

Importing Terminology into Semantic MediaWiki

Harold Solbrig

Division of Biomedical Statistics
and Informatics

Mayo Clinic

Normalizing Terminology

Terminology comes in a variety of forms:

- RDF (SKOS, OWL, DC, FOAF, ad-hoc, ...)
- XML (Ontylog, VoTe, ...)
- Tabular (SNOMED-CT, many others)
- DB (UMLS, ...)
- Excel (UNSPSC, ...)
- PDF (ICD-9-CM, HCPCS, ...)

Terminology Normalization

Semantic Normalization

Semantic Normalization

- Unique entity identifiers
 - Label, Code, Nomenclature, CID, ...
- Entity designations
- Entity definitions, comments (flavors), instructions
- Relationships

Terminology Normalization

Syntactic Normalization

Once the *semantics* is harmonized, it is possible to specify multiple “isosemic” syntaxes

- XML – for transforms and interchange
- RDF – for reasoners and triple stores
- *Wiki* – for loading into SMW

Semantic Normalization

LexGrid terminology model:

- Defines semantic entities:
 - codingScheme
 - codedEntry (“entity” in latest release)
 - presentation, definition, comment & associated metadata
 - Various forms of relationships / associations
 - *Mapping to native terminology (!)*

Semantic Normalization

LexGrid Model

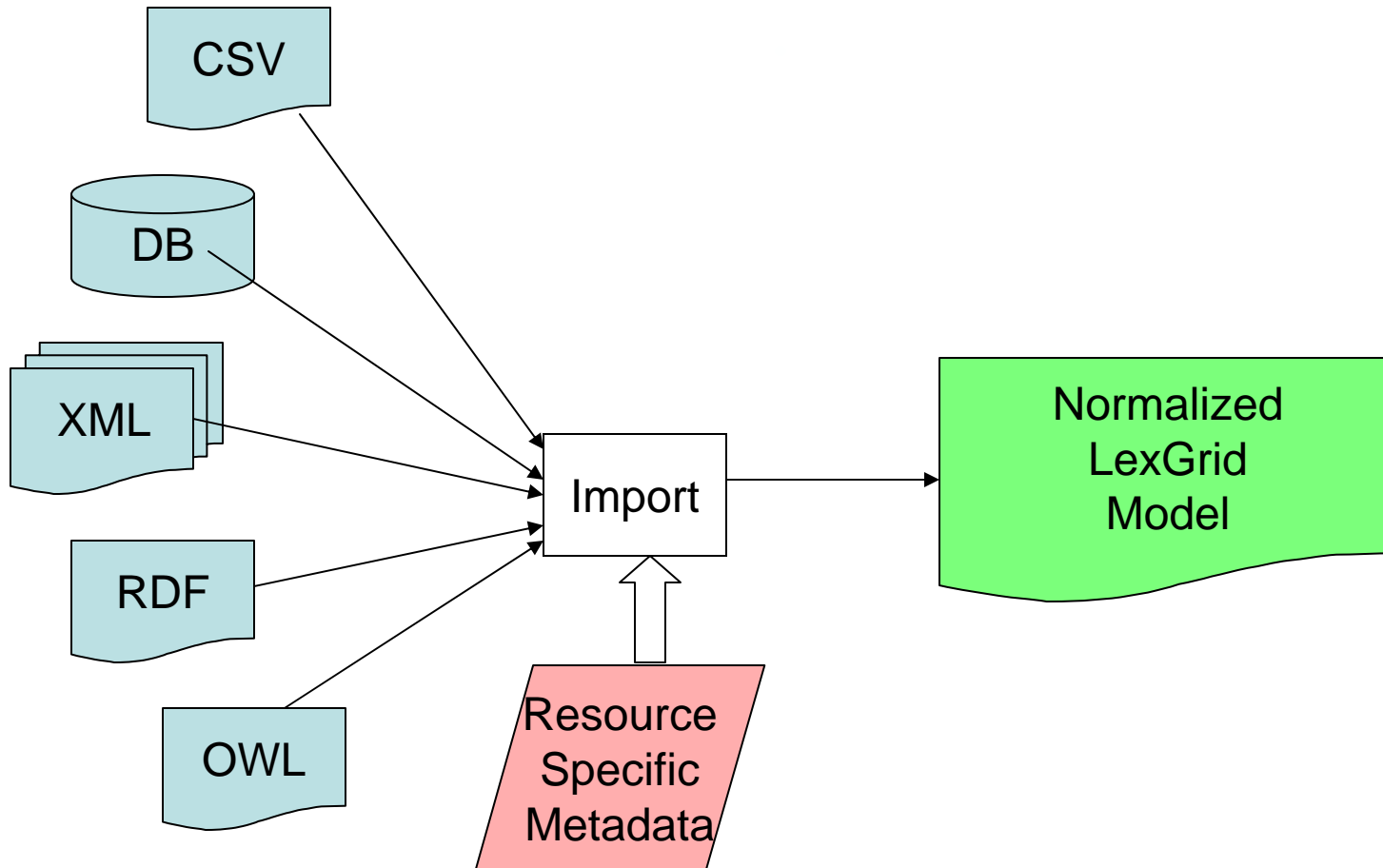
Model is available in:

