Semantic Web

Social Semantic Web
<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2</td>
<td>Semantic Web architecture</td>
</tr>
<tr>
<td>3</td>
<td>Resource Description Framework</td>
</tr>
<tr>
<td>4</td>
<td>Semantic Web of hypertext and Web of data</td>
</tr>
<tr>
<td>5</td>
<td>Generating Semantic Annotations</td>
</tr>
<tr>
<td>6</td>
<td>Repositories</td>
</tr>
<tr>
<td>7</td>
<td>OWL</td>
</tr>
<tr>
<td>8</td>
<td>RIF</td>
</tr>
<tr>
<td>9</td>
<td>Web-scale reasoning</td>
</tr>
<tr>
<td>10</td>
<td><strong>Social Semantic Web</strong></td>
</tr>
<tr>
<td>11</td>
<td>Ontologies and the Semantic Web</td>
</tr>
<tr>
<td>12</td>
<td>Service Web</td>
</tr>
<tr>
<td>13</td>
<td>Semantic Web Tools</td>
</tr>
<tr>
<td>14</td>
<td>Semantic Web Applications</td>
</tr>
<tr>
<td>15</td>
<td>Exam</td>
</tr>
</tbody>
</table>
1. Motivation
2. From Web to Web 2.0: Technical solution and illustrations
   1. Definition
   2. Wikis
   3. Tagging / Folksonomies
   4. Blogs
   5. Applications
   6. The Wisdom of Crowds
3. Social Semantic Web: Technical solution and illustrations
   1. Web 3.0 Approaches
   2. Semantic Wikis
   3. Development of Ontologies
   4. Games
4. Extensions
5. Summary
6. References
MOTIVATION
Motivation (cont’d)

• File Sharing:
  – Flickr (Images)
  – YouTube (Videos)
  – Wikipedia (Online Encyclopedia)
  – Blogs
  – Open Source Community (Linux)

• File Management
  – Tagging

• Social Websites and Communication:
  – Facebook
  – LastFM
  – Skype
  – StudiVZ
  – LinkedIn, Xing

• Open Systems: APIs, partly open source allow extensions by users
Internet platform for creation of social networks

- Founded in 2004
- 64 Millionen active users
- 250,000 new registrations on average per day since Jan. 2007
- More than the half of users are not any more on college
- More than 65 Billion page views per month
- More than the half of the users visit Facebook daily
- Average Visit: 20 minutes
- Estimated market value: 15 Billion Dollars
Free Online Encyclopedia

- **2,214,717 Articles** (english Wikipedia)
- **6,383,758 registered users**
- Clever mechanisms combined with human intelligence
- High quality articles
- Uncontrolled and open

![Number of Articles Graph](chart.png)
Videoportal: free Up- and Download of Videos
• Number of videos grew by 20 percent to 6.1 million in a single month
• 45 Terabyte of Videos
• **1.73 Billion Video** Views
• All users together spent 9.305 years with watching YouTube videos
• Google paid 1.6 Billion Dollars for YouTube in 2008
FROM WEB TO WEB 2.0: TECHNICAL SOLUTION AND ILLUSTRATIONS
Web 1.0 to Web 2.0

• Evolution

• Definition

• Applications and success stories

• Statistics to Web 2.0
Web 2.0 is a notion for a row of interactive and collaborative systems of the internet.
**What is the web 2.0? „Definition“ by O’Reilly**

<table>
<thead>
<tr>
<th>Web 1.0</th>
<th>Web 2.0</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoubleClick</td>
<td>Google AdSense</td>
<td>personalized</td>
</tr>
<tr>
<td>Ofoto</td>
<td>Flickr</td>
<td>tagging, community</td>
</tr>
<tr>
<td>Britannica Online content</td>
<td>Wikipedia</td>
<td>community, free</td>
</tr>
<tr>
<td>Webseiten publishing</td>
<td><strong>blogging</strong></td>
<td>dialogue</td>
</tr>
<tr>
<td>CMS directories taxonomy</td>
<td><strong>wikis tagging</strong> folksonomy</td>
<td>flexibility, freedom community</td>
</tr>
</tbody>
</table>

