Semantic Commitment for Designing Ontologies: A Tool Proposal

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Goals: - using ontologies in order to describe the content of audiovisual documents (and indexing them by their content)
- using a methodology to ease the organization of the subsumption hierarchies by normalizing the meaning of the concepts
- implementing a basic tool to support this methodology. DOE is available for free at http://opales.ina.fr/public

First Step: Semantic Normalization

1. Terms from a given domain
   - The first step aims at making explicit the meaning of the labels used for naming the concepts following differential semantics
   - A linguistic primitive is defined by the differences and similarities it maintains with its close neighborhood (in the taxonomy, its parent and its siblings).
   - The similarity with parent (SWP): gives a semantic axis, a property enabling to compare the primitive with its siblings
   - The difference with parent (DWP): explains why the primitive inherits the properties of the one that subsumes it
   - The similarity with siblings (SWS): gives a semantic axis, a property enabling to compare the primitive with its siblings
   - The difference with siblings (DWS): precises the property enabling to distinguish the primitive from its siblings
   - The difference with parent (DWP): explains the difference enabling to distinguish the primitive from its parent

2. Normalization
   - The tool assists the ontologist during the typing of the four principles and automatizes partly this task
   - The tool proposes to attach to each notion some additional information in a given language

3. Formalization
   - The second step aims at making explicit the meaning of the labels used for naming the concepts following differential semantics
   - A set of logical axioms can be added (relational algebra, partial-axioms, exhaustive partitions, etc.)
   - The tool allows to add new concepts, to set the arity and the domains of the relations
   - The tool provides some basic reasoning services: propagation of the arity among the hierarchy of relations and inheritance of the domains

4. Operationalization
   - The third step aims at linking the linguistic primitives to a set of referents using ontologies in order to describe the content of audiovisual documents (and indexing them by their content)
   - The tool proposes to attach to each notion some additional information in a given language

Second Step: Knowledge Formalization

1. Types of terms
   - The second step aims at linking the linguistic primitives to a set of referents using a formal and extensional semantics
   - A formal concept can remain primitive or be defined (with necessary and sufficient conditions)
   - A set of logical axioms can be added (relational algebra, partial-axioms, exhaustive partitions, etc.)

2. Formalization
   - A differential ontology can be formed (ontology with the primitives specific to a domain)
   - The referential ontology is exported in a knowledge representation language (e.g. DAML+OIL, RDF/S)
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3. Operationalization
   - The third step aims at linking the linguistic primitives to a set of referents using ontologies in order to describe the content of audiovisual documents (and indexing them by their content)
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Case studies

- The cycling ontology (90 concepts and 40 relations) aims at modeling the domain of cycling race in order to describe broadcast TV programs like the Tour de France event.
- The medical ontology (1800 concepts and 500 relations) aims at modeling the coronary diseases patients suffer from in the medicine domain. It contains medical notions as well as anatomy or drugs.
- The childhood ontology as dealt with in the psychology and anthropology domains (500 concepts and 40 relations) aims at describing the practices, people, objects and theorems observed in audiovisual documents dealing with childhood.

Future Work

- The tool assists the ontologist during the typing of the four principles and automatizes partly this task.
- The tool proposes to attach to each notion some additional information in a given language.
- The second step aims at linking the linguistic primitives to a set of referents using ontologies in order to describe the content of audiovisual documents (and indexing them by their content)
- The tool allows to add new concepts, to set the arity and the domains of the relations.
- The tool provides some basic reasoning services: propagation of the arity among the hierarchy of relations and inheritance of the domains.

Top Level Ontology

- A common modeling problem: how to join the root of the ontology with the concepts specific to a domain?
- Inspiration: UpperCyc, EuroO inevitably, SUO-IEEE
- Results: the methodology makes easier the organization of this upper part even if the manipulation of the differential principles is quite difficult. For the first branches of the hierarchy
- Reusability of the main part of this top-ontology in the different ontologies studied.

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