- XML Schema
- UML
- Castor / EMF / JAXP

Available software includes:

- Variety of loaders / dumpers
- Query and service API's

LexGrid Transformation



Example Snippet from SKOS Core

```
<rdfs:Class rdf:ID="CollectableProperty">
  <rdfs:label xml:lang="en">Collectable Property</rdfs:label>
  <skos:definition xml:lang="en">A property which can be used with a skos:Collection.</skos:definition>
  <rdfs:comment xml:lang="en">The following rule applies for this property: [(?x ?p ?c) (?c skos:member ?y) (?p rdf:type skos:
  <skos:example rdf:resource="http://www.w3.org/2004/02/skos/core/examples/CollectableProperty.rdf.xml"/>
  <rdfs:isDefinedBy rdf:resource="http://www.w3.org/2004/02/skos/core"/>
  <dc:issued>2004-10-20</dc:issued>
  <dc:modified>2005-09-29</dc:modified>
  <skos:changeNote rdf:parseType="Resource">
    <rdf:value>The statement about this resource, involving the skos:subjectIndicator predicate, was removed.</rdf:value>
    <dc:date>2005-09-29</dc:date>
    <dc:creator>Alistair Miles</dc:creator>
    <rdfs:seeAlso rdf:resource="http://www.w3.org/2004/02/skos/core/review-2#subjectIndicatorUse-1"/>
  </skos:changeNote>
  <vs:term_status>unstable</vs:term_status>
</rdfs:Class>
```


