WikiTaaable: A semantic wiki as a blackboard for a textual case-based reasoning system

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Taaable Project

- Querying a cooking recipe base to solve cooking problem
  - "I want a dessert with rhubarb but without chocolate"
  - If no recipe exists, an existing recipe is adapted
- Case-based reasoning engine performs adaptation
  - Replacing some ingredients by others "closing" one
- Taaable system was vice champion of the 1er Computer Cooking Contest (CCC), 2008

Taaable

Ingredients

I want: orange ?

I don't want: ?

Type of dish

I want: pie ?

I don't want: ?

More options

☐ Vegetarian ☐ Nut-free ☐ No alcohol *Advanced Configuration ?*

Find recipes! | Get 5! | Reset query

Your request: orange D:pie

Common path: 1<citrus_fruit --> orange>

Common cost: 1.3778748590755354

#	Original recipe name	Adaptation overview	Cost
1	Apple Crumble Pie	Replace: lemon_juice by citrus_fruit	5
2	Delicious Key Lime Pie	Replace: key_lime_juice by citrus_fruit, key_lime_peel by citrus_fruit	5
3	Key Lime Pie	Replace: key_lime by citrus_fruit, key_lime_juice by citrus_fruit	5
4	Strawberry Lime Pie	Replace: lime by citrus_fruit	5
5	UPSIDE DOWN APPLE PIE	Replace: lemon_juice by citrus_fruit	5

Results 1 - 5 on 5 | Processing time: 0.0246 secondes

Key Lime Pie

Type(s): D:baked good,D:dessert,D:cheesecake,D:pie,D:sweet

Substitution List

- Replace **key_lime_juice, key_lime,** by **orange**

Original Recipe

Ingredients :

Original ingredient	Prefered term
3/4 cup key lime juice	key lime juice
2 teaspoons key lime juice	key lime juice
2 1/4 cups sweetened condensed milk	sweetened condensed milk
1 teaspoon grated key lime rind	key lime
3 egg yolks	egg yolk
9 inch graham cracker pie crust	graham cracker
sweetened whipped cream	whipped cream

Recipe :

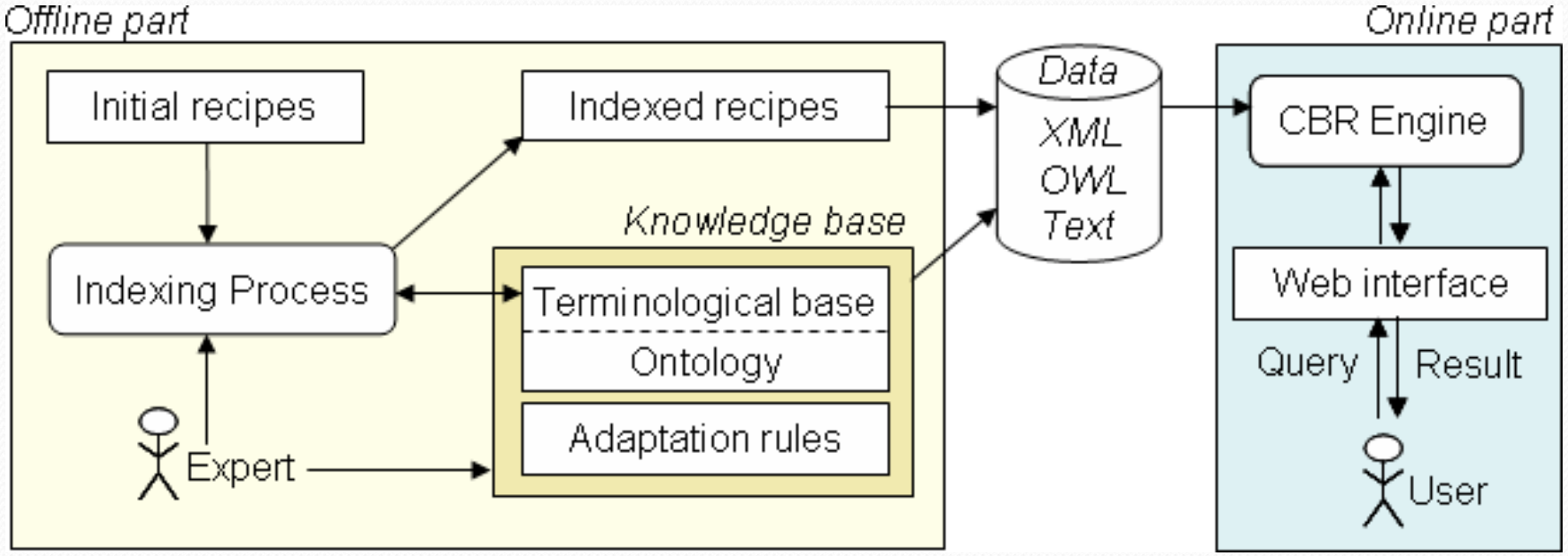
yield: 8 servings squeeze juice from 4 large or 6 small key lime and grate rind set aside using a whisk beat egg yolk until buttercup yellow add about half the condensed milk blend well with a whisk and add remaining milk add half the lime juice and blend slowly add remaining juice and blend add grated rind mix and pour into chilled pie crust refrigerate for 4 hours may be frozen slice while still frozen and let stand for about 10 minutes top with whipped cream

Go back

Knowledge sources

- Domain Ontology
  - Ingredients hierarchy: lemon, apple,
  - Dish moment : appetizer, dessert,…
  - Dish type : cake, pizza,
  - Dish origin: Mediterranean, Chinese, ..
- Indexed recipes
  - Recipes given by the CCC are a loosely structured XML file
    - TI tag: for recipe title,
    - IN tag: for ingredient,
    - PR tag: for preparation.
- Automatic indexing process: to index the recipes according to the domain ontology.

