Linked Data in Linguistics for NLP and Web Annotation

http://nlp2rdf.org
http://lod2.eu

Sebastian Hellmann
AKSW, Universität Leipzig
How can we leverage the Data Web for natural language processing?

1. Use the Data Web as background knowledge for NLP

2. Use Data Web technologies for integrating NLP tools & approaches

3. Make the output of NLP tools available on the Data Web

On the Web, by sharing and copying the value of information increases

50 Billion facts covering all kinds of domains are readily available
Leverage the wisdom of the crowds

RDF is all about semantic interoperability
1. Use the Data Web as background knowledge for NLP

Linguistic Data currently filed under “cross-domain”
1. Use the Data Web as background knowledge for NLP

Three communities with three resources:

- Working Group for Open Linguistics Data (OWLG)
  – > http://linguistics.okfn.org
- DBpedia Internationalization Committee
  – > http://wiki.dbpedia.org/Internationalization
- Wiktionary2RDF Wrappers
  – > http://dbpedia.org/Wiktionary

All communities are open, please join!
The Linguistic Linked Open Data Cloud

Draft of the Linguistic Linked Open Data (LLOD) cloud

- As of February, 2012
  - Lexical-semantic resources (LSRs), schemes for LSRs
  - Metadata and terminology repositories, linguistic KBs
  - Annotated corpora, schemes for annotated corpora

Resources:
- WOLD
- WordNet
- Wiktionary
- Cornetto
- Open Data Thesaurus
- YAGO
- DBpedia
- OpenCyc
- Europarl
- Localized DBpedias
- FrameNet
- OLiA Annotation Models
- OLiA Reference Model
- MASC
- NEGRA sample
- APICS
- ASJP
- Glottolog
- Langdoc
- QHL
- ISOcat morphosyntax
- OLS
- PHOIBLE
- WALS
- Lexvo
- GOLD
- lingvoj
- POWLA
- Open Linguistics Working Group
  - http://linguistics.okfn.org/llod
DBpedia Internationalization Committee
List of DBpedia language Chapters (May 2012)

http://wiki.dbpedia.org/Internationalization
Wiktionary2RDF – Mediator Wrapper

http://dbpedia.org/Wiktionary

Mediator Lemon
Golden Hammer Anti-pattern

The question is not whether to use RDF and Linked Data, but when to use...
2. Use Data Web Technologies for Integrating NLP Tools and Approaches

- Ontologies provide (formal) documentation (UML, ERD)
- Structure is easy to understand
- Wide range of RDF tools can be used, e.g. LOD2 Stack
- Indexing and querying as Big Picture possible
The NLP Interchange Format (NIF) is an RDF/OWL-based format that aims to achieve interoperability between Natural Language Processing (NLP) tools, language resources and annotations.

- **Road map**
  - Bootstrapped by LOD2, but a community project
  - First release in September 2011
  - Great resonance
    - Over 50 people joined the mailing list:  
      http://lists.okfn.org/mailman/listinfo/open-linguistics
    - First third party implementations and contributions
    - Several project discuss usage
  - Currently setting up advisory board, next draft in July
S. Auer and S. Hellmann: The Web of Data: Decentralized, collaborative, interlinked and interoperable
3. Make the Output of NLP Tools available on the Web

Currently there is no standard mechanism to transparently combine the WWW, GGG and NLP

GGG = Giant Global Graph (basically the Web of Data)

see: http://dig.csail.mit.edu/breadcrumbs/node/215
3. Make the Output of NLP Tools available on the Web

Linked Data

The Semantic Web isn't just about putting data on the web. It is about making links, so that a person or machine can explore the web of data. With linked data, when you have some of it, you can find other, related, data.

Like the web of hypertext, the web of data is constructed with documents on the web. However, unlike the web of hypertext, where links are relationships anchors in hypertext documents written in HTML, for data they links between arbitrary things described by RDF. The URIs identify any kind of object or concept. But for HTML or RDF, the same expectations apply to make the web grow:

1. Use URIs as names for things
2. Use HTTP URIs so that people can look up those names.
3. When someone looks up a URI, provide useful information, using the standards (RDF*, SPARQL)
4. Include links to other URIs, so that they can discover more things.

Simple. In fact, though, a surprising amount of data isn't linked in 2006, because of problems with one or more of the steps. This article discusses solutions to these problems, details of implementation, and factors affecting choices about how you publish your data.

The four rules

I'll refer to the steps above as rules, but they are expectations of behavior. Breaking them does not destroy anything, but misses an opportunity to make data interconnected. This in turn limits the ways it can later be reused in unexpected ways. It is the unexpected re-use of information which is the value added by the web.
3. Make the Output of NLP Tools available on the Web

3. Make the Output of NLP Tools available on the Web

Linked Data

The Semantic Web isn't just about putting data on the web. It is about making links, so that a person or machine can explore the web. With linked data, if you have some of it, you can find other, related, data.

Like the web of hypertext, where links are constructed with documents on the web. However, unlike the web of hypertext documents written in HTML, for data they links URIs identify any kind of object or concept. But for HTML or RDF, now:

1. Use URIs as resource names.
2. Use HTTP URLs as base URLs from which other URIs can be inferred.
3. When some or all of the data is structured, use the standards (RDF, SPARQL)
4. Include links to other URIs, so that they can discover more things.

Simple. In fact, though, a surprising amount of data isn't linked in 2006, because of problems with one or more of the steps. This article discusses solutions to these problems, details of implementation, and factors affecting choices.

http://annotateit.org
http://sourceforge.net/projects/fragmentlinks/
3. Make the Output of NLP Tools available on the Web

NLP Interchange Format (NIF) join the mailing list at:
http://nlp2rdf.org

@PREFIX : http://www.w3.org/DesignIssues/LinkedData.html#

<table>
<thead>
<tr>
<th>Scheme 1: Offset-Based</th>
<th>offset_717_729</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifier _ Begin Index _ End Index</td>
<td></td>
</tr>
</tbody>
</table>

:offset_717_729
sso:oen dbpedia:Semantic_Web ;
rev:hasComment "Hey Tim, good idea that Semantic Web!" .

<table>
<thead>
<tr>
<th>Scheme 2: Context-Hash-Based</th>
<th>hash_10_12_60f02d3b96c55e137e13494cf9a02d06_Semantic%20Web</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifier _ Context length _ String length _ MD5 Hash _ String MD5 Hash = md5(&quot;The (Semantic Web) isn't jus&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

:hash_10_12_60f02d3b96c55e137e13494cf9a02d06_Semantic%20Web
sso:oen dbpedia:Semantic_Web ;
rev:hasComment "Hey Tim, good idea that Semantic Web!" .

Hellmann et.al.: Towards an Ontology for Representing Strings In: EKAW 2012
Contact

Address

University of Leipzig
Faculty of Mathematics and Computer Science
Institute of Computer Science
Department of Business Information Systems

Postfach 100920
04009 Leipzig
Germany

Project: http://lod2.eu
Presenter: http://bis.informatik.uni-leipzig.de/SebastianHellmann
NLP2RDF page: http://nlp2rdf.org

Acknowledgement:
some slides are taken from the keynote of Sören Auer at LREC 2012