiki.

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