Consumers → Prosumers
What is the Web 2.0? - Examples

- Gmail
- Google Notebooks (Collaborative Notepad in the Web)
- Wikis
- Wikipedia
  - Worlds biggest encyclopedia, Top 30 web site, 100 languages
- Del.icio.us (Social Tagging for Bookmarks)
- Flickr (Photo Sharing and Tagging)
- Blogs, RSS, Blogger.com
- Programmableweb.com: 150 web-APIs
Blogs

• Easy usable user interfaces to update contents
• Easy organization of contents
• Easy usage of contents
• Easy publishing of comments
• Social: collaborative (single users but strongly connected)
• Wiki → invented by Ward Cunningham
• Collection of HTML sites: read and edit
• Most famous and biggest Wiki: Wikipedia (MediaWiki)
  – But: Also often used in Intranets (i. e. our group)
• Problems solved socially instead of technically
• Flexible structure
• Background algorithms + human intelligence
• No new technologies
• social: collaborative (nobody owns contents)
• **Open**  
  Should a page be found to be incomplete or poorly organized, any reader can edit it as they see fit.

• **Incremental**  
  Pages can cite other pages, including pages that have not been written yet.

• **Organic**  
  The structure and text content of the site are open to editing and evolution.

• **Mundane**  
  A small number of (irregular) text conventions will provide access to the most useful page markup.

• **Universal**  
  The mechanisms of editing and organizing are the same as those of writing so that any writer is automatically an editor and organizer.

• **Overt**  
  The formatted (and printed) output will suggest the input required to reproduce it.
• **Unified**
  Page names will be drawn from a flat space so that no additional context is required to interpret them.

• **Precise**
  Pages will be titled with sufficient precision to avoid most name clashes, typically by forming noun phrases.

• **Tolerant**
  Interpretable (even if undesirable) behavior is preferred to error messages.

• **Observable**
  Activity within the site can be watched and reviewed by any other visitor to the site.

• **Convergent**
  Duplication can be discouraged or removed by finding and citing similar or related content.
Social Tagging

- Idea: Enrich contents by user chosen keywords
- Replace folder based structure by an organisation using tags
- New: Simple user interfaces for tagging and tag based search
- First steps to Semantic Web?
- Technically: user interfaces
- **Social: collaborative** (own contents, shared tags)
Collaborative Tagging

Tons of Linux Links save this
first posted by ramee_27 on 2005-10-20 ... saved by 182 other people (136 recently)

Linux.com / My sysadmin toolbox save this
first posted by screaming on 2006-03-25 ... saved by 126 other people (102 recently)

Linux App Finder save this
first posted by kjelmarwell on 2005-03-25 ... saved by 94 other people (79 recently)
Tagging: Flickr.com

**Tags / beach / clusters**

  - See more in this cluster.

- **tree**, **palm**
  - See more in this cluster.

- **brazil**, **brazil**
  - See more in this cluster.
Folksonomies

Data created by tagging, knowledge structures

Mary tags [www.wikipedia.org](http://www.wikipedia.org) with wiki wikipedia encyclopedia
Bob tags [www.wikipedia.org](http://www.wikipedia.org) with wiki web2.0 encyclopedia knowledge
• Rights for Tagging
  – Self-tagging: Contents only tagged by owner (Technorati)
  – Free-for-all tagging: Tagging by all users (Yahoo!)

• Support of Tagging
  – Blind Tagging: Existing Tags are not displayed (Flickr)
  – Viewable Tagging: Existing Tags are displayed (Del.icio.us)
  – Suggestive Tagging: Suggestions for Tags (MyWeb 2.0)

• Aggregation of Tags
  – Bag-model: Multiple entries (Del.icio.us)
  – Set-model: Only single entries (YouTube)
Types of Resources

- Text vs. Others (Images, URL, Places, ...)