Architecture Taaable System



Problems

- Indexed recipes contain errors:
  - Indexed recipes are XML files and cannot be verified easily and corrected by "common" users.
- When CBR gives inadequate answers (lasagna with chocolate)
  - Users can not mention this problem ? How to capture this new knowledge ?
  - How humans can browse and correct the ontology in order to fix the problem ?
- Taaable system does not support human-machine collaboration.

WikiTaaable

Semantic MediaWiki as a blackboard

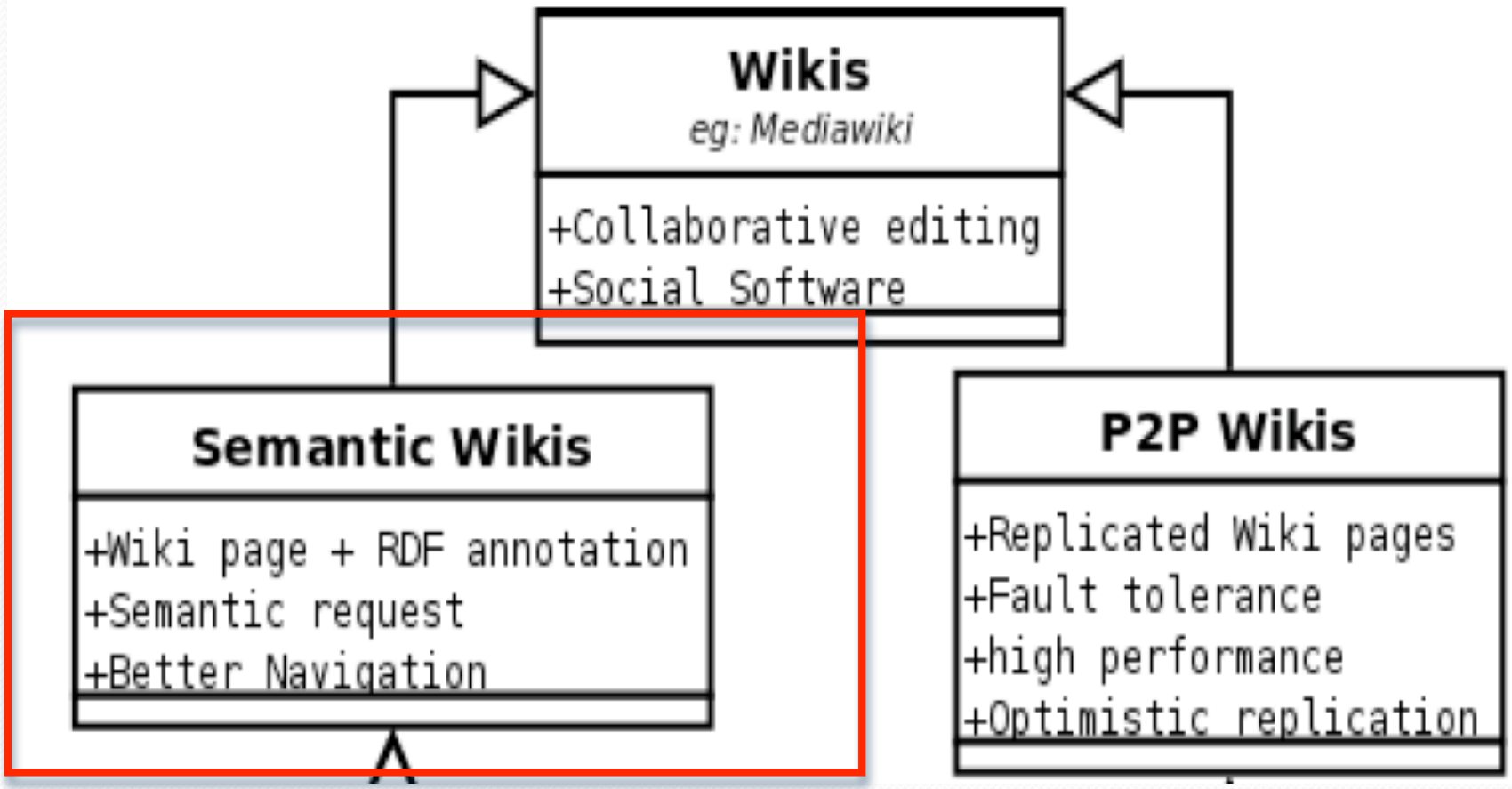
Wikis

- Wikis are the most popular collaborative editors
- Wiki are simple to use
  - No technical skills
- Wikis are Social software
  - Everyone can participate in building global knowledge
  - Quality is the result of social filtering, discussion, negotiation…
- Wikipedia:
  - 2,925,788 articles, and 17,222,924 pages in total
  - 9,952,902 registered users,
  - In the Top 10 of Web sites…