Example

LexGrid Equivalent of SKOS

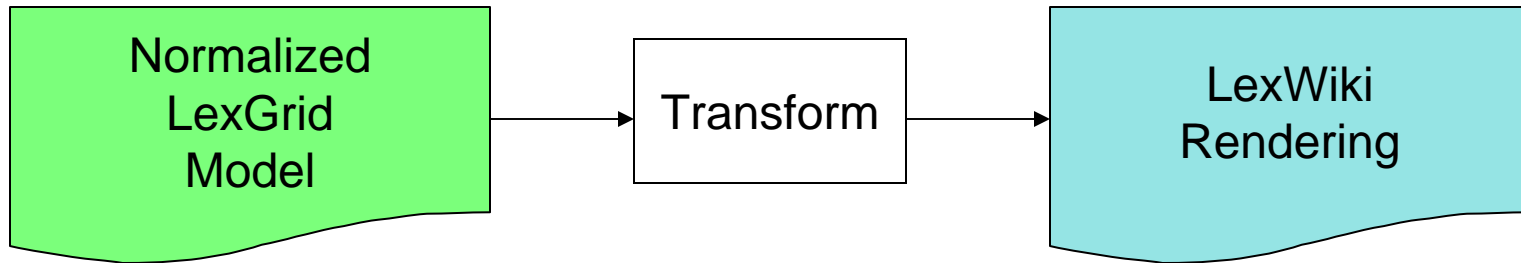
```
<lgCon:concept conceptCode="CollectableProperty" conceptStatus="unstable">
  <lgCommon:entityDescription>Collectable Property</lgCommon:entityDescription>
  <lgCon:presentation property="label" propertyId="506ec8dd-509a-46d7-a82a-8d25848c7389" language="en" isPreferred="true">
    <lgCommon:text>Collectable Property</lgCommon:text>
  </lgCon:presentation>
  <lgCon:definition property="comment" propertyId="0459ff22-2997-47d1-bd28-bd54a98addc5" language="en" isPreferred="true">
    <lgCommon:text>The following rule applies for this property: [(?x ?p ?c) (?c skos:member ?y) (?p rdf:type skos:CollectableProp
  </lgCon:definition>
  <lgCon:definition property="definition" propertyId="f015ce10-2854-47b1-874a-9fa9a3b102d6" language="en" isPreferred="false">
    <lgCommon:text>A property which can be used with a skos:Collection.</lgCommon:text>
  </lgCon:definition>
  <lgCon:comment property="changeNote" propertyId="6aa7bcb7-4409-4001-b6d9-c4cacdf6fd99">
    <lgCommon:text>(((RDF:value "The statement about this resource, involving the skos:subjectIndicator predicate, was removed.
  </lgCon:comment>
  <lgCon:conceptProperty property="example" propertyId="6b6e12b4-4c1f-4d7a-b5a7-045c92918232">
    <lgCommon:text>http://www.w3.org/2004/02/skos/core/examples/CollectableProperty.rdf.xml</lgCommon:text>
  </lgCon:conceptProperty>
  <lgCon:conceptProperty property="modified" propertyId="90655195-d042-4594-a101-cd6d1c9b6feb">
    <lgCommon:text>2005-09-29</lgCommon:text>
  </lgCon:conceptProperty>
  <lgCon:conceptProperty property="issued" propertyId="efd5623f-9fbf-447c-a7c6-9eef9ad7df03">
    <lgCommon:text>2004-10-20</lgCommon:text>
  </lgCon:conceptProperty>
</lgCon:concept>
```

Meta Information?

```
<owl:Class rdf:about="&snap;Continuant">
  <rdfs:subClassOf rdf:resource="&bfo;Entity"/>
  <owl:equivalentClass>
    <owl:Class>
      <owl:unionOf rdf:parseType="Collection">
        <owl:Class rdf:about="&snap;DependentContinuant"/>
        <owl:Class rdf:about="&snap;IndependentContinuant"/>
        <owl:Class rdf:about="&snap;SpatialRegion"/>
      </owl:unionOf>
    </owl:Class>
  </owl:equivalentClass>
  <owl:disjointWith rdf:resource="&span;Occurrent"/>
  <rdfs:label rdf:datatype="&xsd:string">continuant</rdfs:label>
  <rdfs:comment rdf:datatype="&xsd:string">Definition: An entity [bfo:Entity] that exists in full at any time in w<
  <rdfs:comment rdf:datatype="&xsd:string">Examples: a heart, a person, the color of a tomato, the mass of
  <rdfs:comment rdf:datatype="&xsd:string">Synonyms: enduring</rdfs:comment>
</owl:Class>
```

LexWiki

LexWiki is a set of SemanticMediawiki templates that represent an “isosemic” transformation of the LexGrid model