Source of Resources

- Participant (Upcoming)
- System (Last.fm)
- Arbitrary web resource (Del.icio.us)

Connection between resources

- linked, grouped, none

Social Connections
Social Bookmarking Tools like Flickr or del.icio.us are very successful and have a big community.

Why users participate to such systems?

What are their targets?
Tag Clouds

All time most popular tags

amsterdam animal animals april architecture art australia baby barcelona beach berlin bird birthday black blackandwhite blue boston bridge building bw california cameraphone camping canada car cat cats chicago china christmas church city clouds color colorado concert day dc dog dogs england europe family festival fireworks florida flower flowers food france friends fun garden geotagged germany girl graduation graffiti green hawaii holiday home honeymoon house india ireland italy japan july june kids lake landscape light london losangeles macro march may me mexico moblog mountains museum music nature new newyork newyorkcity newzealand night nyc ocean orange oregon paris park party people phone photo pink portrait road roadtrip rock rome sanfrancisco school scotland sea seattle sign sky snow spain spring street summer sun sunset taiwan texas thailand tokyo toronto travel tree trees trip uk untold urban usa vacation vancouver washington water wedding white winter yellow zoo

Size of Tags: count of usage

Browsing replaces Searching

Different meaning for different users

Orientation in Information Set
What is the Web 2.0? Trends for Web Applications

- **Technical Evolution**
  - **Web User Interfaces become faster** *(AJAX)*
  - **Desktop shifts to Web** *(GMail, Google Notebooks, AJAX)*

- **Social Evolution**
  - **Collective creates additional value** *(Wiki, Tagging)*
  - **Free contents become popular** *(Licenses)*
  - **Attention is getting monetarized** *(Text-Ads)*
  - **Websites with additional value by recombination** *(Mash-Ups, RSS)*
Intrinsic Motivation

- Altruism
- **Value for user** (Tags: organization, reusability)
- **Acceptance** in community
- **Affiliation** to community, one common target
- Autonomy
- Attention
- **Self expression** (Facebook)
- **Social component** (meet other people)

(Kuznetsov, 2004; Marlow et al., 2006)
Wikinomics: Web 2.0 in Companies

- Potential
- Wikinomics
- Wisdom of Crowds
Don Tapscott
„A new way to economize with revolutionary ways of cooperation. People are working together on projects self organized without hierarchies and inflexible organization structures."

• voluntary cooperation,
• candidness,
• a culture of sharing,
• global acting,
• „Mass Collaboration“
• Open Source community (Linux)
• Ideagoras: Companies publish problems and ask for solutions
• “virtual communities such as Second Life, where participants can create unique identities and interact with others (even to the point of exchanging goods and services for money in the real world)“
• „Prosumers“ create contents collaboratively: Film „Snakes on a Plane“
• Companies like Google and Amazon open their systems (APIs) for free use
James Surowiecki, 2004

Collective Wisdom

• Coordination
• Cooperation

Basics:

• Information Diversity
• Freedom of opinion
• Decentralizing
• Aggregation
SOCIAL SEMANTIC WEB: TECHNICAL SOLUTION AND ILLUSTRATIONS
## Semantic Web + Web 2.0 = Web 3.0?