Wikis Drawbacks

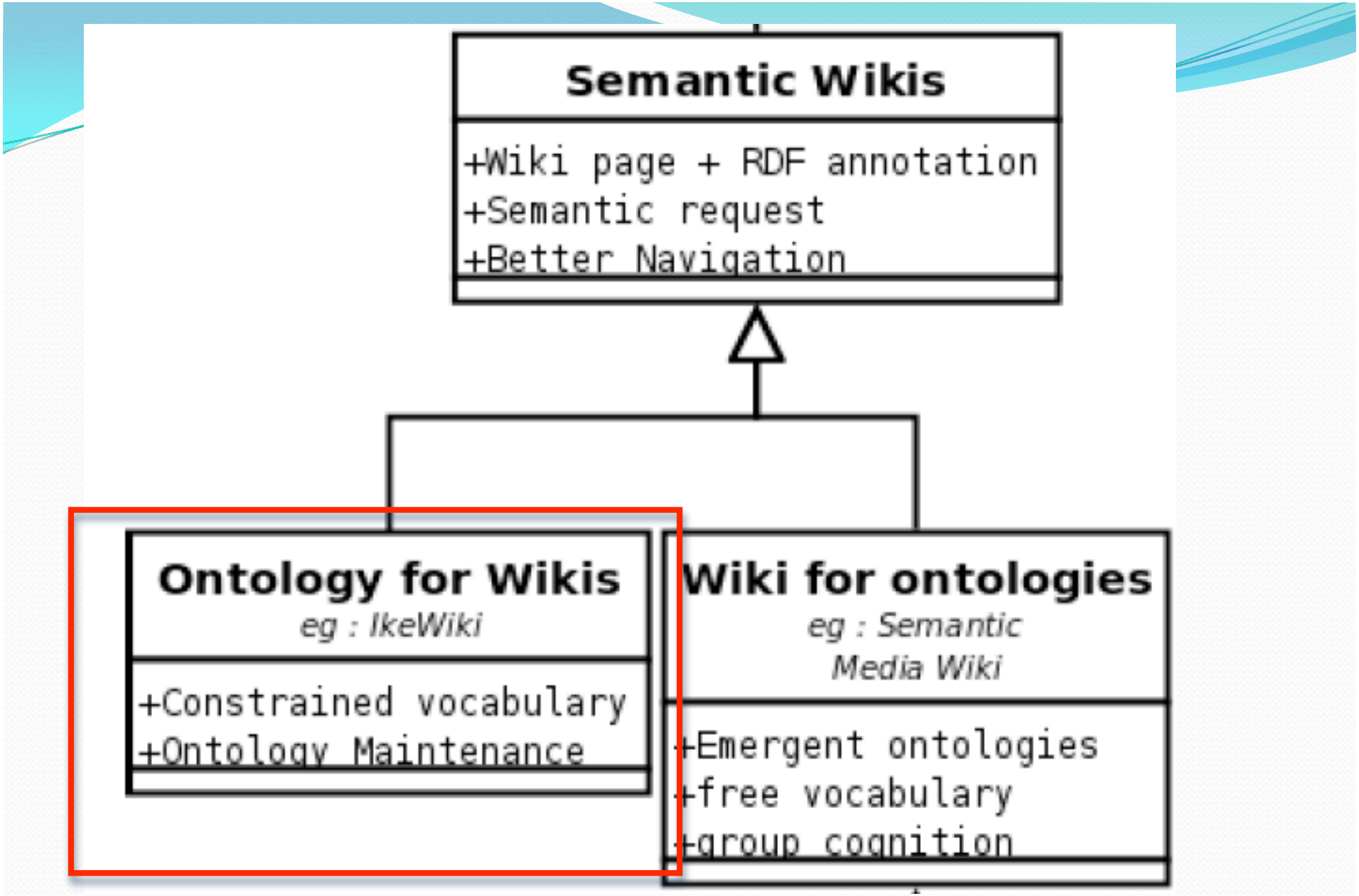
- Search and reuse:
  - Not easy to find information
  - Not reusable by machine
  - Many pages are maintained by humans but it can be generated by computers (matrix pages, lists pages)…
- Centralized architecture:
  - Content is unavailable in case of failure
  - Scalability
  - Performances…
- Collaborative editing
  - No Off-line work, mobile editing…
  - No transactional changes: no atomic changes across multiple pages

Wikis Evolutions



Semantic Wikis

- Objective
  - Structure the Wikis for better search and navigation
  - Machine accessible
    - Efficient data search
    - Reusable knowledge
- How ?
  - Adding formal structures to wikis
  - By using Semantic Web technologies : RDF, SPARQL
  - Integrate requests in wiki pages to generate content.



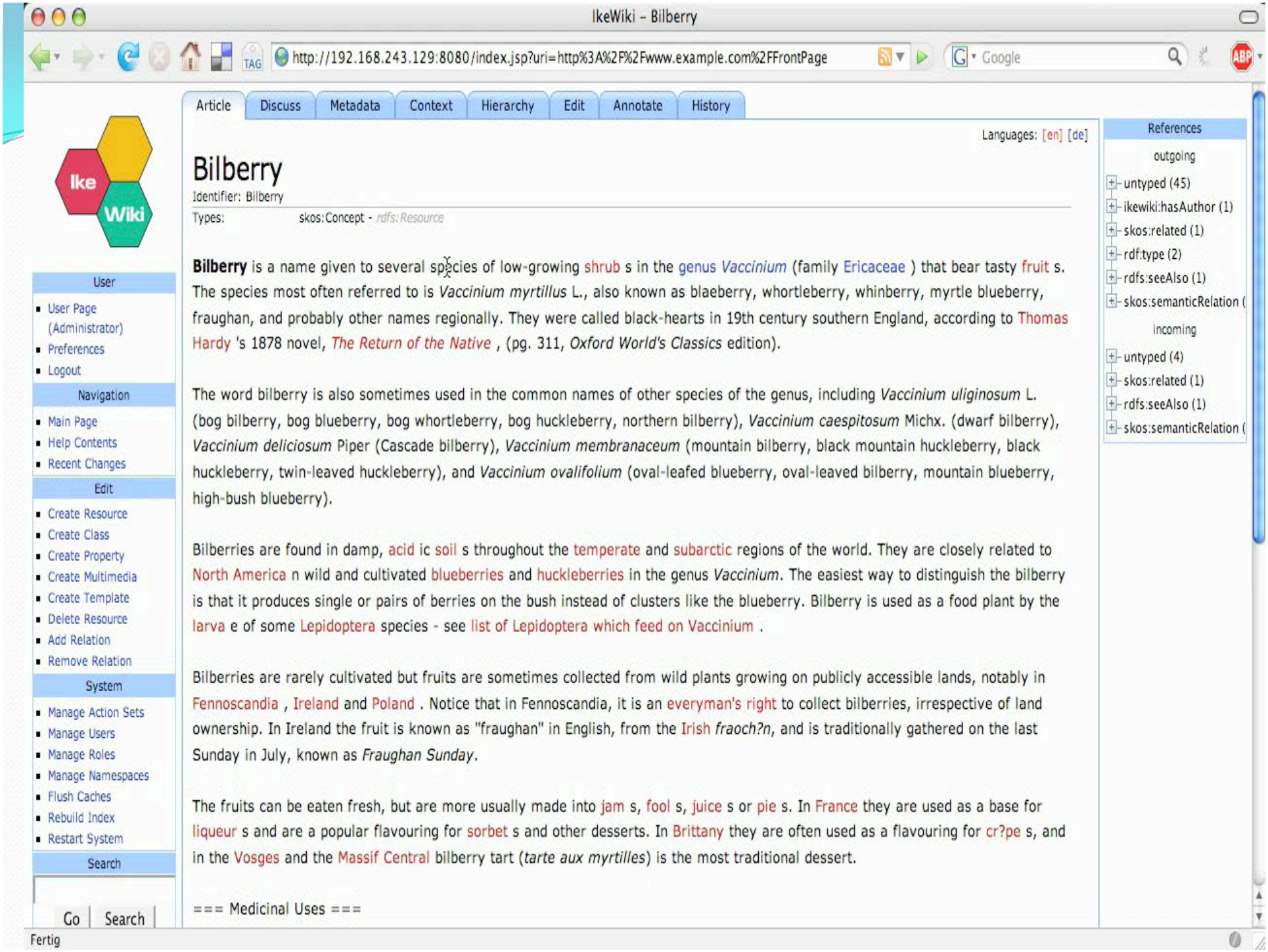
Buffa et al. SweetWiki: A Semantic Wiki. Journal of Web Semantic, 6(1), 2008.

