Ontology Lifecyle

Introduction

As with software, developing an understanding of the lifecycle of ontologies and their development is a key task in the realization of the Semantic Web. Ontologies must be created, either from new or by extending existing sources. If existing sources are to be used, we must be able to find them and determine their content and suitability.

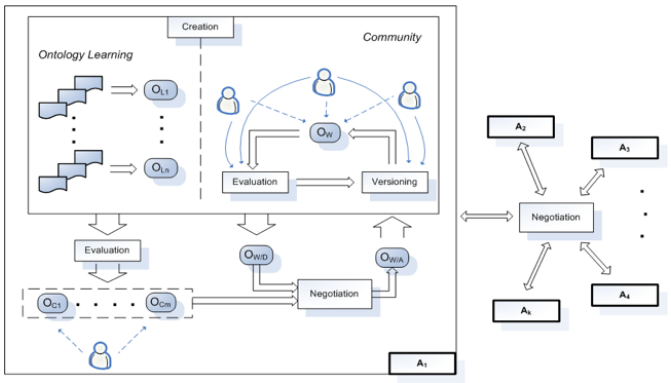
Mechanisms for evaluation of ontologies are needed, to ensure quality of both the ontologies themselves and the data that they are instantiated with.

Once developed, ontologies will evolve, introducing the need for versioning mechanisms, and corresponding evolution strategies for data annotations.

The Semantic Web is distributed – principled mechanisms for modularity will allow users to reuse and integrate existing models. In addition, modularity is vital if we are to offer scalable approaches.

This briefing highlights work undertaken by members of the KnowledgeWeb network on aspects of the ontology lifecyle.

Overview



Ontology Lifecycle

Four broad stages have been identified in the ontology lifecycle: *Creation*, *Versioning*, *Evaluation* and *Negotiation*. Creation involves either automatic ontology extraction (ontology learning), or manual ontology development, possible in a collaborative environment. Evaluation and Versioning are used to maintain ontology quality and manage changes during development. Negotiation comes into play when interchanging or sharing knowledge with independent actors in the field.

Case Studies

Investigations into Ontology Lifecycle have been in the context of use cases drawn from the domains of healthcare and biomedicine. Scenarios include:

- Longitudinal Electronic Health Records
- Epidemiological Registries
- Public Health Surveillance
- Management of Clinical Trials
- Genomics and Proteomics Research

The ontology lifecycle framework provides a complete framework for ontology creation, maintenance and mediation in data-intensive dynamic environments and thus can serve as a substantial part of semantic-enabled solutions for the investigated application domains.

Ontology Creation

Collaborative ontology creation is a community activity, which requires particular support which is lacking in state of the art "single user" ontology development tools. Support is needed for consensus building, with voting mechanisms and communication between users. The MarcOnt Portal was developed in order to supply support for collaborative ontology creation.

Text2Onto provides a framework for automatic ontology creation or ontology learning. Text2Onto is an open environment allowing the integration of learning algorithms.

Evaluation & Metrics

We can only control what we can measure. Metrics support the assessment, measurement and analysis of ontologies, and can allow us to track their evolution. Existing proposals for ontology metrics suffer from problems. In particular, they often focus on structure, and neglect to take into account the underlying semantics of the ontology languages – a key shortcoming where languages like OWL are concerned.

Normalizations – transformations that preserve semantics, but normalize the structure – have been proposed. These then allow definitions of metrics that better capture the semantics of the underlying ontologies.

Versioning

Version management is crucial in supporting the ontology lifecycle. Existing change management approaches such

as CVS provide support for *syntactic* changes that may be made to an ontology, but do not necessarily handle *semantic* changes – for example, changes in the underlying conceptualisation. The SemVersion tool supports versioning of RDF schema, at both syntactic and semantic levels.

A notion of a *Semantic Diff* encapsulates differences between ontology versions and characterises minimal information required to recreate the change from target to source ontology.

Negotiation and Argumentation

Argumentation protocols allow agents to communicate, negotiate and come to agreements. For example, in a situation where agents make use of different ontologies, a correspondence may need to be determined in order to facilitate communication between the agents. This depends partly on an adequate representation of ontology alignments (see KWeb briefing *Ontology Matching & Alignment* for further details).

An Alignment Negotiation Protocol (ANP) allows agents to use available web resources in order to find aligments and supports negotiation between agents when those correspondences do not fully satisfy both parties.

Ontology Integration

An implementation of a lifecycle platform has been delivered, tackling semi-automatic integration of ontology learning results or external ontologies into a manually developed ontology. The integration is based on automatic negotiation of agreed alignments, inconsistency resolution, ontology diff computation and natural language generation methods. This combination of techniques helps reduce end-user effort in the dynamic incorporation of new knowledge and allows application of all the dynamic ontology lifecycle features in the investigated use cases.

Ontology Outreach Advisory

The Ontology Outreach Advisory (OOA) is an association of industry, government, and research leaders working in the area of ontology development, use, and education.

Its broad mission is to develop strategies for ontology recommendation and standardization, while promoting ontology technology to industry. Specific actions of the OOA include:

- the promotion of research on ontology engineering;
- the production of quality guidelines for tools and content;
- the provision of a representative forum for experts within the field.

Work to date has focused on ontology content issues in two industrial sectors: human resources and employment, and healthcare and life sciences. The OOA has organised a number of workshops bringing together practitioners and theorists.

The OOA is an initiative of KnowledgeWeb, has been established as an an international not-for-profit association and will continue in its own right once the network has finished.

Publications & Resources

KnowledgeWeb Deliverable D2.3.7 *Negotiation/argumentation techniques among agents complying to different ontologies*

KnowledgeWeb Deliverable D2.3.8 *Report and Prototype of Dynamics in the Ontology Lifecycle*

KnowledgeWeb Deliverable D2.3.9 *Theoretical Aspects for Ontology Lifecycle*

V. Novacek, L. Laera and S. Handschuh *Semi-automatic Integration of Learned Ontologies into a Collaborative Framework*, Proceedings of WWW2207/HCLSDA, 2007.

D. Vrandecic, Y. Sure, *How to design better ontology metrics*, Proceedings of ESWC 2007, 2007/

Ontology Outreach Advisory
http://www.ontology-advisory.org

Contact

For more information about the results presented here or the KnowledgeWeb Network of Excellence, please see the project web site

http://knowledgeweb.semanticweb.org

or contact the Network Manager.

Alice Carpentier
DERI, University of Innsbruck
Technikerstraße 13
Innsbruck 6020
AUSTRIA
alice.carpentier@deri.org

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KnowledgeWeb Consortium: Centre for Research and Technology Hellas, GR; France Telecom, FR; Free University of Bozen-Bolzano, DE; Freie Universität Berlin, DE; Institut National de Recherche en Informatique et en Automatique, FR; L3S Research Center, DE National University of Ireland Galway, IR; The Open University, UK; Universidad Politécnica de Madrid, ES; University of Innsbruck; AT University of Karlsruhe, DE; University of Liverpool, UK; University of Manchester, UK; University of Sheffield. UK; University of Trento, IT; Vrije Universiteit, NL; Vrije Universiteit Brussel, BE; École Polythechnique Fédérale de Lausanne, CH