<table>
<thead>
<tr>
<th></th>
<th>Web 2.0</th>
<th>Web 3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tagging</strong></td>
<td>• Annotation with Tags</td>
<td>• Annotation with concepts</td>
</tr>
<tr>
<td></td>
<td>• Singular/Plural Problem</td>
<td>• Inferenz (Tag „Dog“ --&gt; Tag „Animal“)</td>
</tr>
<tr>
<td></td>
<td>• Synonyms</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No Intelligence</td>
<td></td>
</tr>
<tr>
<td><strong>Recombination</strong></td>
<td>• Mash-Ups developed earlier by programmer</td>
<td>• Spontaneous by End User</td>
</tr>
<tr>
<td><strong>data from different sources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Search</strong></td>
<td>• Keyword Search or Tag Search <em>finds</em> documents</td>
<td>• Structured Search combines Data and <em>creates</em> documents</td>
</tr>
<tr>
<td><strong>Period</strong></td>
<td>• 2004 - 2007</td>
<td>• 2007 – 2010</td>
</tr>
</tbody>
</table>

Based on Vökl, Vrandecic and colleagues.
Web 3.0 Approaches

- **Automatic Extraction** of knowledge based on big (and free) sets of data, generated by Web 2.0
- **Integration and Reuse** of knowledge (Yahoo Pipes)
- **Motivate** users for generating semantic contents by using Web 2.0 paradigms
- **Creation of Semantic** as side effect of working processes (semantic wikis)
Gartner Hype Curve
Web 2.0 and the Semantic Web

• Web 2.0 and Semantic Web are complementary approaches
• Semantic Blogging
• Semantic Wikis
  – Semantic MediaWiki
• Web 2.0 ontology building
  – myOntology
• Semantically interlinked communities
  – SIOC
• Games for semantic content creation
  – OntoGame
Semantic Blogging

- Creating blog entries in a structured fashion
- Based on ontologies
- This allows:
  - Acquiring complementary information from the Web
  - Finding blog entries better
Semantic Wikis

• A semantic wiki is a wiki that has an underlying model of the knowledge described in its pages.
• Regular, or syntactic, wikis have structured text and untyped hyperlinks.
• Semantic wikis, on the other hand, allow the ability to capture or identify information about the data within pages, and the relationships between pages, in ways that can be queried or exported like database data.
• Wikis:
  – Platypus wiki
  – IkeWiki
  – Kiwi
  – WikiFactory
  – Semantic MediaWiki
Structured Knowledge can be exported (in RDF standard)

- New Web 2.0 Applications are possible
- Reusing of knowledge beyond language borders
- Aggregated Search over more than one site
- Quality: Finding of mistakes and conflicts
  - Has every country a capital city?
  - Is every person born before dying?
  - Does the population density match to population and area?
Semantic Wiki = Wiki + Semantic Web

• Semantic MediaWiki: Extension of the MediaWiki Software

• Syntax extension allows **typed links**
  • Page **Karlsruhe**
    – Up to now: ... in the south of [[Germany]] ...
    – Now: ... in the south of [[is in::Germany]] ...

• Syntax extension allows **annotation of values**
  • Page **Karlsruhe**
    – Up to now: ... has a population of 280,000 people. ...
    – Now: ... has a population of [[population:=280000]] people.

Based on Völkl, Vrandecic and colleagues.
San Diego

San Diego is a city located in the southwestern corner of California, the extreme southern county seat of San Diego County. As of the 2000 census, the city had a total population of 1,305,736 residents. The city is the second largest in California and is one of the most dense cities in the United States. San Diego is known for its beautiful beaches, mild climate, and sunny weather. The city is named after San Diego de Alcala.

Its coordinates are 32°42′54″N, 117°09′45″W, its elevation is 12.6 m.

According to the United States Census Bureau, the city has a total area of 963.6 km². 840.0 km² of it is land and 123.5 km² (47.7 mi²) of it is water. The total area is 12.8% water.

Most notably, San Diego was the location of the International Symposium on Wikis 2006. The location of the San Diego Zoo and the San Diego Chargers.

Relations to other articles

- Click + to find similar articles.
- San Diego is a city.
- San Diego is located in California and United States.
- San Diego is county seat of San Diego County.
- San Diego is named after San Diego de Alcala.
- San Diego is location of WikiSym 2006, San Diego Zoo, and San Diego CI.