The use of Ontologies for wikis

- Require existing ontology to be loaded
- Each page has a type
- Special interface to edit and visualize semantic data
- Examples:
  - IkeWiki, SweetWiki

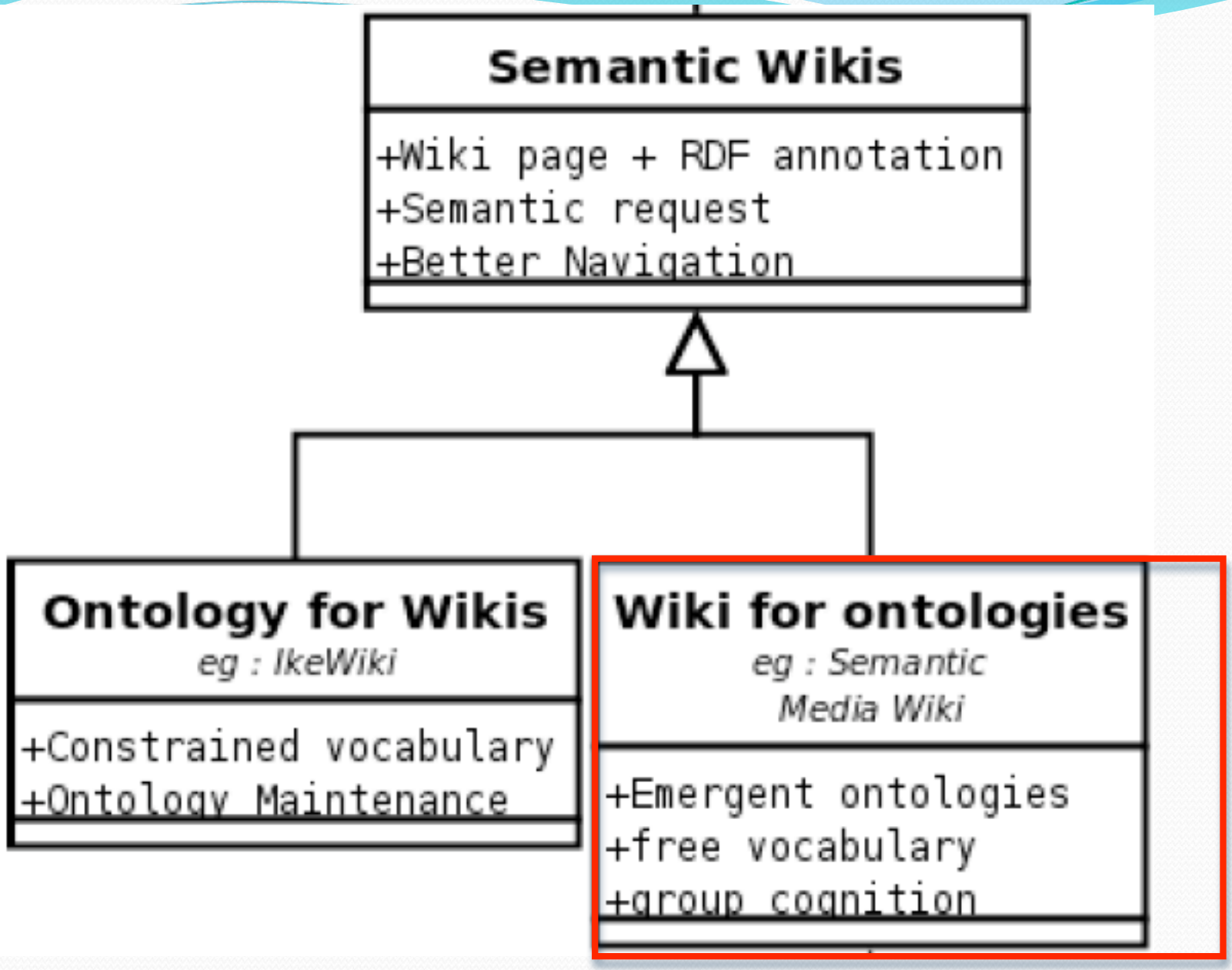
Schaffert. IkeWiki: A Semantic Wiki for Collaborative Knowledge Management. WETICE, 2006. IEEE.

Buffa et Al. SweetWiki: A Semantic Wiki. *Journal of Web Semantic,6(1)*,2008.


