Brief report on NKOS at JCDL2003

NKOS ECDL 2003

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Theme

- How to transform traditional KOS into systems for AI and semantic Web applications, thus
- Leveraging the large pool of knowledge available in existing KOS for lowering the cost of developing knowledge-intensive applications

Presentations

1. **From legacy knowledge organization systems to full-fledged ontologies** Dagobert Soergel, U. of MD

2. **Reengineering AGROVOC to Ontologies**. Towards better semantic structure F. Fisseha, A. Liang, J. Keizer, FAO

3. **From semantic networks, to ontologies, and concept maps: knowledge tools in digital libraries**. M. A. Gonçalves, Digital Library Res. Lab., VATech

4. **Using the NASA Thesaurus to Support the Indexing of Streaming Media** Gail Hodge, Janet Ormes, Patrick Healey, NASA Goddard

5. **Concept-based Learning Spaces. Apply domain-specific KOS principles for organizing collections/services for given applications** Terence Smith, UC Santa Barbara, Marcia Lei Zeng, Kent State Univ.; Alexandria Digital Library Project

6. **Web Services and Terminology**. Adam Farquhar, SchlumbergerSema

7. **Update on Revision to the NISO Z39.19** Thesaurus Standard and Other Terminology Standards (Amy Warner, Lexonomy, Inc./consultant to NISO)

Example 1

Consider

Reading instruction	*isa*	Instruction
Reading instruction	*has domain*	Reading
Reading instruction	*governed by*	Learning standards
Reading ability	*isa*	Ability
Reading ability	*has domain*	Reading
Reading ability	*supported by*	Perception

Example 1, cont.

Can use the rules

- Rule 1
  If X isa (type of) instruction and X *has domain* Z
  and Y *isa* ability and Y *has domain* Z
  Then X *should consider* Y

- Rule 2
  If X *should consider* **Y**
  and Y *is supported by* W
  Then X *should consider* W

Example 1, continued

ERIC Thesaurus entries

Reading instruction
- BT Instruction
- RT Reading
- RT Learning standards

Reading ability
- BT Ability
- RT Reading
- RT Perception

Broader Term (BT) and Narrower Term (NT) relations in AGROVOC

BT and **NT** are typical ***hierarchical*** relations in a thesaurus. However, their semantics is not explicitly defined.It is common for BT/NT relations within a thesauri to include at least the following:

- **Is-A** (e.g. Milk/ Cow's Milk; Development Agency/IDRC))
- **Ingredient of** (e.g. Milk/ Milk Fat)
  - Milk fat is an ingredient of milk
- **Property of** (e.g. Maize/Sweet corn)
  - Sweetness is a property of corn

Some examples from AGROVOC

MAIZE

NT dent maize
NT flint maize
NT popcorn
NT soft maize
NT sweet corn
NT waxy maize

MILK

NT Milk Fat
NT Colostrum
NT Cow's Milk

Development Agencies

NT development banks
NT voluntary agencies
NT IDRC

Related Term (RT) in AGROVOC

RT represents the ***associative*** relation. The RT usually involves the most ambiguous semantics. RT can include the following.

- causality
- agency or instrument
- hierarchy - where polyhierarchy has not been allowed the missing hierarchical relationships are replaced by associative relationships
- sequence in time or space
- constituency
- characteristic feature
- object of an action, process or discipline
- location
- similarity (in cases where two near-synonyms have been included as descriptors)
- antonym

Some examples from AGROVOC

DEGRADATION

causality

- RTchemical reactions
  RT discoloration
  RT hydrolysis
- RT shrinkage

IDRC

- RT Canada
-

location

Some ideas for reengineering AGROVOC

Most of the problems could be solved by:

1.Re-analyzing the existing relations to introduce explicit semantics: for instance,

- **BT/NT** relationship could be resolved to **'Is-A'** relation
- **RT** relationship could be refined to more specific relationships

  (such as "produces", "used by", "made for").

2.Specifying composite concepts in terms of basic concepts that can be un-ambiguously represented: for instance

- **Perishable product** could be represented as "**product"** with attribute "**perishable**"
- **Fencing sword** could be represented as **"sword" used for "fencing"**
- **Mother** could be represented as **"parent** with an attribute **female"**

Steps in converting a legacy KOS

1) Define the ontology structure
2) Fill in values from one or more legacy KOS to the extent possible
3) Edit manually using an ontology editor:
    - make existing information more precise
    - add new information

Intelligent conversion using “rules as you go”

If an editor has determined (or it is known from another source, such as FDA's food vocabulary) that there is a relationship

animal has-part milk

it can be concluded that cow NT cow's milk should become

cow has-part cow's milk

since cow is an animal and "cow's milk" contains the word "milk".