Example

LexWiki Equivalent

```
{(MetaLexWiki_Title|1=SKOS_Collectable_Property(CollectableProperty))}
{(LexWiki_Basic Data Header)}
{(LexWiki_Concept Code|1=CollectableProperty)}
{(LexWiki_PREFERRED Name|1=Collectable_Property|2=en)}
{(LexWiki_inScheme|1=SKOS|2=2006-04-18)}
{(LexWiki_Presentation|1=rdfs_label(label)|2=Collectable_Property|3=en)}
{(LexWiki_Definition|1=The following rule applies for this property: [(?x ?p ?c) (?c skos:member ?y) (?p
rdf:type skos:CollectableProperty) implies (?x ?p ?y)]|language=en)}
{(LexWiki_AltDefinition|1=A property which can be used with a skos:Collection.|language=en)}
{(LexWiki_URI|1=http://www.w3.org/2004/02/skos/core#CollectableProperty)}
{(LexWiki_Basic Data Trailer)}
{(LexWiki_Concept Property Header|1=3)}
{(LexWiki_Concept Property|1=DCTerms_Date_Issued(issued)|2=2004-10-20)}
{(LexWiki_Concept Property|1=DCTerms_Date_Modified(modified)|2=2005-09-29)}
{(LexWiki_Concept Property|1=SKOS_example(example)|2=http://www.w3.org/2004/02/skos/core/examples
/CollectableProperty.rdf.xml)}
{(LexWiki_Concept Property Trailer)}
{(LexWiki_Association Header|1=1)}
{(LexWiki_Parent|1=Category:SKOS_Top_Thing(@))}
{(LexWiki_Association|1=rdf_hasType(type)|2=rdfs_Class(Class))}
{(LexWiki_Association Trailer)}
```

SMW Rendering of SKOS Example



The screenshot shows a web interface for a SKOS Collectable Property. At the top, there are navigation tabs: 'category' (selected), 'discussion', 'view source', and 'history'. Below these is the title 'Category:SKOS Collectable Property(CollectableProperty)'. The main content area is titled 'SKOS_Collectable_Property(CollectableProperty)' and has sub-tabs: 'Lexical' (selected), 'Properties', 'Associations', and 'Factbox'. The 'Lexical' tab displays the following information:

- Concept Code:** CollectableProperty
- Preferred Name:** Collectable Property
- Coding Scheme:** SKOS (2006-04-18)
- label:** Collectable Property (en)
- Definition:** The following rule applies for this property: `[(?x ?p ?c) (?c skos:member ?y) (?p rdf:type skos:CollectableProperty) implies (?x ?p ?y)] (en)`
- Alt Definition:** A property which can be used with a skos:Collection.
- URI:** <http://www.w3.org/2004/02/skos/core#CollectableProperty>

Below the main content, there is a section titled 'Queries for categories' with the text: 'Ask for all instances of "SKOS Collectable Property(CollectableProperty)" and for all instances of its subcategories'. Underneath is a section titled 'Schema information for category "SKOS Collectable Property(CollectableProperty)"' which contains a text box with the text: 'Category: SKOS Top Thing(@)'. On the left side of the page, there is a navigation menu with the following items:

- navigation
 - Main Page
 - Recent changes
 - Help
- agrovoc
 - AGROVOC
 - AGROVOC Categories
- other terminologies
 - RDF
 - RDF Schema
 - Dublin Core
 - DCMI Metadata Terms
 - DCMI Types
 - DC Abstract Model
 - OWL
 - SKOS
 - SKOS Mapping
 - SKOS Extensions

XML and SMW

Additional Comments

Naive XML to Template Transform is reasonably simple:

```
<entity1 a1="v1" a2="v2">  
  <entity2 a3="v3">text</entity2>  
</entity1>
```

```
{{entity1_start|a2=v1|a2=v2}}  
{{entity2|a3=v3|value=text}}  
{{entity1_end}}
```

XML and SMW

Syntax transform is relatively trivial...

... Maybe we should just embed an XML parser?

Semantics are the difficult part.

XMI and SMW

XMI – interchange format for UML (and other things)

As of XMI 2.1, formal transformations between XMI, XML Schema, Java, ...