IkeWiki - Bilberry
http://192.168.243.129:8080/index.jsp?uri=http%3A%2F%2Fwww.example.com%2FFrontPage
Google
Article
Discuss
Metadata
Context
Hierarchy
Edit
Annotate
History
Languages: [en] [de]
Bilberry
Identifier: Bilberry
Types: skos:Concept - rdfs:Resource
Bilberry is a name given to several species of low-growing shrub s in the genus Vaccinium (family Ericaceae) that bear tasty fruit s. The species most often referred to is Vaccinium myrtillus L., also known as blaeberry, whortleberry, whinberry, myrtle blueberry, fraughan, and probably other names regionally. They were called black-hearts in 19th century southern England, according to Thomas Hardy 's 1878 novel, The Return of the Native , (pg. 311, Oxford World's Classics edition).
The word bilberry is also sometimes used in the common names of other species of the genus, including Vaccinium uliginosum L. (bog bilberry, bog blueberry, bog whortleberry, bog huckleberry, northern bilberry), Vaccinium caespitosum Michx. (dwarf bilberry), Vaccinium deliciosum Piper (Cascade bilberry), Vaccinium membranaceum (mountain bilberry, black mountain huckleberry, black huckleberry, twin-leaved huckleberry), and Vaccinium ovalifolium (oval-leafed blueberry, oval-leaved bilberry, mountain blueberry, high-bush blueberry).
Bilberries are found in damp, acid ic soil s throughout the temperate and subarctic regions of the world. They are closely related to North America n wild and cultivated blueberries and huckleberries in the genus Vaccinium. The easiest way to distinguish the bilberry is that it produces single or pairs of berries on the bush instead of clusters like the blueberry. Bilberry is used as a food plant by the larva e of some Lepidoptera species - see list of Lepidoptera which feed on Vaccinium .
Bilberries are rarely cultivated but fruits are sometimes collected from wild plants growing on publicly accessible lands, notably in Fennoscandia , Ireland and Poland . Notice that in Fennoscandia, it is an everyman's right to collect bilberries, irrespective of land ownership. In Ireland the fruit is known as "fraughan" in English, from the Irish fraoch?n, and is traditionally gathered on the last Sunday in July, known as Fraughan Sunday.
The fruits can be eaten fresh, but are more usually made into jam s, fool s, juice s or pie s. In France they are used as a base for liqueur s and are a popular flavouring for sorbet s and other desserts. In Brittany they are often used as a flavouring for cr?pe s, and in the Vosges and the Massif Central bilberry tart (tarte aux myrtilles) is the most traditional dessert.
=== Medicinal Uses ===
References
outgoing
untyped (45)
ikewiki:hasAuthor (1)
skos:related (1)
rdf:type (2)
rdfs:seeAlso (1)
skos:semanticRelation (
incoming
untyped (4)
skos:related (1)
rdfs:seeAlso (1)
skos:semanticRelation (
User
User Page (Administrator)
Preferences
Logout
Navigation
Main Page
Help Contents
Recent Changes
Edit
Create Resource
Create Class
Create Property
Create Multimedia
Create Template
Delete Resource
Add Relation
Remove Relation
System
Manage Action Sets
Manage Users
Manage Roles
Manage Namespaces
Flush Caches
Rebuild Index
Restart System
Search
Go
Search
Fertig

IkeWiki

- Constrained vocabulary
- Ontology maintenance
- Too rigid for emergent domains
  - No established ontologies


Semantic Wikis
+Wiki page + RDF annotation
+Semantic request
+Better Navigation
Ontology for Wikis
eg : IkeWiki
+Constrained vocabulary
+Ontology Maintenance
Wiki for ontologies
eg : Semantic Media Wiki
+Emergent ontologies
+free vocabulary
+group cognition

The use of wikis for Ontologies

- No predefined ontology
- Annotations are embedded in wiki text
- One subject for one page
- Semantic Media Wiki (SMW)
  - Extension of MediaWiki
  - [[predicat::objet]]

M. Krötzsch, D. Vrandecic, M. Völkel, H. Haller, and R. Studer. Semantic wikipedia. Journal of Web Semantic, 5(4), 2007.

'''London''' is the capital of **[[capital of::England]]** and of the **[[capital of::United Kingdom|UK]].** As of [[2005]], the total resident population of London was estimated **[[population:=7,421,328]]**. Greater London covers an area of **[[area:=609 square miles]]**. It is in **[[located in::England]]** in the [[situated in::Europe]].