This clearly indicates that the reengineering effort should start with the topmost concepts.

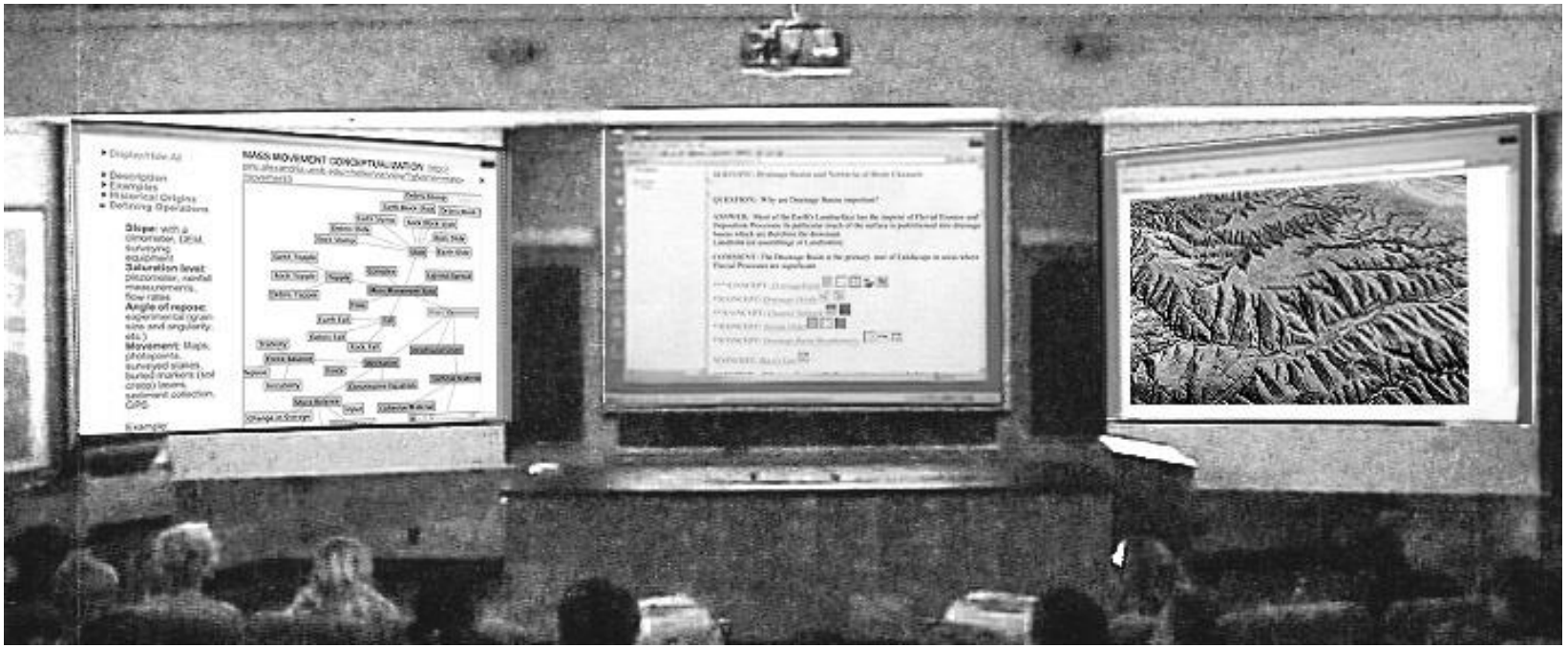
Application in education

From the Smith and Zeng Paper

Science learning spaces: Concept KOS

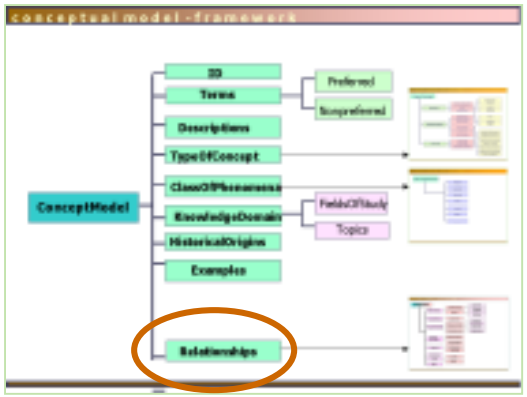
- **Concepts of science as basic knowledge granules**
  - Sets of concepts form bases for scientific representation
  - DL and KOS technology can support organization of science learning materials in terms of concepts
    - Collections of ***models of science concepts*** (knowledge base)
    - Collections of ***learning objects (LO)*** cataloged with concepts
    - Collections of ***instructional materials*** organized by concepts
- **Organize learning materials as "trajectory through concept space"**
  - Lecture, lab, self-paced materials
  - Services for creating/editing/displaying such materials