Attributes of San Diego

- Click + to find similar attributes.
- Population: 1,305,736.
- Climate: temperate.
- Features: many beaches and sunny weather.
- Coordinates: 32°42′54″N, 117°09′45″W. (32.715°N, 117.153°W) + find maps
- Elevation above sea level: 12.6 m (0.013 km, 0.008 miles).
- Area: 963.6 km² (372.648 miles²).

Summary:

Based on Völkli, Vrandecic and colleagues.
What is located in California?

Simple semantic search

Fill in either the upper or lower row of the input form to search for relations or attributes. However, if an attribute value is given, the attribute name must be specified as well. As a special feature, you may press the right button to obtain results. Just pressing Return may not work.

Subject article: Relation name: Object article: 
Is located in: California 
Search Relations

Attribute name: Attribute value:

Search results (relations)

Sacramento County is located in California
San Diego is located in California
Sacramento is located in California
Talk: San Diego is located in California
San Diego Simple is located in California

Relation: Is located in

Something is located in something if it geographically...

This is a transitive relation, i.e., if A is located in B and B is located in C, then the system should also return A if users search for everything located in C. Such reasoning can greatly reduce the amount of typed links that one needs to specify (consider, e.g., in how many things Berlin is located in). However, at the moment, this feature is not supported or treated in any special way, but this page gives an example of how one could define such information.

Based on Völk, Vrandecic and colleagues.
Web 2.0 ontology building

• Make use of various Web 2.0 paradigms to capture knowledge required for ontologies
• Lower entrance barriers for users
• Usually emphasis on collaboration
• Ontologies as community contracts
• Methods for consensus finding
• Visualization of ontologies
• Examples:
  – Myontology
  – Soboleo (image annotation)
Ontology editor for Semantic MediaWiki

- [http://smw-active.sti-innsbruck.at](http://smw-active.sti-innsbruck.at)
• Ontology Element Management
  – Management of vocabularies, categories, properties, and elements
  – Enhanced user interface: tagcloud, forms, tree-view
  – Enriched content through external media (e.g. Flickr)

• Knowledge Repair
  – Statistical analysis of knowledge within the wiki
  – Detection and correction of inconsistencies
  – Discovery of redundancies

• Knowledge Import
  – Folksonomy import through mapping to the SKOS ontology
myOntology

- Collaborative creation of ontologies
- A tool which helps specialists and ontology experts to collaborate easily
- MyOntology uses the Web 2.0 paradigm

www.myontology.org
• **Collaboration** of specialists and ontology experts

• In first phase (until **lightweight ontologies**)

• High **usability**

• Integration and Reusing of web knowledge (Web 2.0: Folksonomies, Flickr, YouTube, Wikipedia, etc.)

• „Background intelligence“ supports development team
Semantically interlinked communities

- Semantically-Interlinked Online Communities (SIOC)
- Connecting forums, posts from many types of online communities (blogs, forums, mailing lists, etc.)
- Interesting possibilities:
  - Distributed linked conversations
  - Decentralised discussion channels and communities
A prerequisite for the Semantic Web to become a reality is the availability of annotated data.

Building the Semantic Web is not a one-time task, but a continuous effort.
Observation

There are tasks that are easy for humans but difficult for computers

Cf. Von Ahn

Not all the tasks on the Semantic Web can be automated. Some at least partly require human intelligence.
Web 2.0 is Hot, Semantic Web is Not. Why?

- Web 2.0 applications enjoy great popularity
- The **incentive** structures are clear (Marlow et al., 2006; Kuznetsov, 2004)
- Incentives for **ontology building**, **ontology alignment**, and **semantic annotation** have not been investigated so far
The OntoGame Idea and Principles

Make people weave the Semantic Web by playing cool multi-player online games.