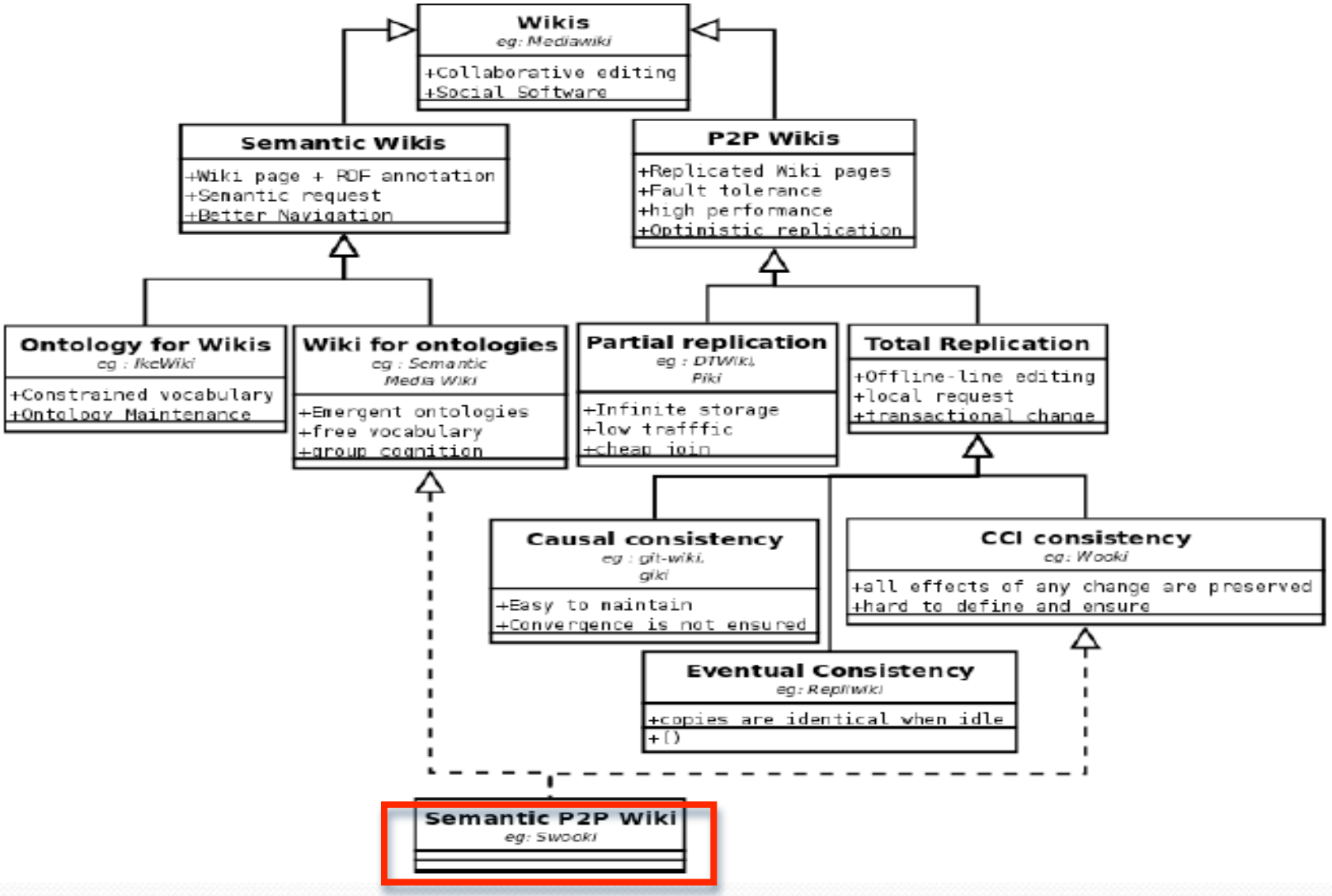
[[Category:City]]

Semantic MediaWiki

- Annotations in context
- Human readable annotations
- Machines accessible annotations
- Enable the emergence of “Ontology”

Semantic Wikis

- Better search and navigation
- Machine accessible knowledge
- But still centralized
  - Performance for semantic queries
  - Availability,
  - Scalability
  - No Off-line work
  - No transactional changes : atomic changes across multiple pages.



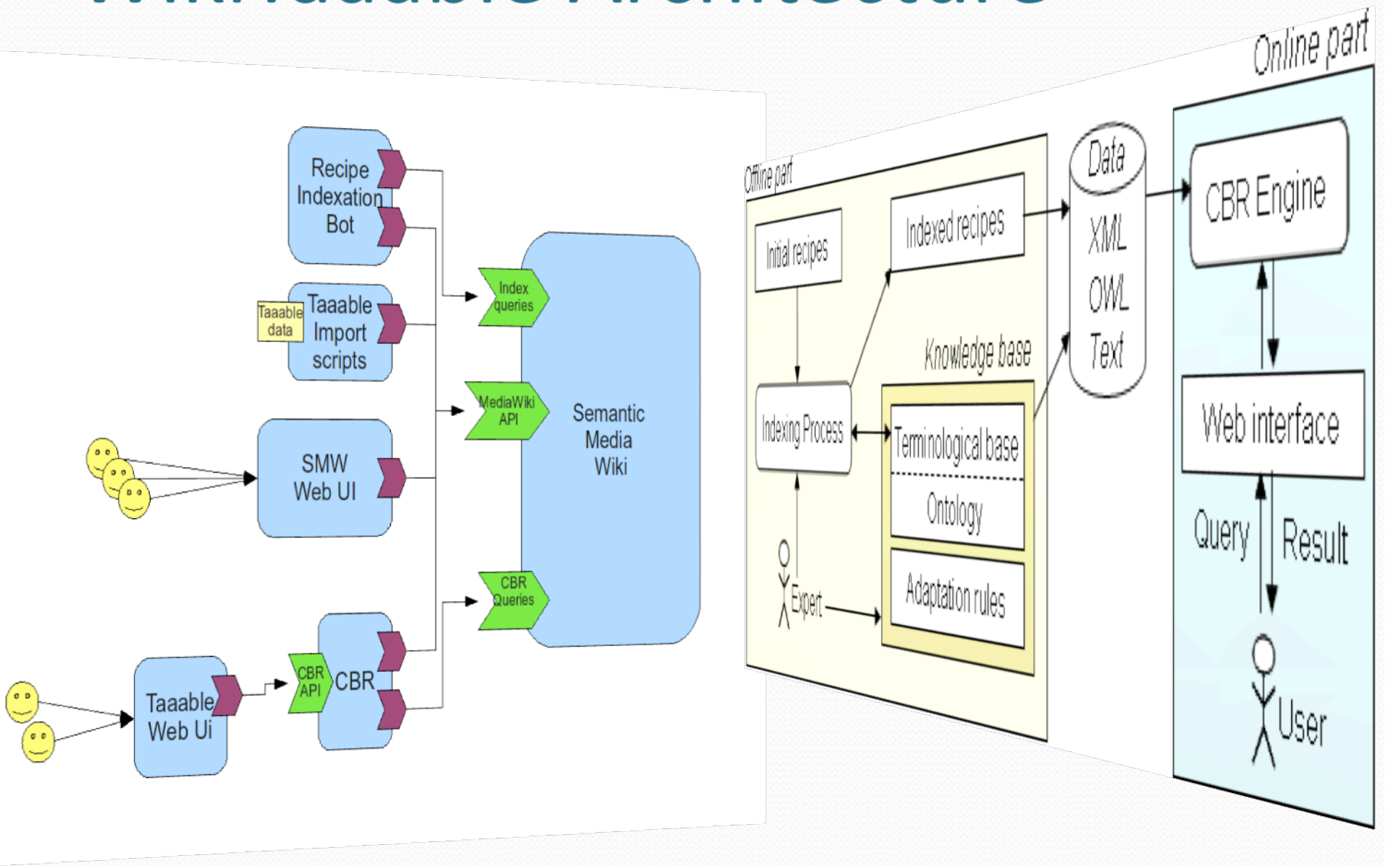
Hala Skaf-Molli, C. Rahhal, and P. Molli. Peer-to-peer semantic wiki. In DEXA'09: 20th International Conference on Database and Expert Systems Applications, August 2009.