Learning environment display (*lecture mode)*



- The lecture is presented on three projection screens, showing the
  - **Concept window** (left)
  - **Lecture window** (center)
  - **Object window** (right)

- **Relationships**
  - **Hierarchical**
    - SetMembership
      - CotainedIn
      - Contains
    - Partitive
      - IsPartOf
      - HasParts
  - **ScientificUse**
    - Applications
  - **Representation**
    - HasRepresentation
      - ExplicitFull
      - ExplicitPartial
      - ImplicitFull
      - ImplicitPartial
    - PartiallyRepresents
      - ExplicitFull
      - ExplicitPartial
      - ImplicitFull
      - ImplicitPartial
  - **Defining Operation**
    - AbstractSyntactic
    - Methodological
  - **Property**
    - HasProperty
    - PropertyOf
  - **CoRelated**
  - **Causal**
    - CausedBy
    - Causes
  - **other**



6th NKOS Workshop

May 31, 2003

Houston, TX, US

Semantic Network Services

Sharing an integrated Ontology using Topic Maps and Web Services

Adam Farquhar (presenter)

KM Architect, Schlumberger, Austin, TX

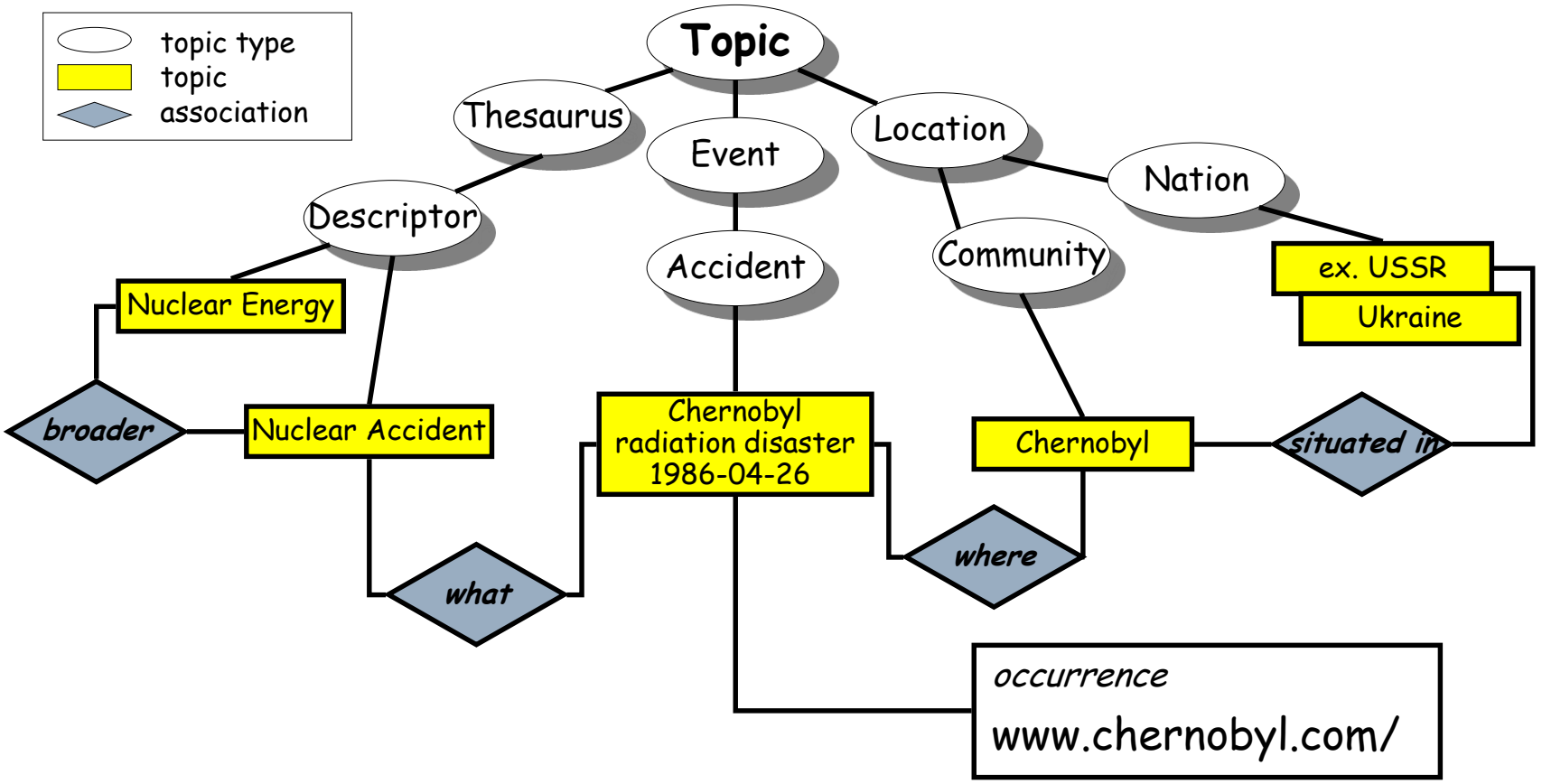
Thomas Bandholtz

KM Solution Manager, SchlumbergerSema, Cologne (DE)

