Terminology & Ontology in the Digital Age

Renmin University (China)
26-30 October 2020

Prof. Christophe Roche
Liaocheng University (China)
Savoie Mont-Blanc University (France)

http://christophe-roche.fr
Abstract: The Digital World is made up of heterogeneous and complex systems, which have to communicate and exchange information. Smart City and the Semantic Web are representative examples of such systems. However, communication and knowledge sharing require agreement on the terms used and their meaning. Terminology and Ontology understood as a vocabulary whose term meaning is in a computer-readable form are the two cornerstones of the Digital World, as long as they follow the international standards.

Objectives: This one-week course (5x3h) aims to master, both from a theoretical and practical point of view, the principles, methods and tools in Terminology, Ontology and International Standards.

Courses: The teaching will alternate theoretical courses with exercises on computers. To illustrate the potential of Terminology and Ontology, two different unrelated domains of application have been chosen. The first one concerns Smart City Standards (ISO, W3C and IEC), the second one is about Digital Humanities in the context of the Semantic Web.

Participants will be required to bring their laptops.

Key words: Principles: Terminology, Ontology, Knowledge Graph, Standardization, Semantic Web
Domains of application: Smart City, Digital Humanities (Cultural Heritage)
Standardization:
- W3C Standards on Knowledge Graph, Ontology and Terminology: RDF, RDFS, FOAF, DC, SKOS, OWL, OntoLex-Lemon, etc.

Tools and Environments:
- Querying Knowledge (RDF) Graph: SPARQL
- Ontology & Terminology Building: CmapTools, Protégé, Tedi
Contents

1. A Matter of Meaning (3h)
2. Terminology & ISO Standards (3h)
3. Ontology & W3C Standards (3h)
4. Software Environments: CmapTools, Protégé, Tedi (3h)
5. Applications: Smart City & Digital Humanities (3h)
There is neither communication nor knowledge sharing without any agreement on terms and meanings. It remains to define what meaning means.

This first lesson is an introduction to the main issues about term, concept, and definition. We will see that we have to deal with two dimensions, linguistic and conceptual. Since a concept is an extra-linguistic knowledge, it requires a specific formal language for its definition. It will remain to link all these notions.

1.1 Semantic Triangle
   - Word
   - Meaning
   - Objet

1.2 Definition
   - Lexicographic definition
   - Terminological definition

1.3 Formal language
   - Computer readable language

1.4 Requirements
   - Formal definition
   - Definition in natural language
2. Terminology (Day 2 - 3h)

There is neither communication nor knowledge sharing without commitment to the terms used and to their meaning. Terminology building is, therefore, the first task to achieve. What remains is to represent term meaning in a computer-readable form in order operationalize Terminology for IT applications and to open it to the Semantic Web.

The second day will be devoted to Terminology, its principles and methods for building and representing conceptual systems as well as writing definitions both in natural language and in a computer-readable form. We will also focus on the ISO and W3C standards on Terminology on which Terminology Work relies in the Digital Age.

2.1 Terminology
- Definition(s)
- Term meaning
- Linguistic & conceptual dimensions

2.2 Standards
- ISO: 1087, ISO 704, ISO TBX, ISO LMF
- W3C: OntoLex-Lemon
Operationalization of Terminology for IT Applications, e.g. multilingual-semantic search engines, knowledge management systems, etc. requires a computational representation of the conceptual system on which relies the meaning of terms (a term is a verbal designation of a concept [ISO 1087]). Ontology, from Artificial Intelligence, understood as a specification of a conceptualization written in a computer-readable language is one of the more promising perspectives for Terminology in the Digital Age.

The third day will focus on Ontology from Knowledge Engineering, its principles and methods. The W3C standards for ontology will be presented as well as software environments for building conceptual systems.

3.1 Ontology
- Definition(s)
- Representation languages
- Methodology

3.2 Standards
- W3C: RDF, RDFS, OWL, SKOS

3.3 Environments
- CmapTools
- Protégé

https://intelligence.weforum.org/topics
Combining Ontology and Terminology, i.e. representing the conceptual system of the terminology as an ontology, opens new perspectives for Terminology, mainly, but not only, for IT applications.

The fourth day will be dedicated to Ontoterminology, a new paradigm of Terminology whose conceptual system is a formal ontology. The ontological approach requires to “rethink” Terminology in its methods and principles while at the same time rising the issue of reconciling the theories of concept from Terminology and Artificial Intelligence. A practical example carried out by attendees will illustrate this approach.

4.1 Combining Ontology and Terminology
- Concept theories in Artificial Intelligence and in Terminology
- Term definition versus concept definition
- Methodology

4.2 Practical Works
- CmapTools
- Protégé
- Tedi
5. Smart City & Digital Humanities (Day 5 – 3h)

The last day will be devoted to the presentation of 2 domains of application. The first one will focus on standards for Smart Cities, both on terminological and ontological aspects. The second one will illustrate the use of ontology and terminology for Knowledge Graphs applied to Digital Humanities.

5.1 Smart Cities
A Smart City is a network of heterogeneous systems which have to communicate and collaborate in order to improve quality of life. The IEC 60050-831 and the PAS BSI 180:2014 defines terms relating to smart cities when the Open 311 Ontology provides a reference model for representing the 311 data of cities in OWL.

5.2 Digital Humanities
The one-week course will end with the implementation of a complete example of building and populating an ontology and terminology in the domain of cultural heritage and then querying them in SPARQL.