C. Rahhal, Hala Skaf-Molli, Pascal Molli and Stéphane Weiss. Multi-synchronous Collaborative Semantic WikisIn Wise'09: International Conference on Web Information Systems, October,

WikiTaaable :Semantic MediaWiki as a blackboard

- Machines read and write :
  - Automatic indexation : reads ontology and index recipes
  - Case-based reasoning : reads indexed recipes and ontology and proposes adapted recipes.
- Humans reads and write :
  - Human can write new recipes and update the ontology in the wiki
  - Human can correct automatic indexation errors directly in the wiki
  - CBR proposed recipes, feedback of humans are written back in the knowledge base.
- Humans and machines collaborate together through the semantic wiki

WikiTaaable Architecture



Taaable

navigation

- Main Page
- Community portal
- Current events
- Recent changes
- Random page
- Help
- Donations

search

Go Search

toolbox

- What links here
- Related changes
- Special pages
- Printable version
- Permanent link
- Browse properties

Main Page

Contents [show]

Problem pages

Referenced but does not exist...

SPARQL endpoint

http://dev1.loria.fr/mediawiki/extensions/SemanticMediaWiki/libs/rdfapi-php/rdfapi-php/netapi/model http://libresource.loria.fr/mediawiki/extensions/SemanticMediaWiki/libs/rdfapi-php/rdfapi-php/netapi/model

Example of substitution page

- IngredientSubstitution42

ViewPoints

- category:ViewPoint

Top entry points for Taaable 2

- You want to see our recipes Category:Recipe (1482)
- You want to see our recipes Category:RecipeCompulsary (1482)
- You want to see our ingredient ? Category:Ingredient (9268)
- You want to see our dish types ? Category:Dishtype (1364)
- You want to see our dish origin ? Category:Dishorigin (440)
- You want to see our dish role ? Category:Dishrole (694)
- You want to see top primitive class for Ingredient, dish types, dishes origins and dish role? Category:TopPrimitiveClass (10793)
- You want to see top primitive class for Ingredient, dish types, dishes origins and dish role? Category:Thing (10793)
- Additional actions Category:AdditionalActions (0)
- Additional actions Category:IngredientOR (7113)

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Category:Ingredient

Subcategories

There are 13 subcategories to this category.

A

- [-] Accompaniment
  - [+] Candied food
  - [+] Condiment
  - [+] Mushroom
  - [+] Olive
  - [+] Pickle
  - [+] Preserve and fruit butters

B

- [+] Baking supplies

D

- [+] Dairy

F

- [+] Fat and oil

F cont.

- [-] Flavoring
  - [+] Fortified wine
  - [+] Garlic
  - [+] Ginger and other rhizome
  - [+] Onion
  - [+] Seed
  - [+] Spice
- [-] Fruit
  - [+] Berry
  - [+] Citrus fruit
  - [+] Common tropical fruit
  - [+] Dried fruit
  - [+] Exotic tropical fruit
  - [+] Fruit vegetable
  - [+] Melon
  - [+] Pome fruit
  - [+] Stone fruit

G

- [+] Grain
- [+] Grain product

L

L cont.

- [-] Liquid
  - [+] Alcohol
  - [+] Coffee
  - [+] Cultured milk product
  - [+] Juice
  - [+] Milk and cream
  - [+] Stocks, broths and gravies
  - [+] Tea
  - [+] Vinegar
  - [+] Water and soda

M

- [+] Miscellaneous

U

- [+] Unclassifiedfood

V

- [+] Vegetarian

Apple pudding - lighter

Ingredients [edit]

- 1 c Sugar category:granulated_sugar (1, c, ?, ?, ?)
- 1/8 c Lighter Bake (1/8, c, ?, ?, lighter bake)
- 2 md Eggs category:egg (2, ?, medium, ?, ?)
- 1 c Flour category:all-purpose_flour (1, c, ?, ?, ?)
- 1 ts Nutmeg category:nutmeg (1, tsp, ?, ?, ?)
- 1/2 ts Cinnamon category:cinnamon (1/2, tsp, ?, ?, ?)
- 2 c Apples; peeled and diced category:apple (2, c, peeled,diced, ?, ?)
- 1 c Walnuts; chopped category:walnut (1, c, chopped, ?, ?)
- 1 ts Baking soda category:baking_soda (1, tsp, ?, ?, ?)
- 1/8 c Hot water category:water (1/8, c, hot, ?, ?)

Preparation [edit]

- Cream sugar and shortening together. Add eggs and mix at low speed until blended. Stir flour, nutmeg and cinnamon together and add to egg and sugar. Mix. Stir in apples and nuts. Dissolve baking soda in hot water, then stir into batter. Pour into greased and floured square baking dish. Bake at 375 degrees until knife inserted at center comes out clean. Approx baking time 35 - 45 minutes.

1.

Facts about Apple pudding - lighter RDF feed

IngredientLine	category:granulated_sugar (1, c, ?, ?, ?) + 🔍, (1/8, c, ?, ?, lighter bake) + 🔍, category:egg (2, ?, medium, ?, ?) + 🔍, category:all-purpose_flour (1, c, ?, ?, ?) + 🔍, category:nutmeg (1, tsp, ?, ?, ?) + 🔍, category:cinnamon (1/2, tsp, ?, ?, ?) + 🔍, category:apple (2, c, peeled,diced, ?, ?) + 🔍, category:walnut (1, c, chopped, ?, ?) + 🔍, category:baking_soda (1, tsp, ?, ?, ?) + 🔍, and category:water (1/8, c, hot, ?, ?) + 🔍

Categories: Recipe | RecipeCompulsary | Side dish | Pudding dish | Dessert dish | Bread dish | Muffin dish | Roll dish

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Taaable

Ingredients

I want: orange ?