1. Fun and intellectual challenge
2. Consensus
3. Massive content generation
Potential - An Example

- 50 individuals around the globe play in every single moment for half a year
- **216,000 hours** (50 * 24 * 180) of intellectual work
- Average wage of 10 € for conceptual modeling tasks
- **2 Million €** on the labor market
- 4 conceptual choices per game round of two minutes

- **12 Million conceptual modeling choices in half a year**
  (216,000 * 60 = 12,960,000)
10 Challenges

1. Identifying suitable tasks in semantic content creation
2. Designing games
3. Designing a usable, attractive interface
4. Identifying suitable knowledge corpora
5. Preventing cheating
6. Defusing typical pitfalls of conceptual modeling
7. Distribution of labor
8. Fostering user participation
9. Deriving formal representations
10. Scalability and performance
The OntoGame Series

OntoTube: Annotating YouTube Videos
OntoBay: Annotating eBay Offerings
OntoPronto: Linking Wikipedia/DBpedia URIs to PROTON
SpotTheLink: Aligning UNSPSC and eC@ss

Step 1: Build and Maintain Semantic Web Vocabularies
Step 2: Align Semantic Web Vocabularies
Step 3: Annotate Content and Maintain Annotations

Weaving the Semantic Web by Online Gaming
Features

• Players paired randomly and anonymously
• Best strategy to get points: truthful answers
• Live mode, single player mode, chess mode (remote)
• Skip
• Limited amount of time
• Cheating:
  – Anonymity
  – Pre-recorded challenges
• Generic gaming platform
• Derive formal representations of the data
Lupicinus
Lupicinus was a Roman lieutenant of Valens in Thrace in the late fourth century AD. [1]

**hint**
- "Dog" is a class (as several entities of this class exist)
- "Lassie" is an instance

**Is this Wikipedia page about a:**
- single object or happening ➔ = instance
- set/type of objects ➔ = class

**or rather describing a:**
- single object or happening ➔ = instance
- set/type of objects ➔ = class

**YOUR PARTNER INFO**
OntoTube: Annotating YouTube videos
EXTENSIONS
Social Semantic Web Extensions

• Semantic wikis
• Semantic blogs
• Games for semantic content creation
• Collaborative and community-driven ontology engineering
• Projects:
  – www.active-project.eu
  – www.kiwi-project.eu
  – www.insemtives.eu
The Web has undergone change from „Web 1.0“ to „Web 2.0“.

Web 2.0 stands for more user interaction, the change from consumers to prosumers, the programmable Web, collaboration, easy interfaces, etc.

This movement has triggered enormous user participation. Many tools provide strong incentives to their users.

Social Semantic Web approaches aim at combining parts of Web 2.0 with semantics.

Examples including Semantic Wikis, Semantic blogs, games for Semantic content creation, etc.
References

- [http://semanticweb.org](http://semanticweb.org)
<table>
<thead>
<tr>
<th>#</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2</td>
<td>Semantic Web architecture</td>
</tr>
<tr>
<td>3</td>
<td>Resource Description Framework</td>
</tr>
<tr>
<td>4</td>
<td>Semantic Web of hypertext and Web of data</td>
</tr>
<tr>
<td>5</td>
<td>Generating Semantic Annotations</td>
</tr>
<tr>
<td>6</td>
<td>Repositories</td>
</tr>
<tr>
<td>7</td>
<td>OWL</td>
</tr>
<tr>
<td>8</td>
<td>RIF</td>
</tr>
<tr>
<td>9</td>
<td>Web-scale reasoning</td>
</tr>
<tr>
<td>10</td>
<td>Social Semantic Web</td>
</tr>
<tr>
<td>11</td>
<td>Ontologies and the Semantic Web</td>
</tr>
<tr>
<td>12</td>
<td>Service Web</td>
</tr>
<tr>
<td>13</td>
<td>Semantic Web Tools</td>
</tr>
<tr>
<td>14</td>
<td>Semantic Web Applications</td>
</tr>
<tr>
<td>15</td>
<td>Exam</td>
</tr>
</tbody>
</table>
Questions?