Available

Sample XMI

```
<packagedElement xmi:type="uml:Class" xmi:id="EAID_7AB0F39C_E4D6_498c_A122_82F11B7462F7" name="codedEntry" visibility="public">
  <ownedAttribute xmi:type="uml:Property" xmi:id="EAID_7A6E7F6F_E860_4713_9A4E_E693C49FA490" name="conceptCode" visibility="public" isC
    <lowerValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000005_E860_4713_9A4E_E693C49FA490" value="1"/>
    <upperValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000006_E860_4713_9A4E_E693C49FA490" value="1"/>
    <type xmi:idref="EAnone_conceptCode"/>
  </ownedAttribute>
  <ownedAttribute xmi:type="uml:Property" xmi:id="EAID_893CCDF4_8C36_428e_931B_157FE012797C" name="conceptStatus" visibility="public" i
    <lowerValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000007_8C36_428e_931B_157FE012797C" value="0"/>
    <upperValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000008_8C36_428e_931B_157FE012797C" value="1"/>
    <type xmi:idref="EAnone_localId"/>
  </ownedAttribute>
  <ownedAttribute xmi:type="uml:Property" xmi:id="EAID_3433DF68_3285_4264_B8E6_9AFBC00CA7D0" name="isActive" visibility="public" isDerive
    <lowerValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000009_3285_4264_B8E6_9AFBC00CA7D0" value="0"/>
    <upperValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000010_3285_4264_B8E6_9AFBC00CA7D0" value="1"/>
    <type xmi:idref="EAnone_tsBoolean"/>
  </ownedAttribute>
  <ownedAttribute xmi:type="uml:Property" xmi:id="EAID_7167AECC_A4E3_4397_B78D_69A539640964" name="isAnonymous" visibility="public" is
    <lowerValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000011_A4E3_4397_B78D_69A539640964" value="0"/>
    <upperValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000012_A4E3_4397_B78D_69A539640964" value="1"/>
    <type xmi:idref="EAnone_tsBoolean"/>
  </ownedAttribute>
  <ownedAttribute xmi:type="uml:Property" xmi:id="EAID_F9CCED77_55DE_47cc_A3D1_885373017D50" name="propertyLink" visibility="public" isC
    <lowerValue xmi:type="uml:LiteralInteger" xmi:id="EAID_LI000013_55DE_47cc_A3D1_885373017D50" value="0"/>
```

XMI as Templates

```
{{MetaLexWiki_Title|1=lgCon_codedEntry(codedEntry)}}
{{LexWiki_Basic Data Header}}
{{LexWiki_Concept Code|1=codedEntry}}
{{LexWiki_PREFERRED Name|1=codedEntry|2=en}}
{{LexWiki_inScheme|1=lgCon|2=2006/01}}
{{LexWiki_Presentation|1=rdfs_label(label)|2=codedEntry|3=en}}
{{LexWiki_Definition|1=A concept code within a coding scheme or a coding scheme version.|language=en}}
{{LexWiki_URI|1=http://LexGrid.org/schema/2006/01/LexGrid/concepts#codedEntry}}
{{LexWiki_Basic Data Trailer}}
{{LexWiki_Concept Property Header|1=0}}
{{LexWiki_Concept Property Trailer}}
{{LexWiki_Association Header}}
{{LexWiki_Parent|1=Category:lgCommon_versionableAndDescribable(versionableAndDescribable)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasConceptCode(codedEntryConceptCode)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasConceptStatus(codedEntryConceptStatus)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_isActive(codedEntryIsActive)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_isAnonymous(codedEntryIsAnonymous)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasPropertyLink(codedEntryPropertyLink)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasInstruction(codedEntryInstruction)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasComment(codedEntryComment)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasPresentation(codedEntryPresentation)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasProperty(codedEntryProperty)}}
{{LexWiki_Association|1=rdfs_domainFor(domain)|2=Property:lgCon_hasDefinition(codedEntryDefinition)}}
{{LexWiki_Inverse Association|1=rdfs_hasRange(range)|2=Property:lgCon_hasConcept(conceptsConcept)}}
{{LexWiki_Association Trailer}}
```

Additional Steps

Formal XMI Templates

Attribute Label vs. Type Issue