I don't want: ?

Type of dish

I want: pie ?

I don't want: ?

More options

☐ Vegetarian ☐ Nut-free ☐ No alcohol *Advanced Configuration ?*

Find recipes! Get 5! Reset query

Your request: orange D:pie

Common path: 1<citrus_fruit --> orange>

Common cost: 1.3778748590755354

#	Original recipe name	Adaptation overview	I like/I don't like
1	Apple Crumble Pie	Replace: lemon_juice by citrus_fruit	I don't like it !
2	Delicious Key Lime Pie	Replace: key_lime_juice by citrus_fruit, key_lime_peel by citrus_fruit	I like it !
3	Key Lime Pie	Replace: key_lime by citrus_fruit, key_lime_juice by citrus_fruit	I like it !
4	Strawberry Lime Pie	Replace: lime by citrus_fruit	I don't know
5	UPSIDE DOWN APPLE PIE	Replace: lemon_juice by citrus_fruit	I don't know

Results 1 - 5 on 5 | Processing time: 0.0141 secondes

t a @ a ble

IngredientSubstitution42

Positive Context : Salad

Negative Context : Potato

Positive From : Vinegar

Positive By :Citron and Salt Cost: :0.3

Facts about IngredientSubstitution42 RDF feed

HasCost	0.3 +
NegativeContext	Potato +
PositiveBy	Citron + , and Salt +
PositiveContext	Salad +
PositiveFrom	Vinegar +

Category: Substitution

Solved problems

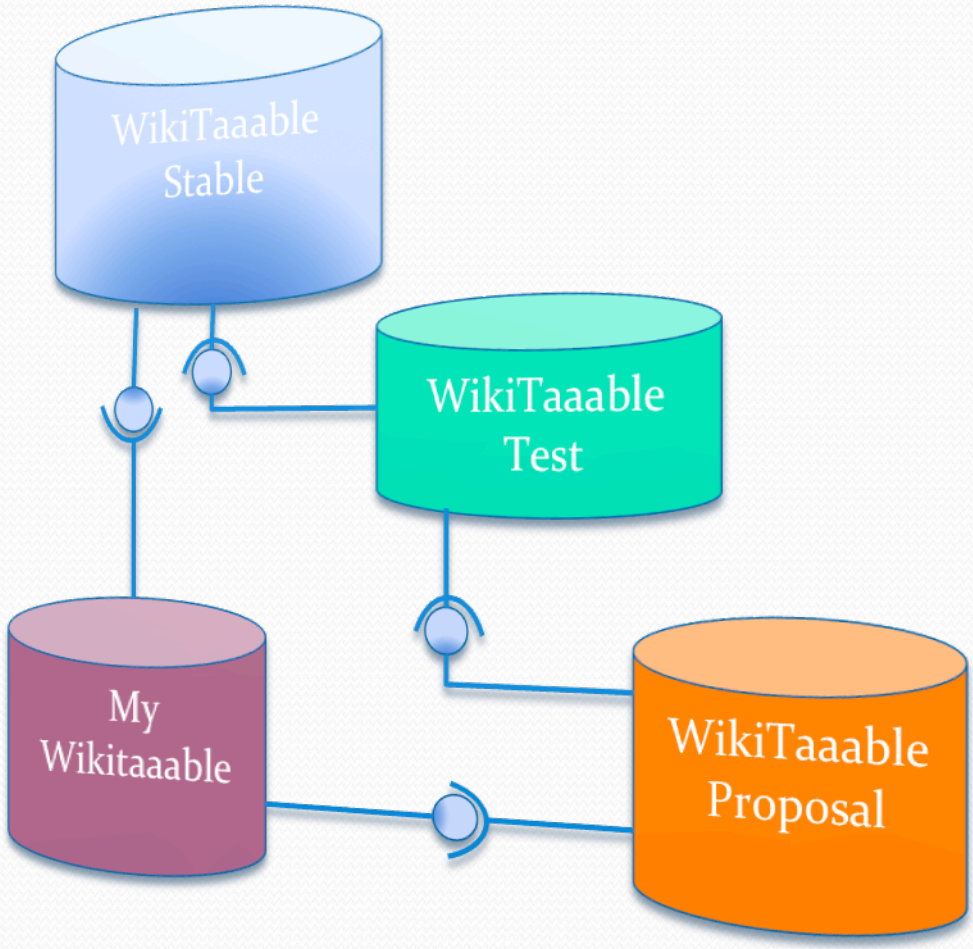
- Collaborative acquisition of knowledge
  - Recipe, ontology, adaptation knowledge
- Users can correct the indexation of recipes
- Users can browse, navigate and edit the ontology
- Modifications are immediately taken in account by the CBR engine
  - Learn from experience
    - Easy to capture the feedback of the user

Open issues

- How to avoid regression of the system ?
  - Users can make change to ontology that will invalidate previously verified requests.
  - Users can diverge on ontology evolution…
- Existing strategies:
  - Restrict ontology updates to administrators
    - not in the wiki spirit
  - Validation of changes before integration (Featured extension):
    - Manual validation of changes proposal. Time consuming for administrators.

Peer-to-peer Semantic wikis for process support…

- Personalization:
  - Personal adaptation
- Processes models
  - Continuous integration model.
- Problematic changes can be undone by using Undo mechanism



WikiTaaable

- WikiTaaable is the first example of Human-Machine collaboration relying on a semantic wiki.
- P2P Semantic wikis as distributed blackboard for supporting Human-machine collaboration
- WikiTaaable system participates champion of the 2nd Computer Cooking Contest (CCC), 2009