Ontology Engineering
Lecture 8: Bottom-up Ontology Development – SKOS

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Slides by Jos de Bruijn, who based it on slides by Mark van Assem,
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• **SKOS**
  
  – “Simple Knowledge Organisation System(s)"
  
  – Simple, extensible, machine-understandable representation for “concept schemes”
  
  • Thesauri
  • Classification Schemes
  • Taxonomies
  • Subject Headings
  • Other types of ‘controlled vocabulary’...
SKOS Development

• Developed by W3C’s Semantic Web Best Practices-WG
• Draft for Working Group Note
• Design: public, consensus-driven, open community, email
• Input from actual vocabulary maintainers
Motivation

Semantic Web technology can help improve search facilities and reuse:

1. Concept-based search instead of text-based search
2. Reuse each other’s concept definitions
3. Search across (institution) boundaries
4. Standard software
1. Concept Search

• Painter Domenikos Theotocopoulos = “El Greco” (nickname)
• Some indexers use “El Greco”, others “D. Theotocopouloos”
• Searching for “El Greco” does not give all results
• Solution: one concept with different lexical labels.
Example

- N.B.: vocabulary with *identifiers* for preferred terms and indexing with *identifiers* accomplishes this
2. Reuse

• Reuse existing concept “El Greco”

 проведите 1: one “exchange syntax”

 проведите 2: “point” at other concepts
3. Search Across Boundaries

- Search for concept “El Greco” returns paintings from both institutions
  - Same requirements
4. Standard Software

• If all concept schemes use same “exchange syntax” and “structure”, standardized software can be built to:
  – Display/browse concept scheme
  – Annotate with concept scheme
  – Integrate data from 2 institutions using standard concept schemes (“search across boundaries”)

☞ Req. 3: Similar structures (graphs) in exchange syntax
Why SKOS helps

SKOS uses RDF
- sharing “graphs” in distributed environment (intranet/internet)
- Uses URIs for “pointing” (identifying)
- Easy to extend by anyone for specific purposes

☞ “exchange syntax”
☞ “Point at concept”

SKOS: set of classes and properties to describe concept schemes
- Produce “similar graphs”

☞ “Same structures” / clear what graph means

Disadvantage: unusual concept schemes don’t fit into SKOS (original structure too complex)
Quick RDF: a ‘Statement’

A.K.A. a ‘Triple’

or...

‘xsdsadadghdafasf’
Quick RDF: a ‘Graph’
Quick RDF: exchange syntax

- RDF Graphs can be exchanged in XML (and other formats)

- Alternative ways to represent & exchange the same graph

- Here we only discuss RDF graphs, exchange syntax is “lower-level” technical issue
Controlled Vocabulary

Love

Strong feelings of attraction towards, and affection for, another adult, or great affection for a friend or family member.

Awe

A feeling of great respect sometimes mixed with fear or surprise.

Joy

A feeling of bliss and great happiness.
Converting into SKOS graph

1. Identify
2. Describe
3. Publish
• Step 1: Identify concepts…
  
  http://www.example.com/concepts#love
  http://www.example.com/concepts#awe
  http://www.example.com/concepts#joy
• Step 2: Describe...

`ex:love`  
\[ \text{rdf:type} \rightarrow \text{skos:Concept} \]
\[ \text{skos:definition} \rightarrow \text{‘Love’} \]

‘Strong feelings of attraction towards, and affection for, another adult, or great affection for a friend or family member.’
• Step 3: Publish...

  – Put the file on a web server for programs to download & process

  – Put the file on special RDF server on which you can query with SQL-like language:
    
    • Select * from ... Where ...
Thesaurus (USE/UF)

Love  
    UF Affection  

Affection  
    USE Love  

("USE" directs user from non-pref term to pref-term that should be used in indexing and search)
Lexical Labels

ex:love

skos:prefLabel

'Love'

skos:altLabel

'Affection'
Thesaurus (BT/NT)

Love

BT Emotion

(“BT” = Broader Term)

Emotion

NT Love

NT Awe

NT Joy

(“NT” = Narrower Term)

(BT/NT only between preferred terms)
Broader/Narrower

'Emotion'

skos:prefLabel

ex:emotion

skos:narrower

skos:broader

ex:love

skos:prefLabel

'Love'
Thesaurus (RT)

Love
- RT Beauty

Beauty
- RT Love

("RT" = Related Term)

(RT only between preferred terms)
Story So Far...

• Basic Structure  
  – skos:Concept

• Lexical Labelling  
  – skos:prefLabel, skos:altLabel

• Documentation  
  – skos:definition

• Semantic Relations  
  – skos:broader, skos:narrower, skos:related
More Documentation Properties

• **skos:note**
  
e.g. ‘I’m going bananas’

• **skos:definition**
  
e.g. ‘A long curved fruit with a yellow skin and soft, sweet white flesh inside.’

• **skos:example**
  
e.g. ‘A bunch of bananas.’

• **skos:scopeNote**
  
e.g. ‘Only use for the western family of bananas’

• **skos:historyNote**
  
e.g. ‘Introduced 1986.’
Concept Schemes

• Organise a set of concepts into a **concept scheme**

• Add metadata about the scheme
  – Title
  – Rights
  – creator
Concept Scheme

http://www.ukat.org.uk/thesaurus

- dc:title: 'The UK Archival Thesaurus'
- dc:description: 'All rights reserved…'
- dc:rights: 'UK Archival Thesaurus project'
- dc:creator: 'UK Archival Thesaurus project'
- rdf:type: skos:ConceptScheme
Top Concepts

http://www.ukat.org.uk/thesaurus

skos:ConceptScheme

rdf:type

skos:hasTopConcept

skos:hasTopConcept

skos:narrower

skos:narrower

skos:narrower
Subject Indexing

• One of the main uses of concept scheme is to index documents, pictures, ...

• skos:subject
Spotted Bowerbird
Node Labels in Hierarchy

milk
<milk by source animal> (node label)
  buffalo milk
  cow milk
  goat milk
  sheep milk

(Organize terms into “subcategories” to help users find relevant term; “guide terms”; node label itself not meant for indexing)
Representation in SKOS

skos:narrower

'ex:buffalomilk'

skos:member

'ex:cowmilk'

skos:member

'ex:goatmilk'

skos:member

'ex:sheepmilk'

skos:member

ex:milk

' milk by source animal'
Story So Far...

• Documentation Properties
  – skos:note, skos:definition, skos:example, skos:scopeNote, skos:historyNote

• Concept Schemes
  – skos:ConceptScheme, skos:hasTopConcept,

• Subject Indexing
  – skos:subject

• Node Labels
  – skos:Collection, skos:member

• More properties not shown here
Extensions

• SKOS Core can be extended by refining the classes and properties of the SKOS RDF Schema

• E.g. North-Holland BT Netherlands is a part-of relationship
Example

```
ex:Netherlands rdfs:subPropertyOf ex:broaderPartitive skos:broader ex:North-Holland
```
Links

SKOS Core Homepage
http://www.w3.org/2004/02/skos/core

SKOS Core Guide
http://www.w3.org/TR/swbp-skos-core-guide

SKOS Core Vocabulary Specification
http://www.w3.org/TR/swbp-skos-core-spec

Mailing list
mailto:public-esw-thes@w3.org
http://lists.w3.org/Archives/Public/public-esw-thes/