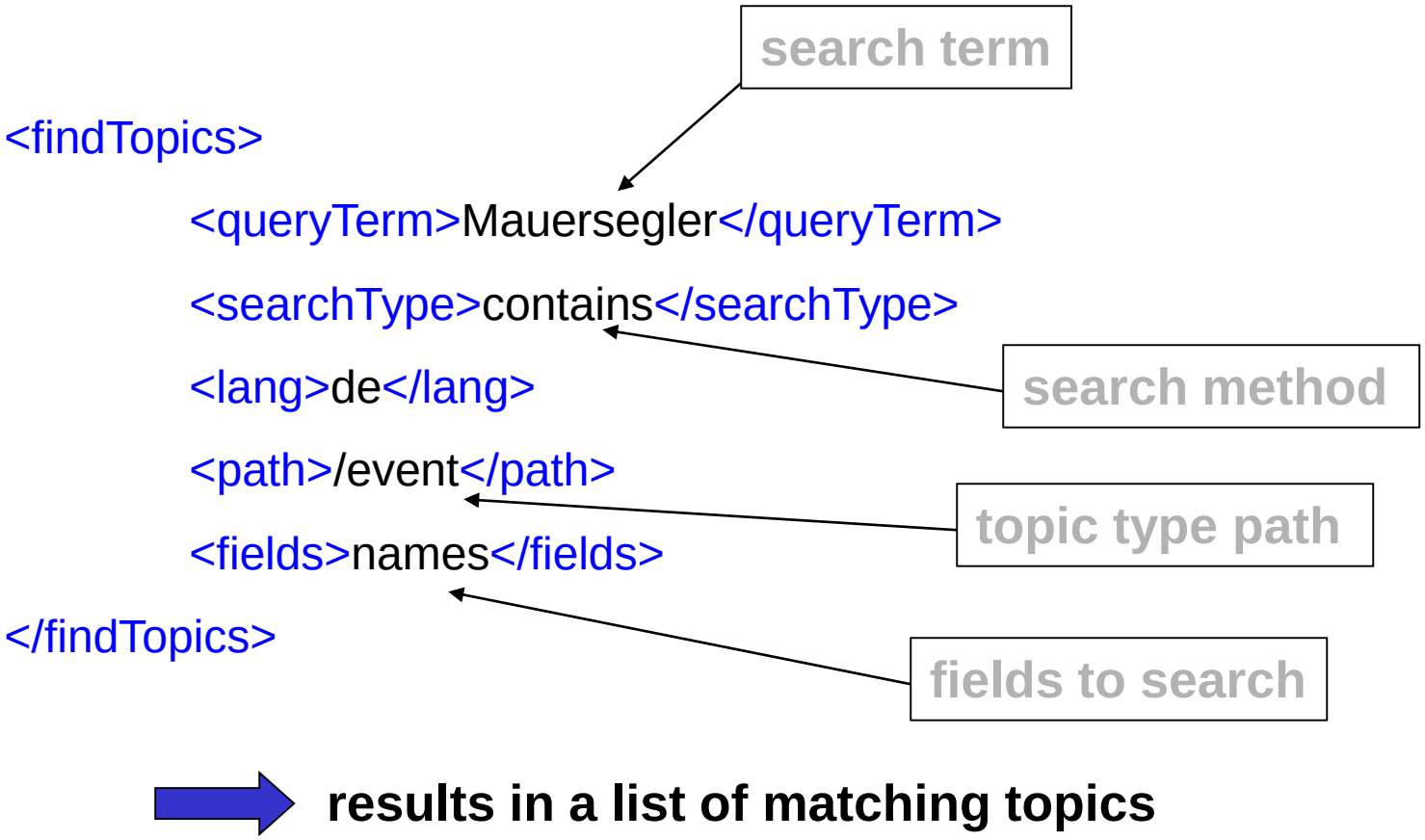
Member, OASIS TC Published Subjects & GeoLang (Topic Maps)

Research project UFOPLAN-Ref. No. 20111612, promoted by BMU/Federal Environmental Agency, Germany

Integration in a Topic Map



sns: findTopics



results in a list of matching topics

Conclusion

- Papers on how to convert legacy KOS to systems with richer, precisely defined semantics (ontologies?)
- Papers on applications of such rich ontologies
- Shows a direction the field should move in

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