

Evolution of OWL 2 QL and EL Ontologies

Tutorial Proposal for OWLED 2012

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1 General Description

Motivation. This tutorial provides a comprehensive overview of research on evolution of ontologies based on Description Logics. We give a high-level review of the field, and put special emphasis on particularly important results and algorithms, practically interesting issues, applications and challenges.

Audience. This tutorial does not have any specific prerequisites and should be accessible to all Semantic Web researchers and practitioners. We believe that it would be of interest to the audience at OWLED, because it brings together different fundamental and practical aspects of ontology evolution. Although three of the presenters have mostly (but not exclusively) worked on theoretical and algorithmically aspects of ontology evolution, system issues and applications will be prominently featured, to reach an appropriate balance of theoretical and practical issues.

Novelty. Despite the growing interest in the area, this would be one of the very few tutorials about ontology evolution in an international conference.

2 Tutorial Objectives

The tutorial aims at providing valuable knowledge about:

- applications where ontology evolution is important;
- classification and examples of evolution problems;
- conceptual requirements to evolution operators;
- overview and drawbacks of approaches currently used in practice,
- overview and drawbacks of logic-bases approaches;
- future directions.

In addition, it summarizes the state of the art, and points out research opportunities to those who are specifically interested in studying ontology evolution.

3 Detailed Outline

Motivation: Ontologies and Evolution (10 min)

1. OWL 2 QL and EL ontologies [1,2,3].

2. Different types, purposes of ontology evolution [4,5].
3. Evolution on schema level: SNOMED [6,7].
4. Evolution on data level: life science, bioinformatics [8,9].
5. Evolution in OBDA systems, in ContentCVS system, etc. [10,11].

Requirements to Ontology Evolution Operators: (10 min)

1. Conceptual view of ontology evolution [12,4,13].
2. Requirements to evolution operators [12].

Current Approaches used in Practice (10 min)

1. Syntactic approaches based on justification [11,14,15,16].
2. SPARQL 1.1 Update [17].
3. Semantic CVS [11].

Logic-Based Approaches (40 min)

1. Conceptual view of logic-based approaches [12,18,19,20].
2. Overview and drawbacks of model-based approaches [21,12,22,23,24,25].
3. Overview and drawbacks of formula-based approaches [26,12,27].
4. Summary of issues with logic-based approaches [28].

OWL specific Evolution Approaches (10 min)

1. Syntactic-Deductive framework [26,28].
2. Experimental results [26].

Directions and Open Problems (5 min)

1. Leashing model-based approaches.
2. Update language for OWL 2 ontologies.
3. Systems to support ontology evolution.

4 About the Presenters

Bernardo Cuenca Grau holds a prestigious University Research Fellowship from the Royal Society. He is also a departmental lecturer at the Department of Computer Science, University of Oxford, and a lecturer at Oriel College. Prior to that, he was a Research Officer at the University of Oxford and a Research Fellow at the University of Manchester. His Ph.D. research was fully funded by a prestigious fellowship from the Spanish government,³ which allowed him to split his Ph.D. research between Spain and the University of Maryland (USA). His doctoral and postdoctoral research has covered many different aspects of ontology-based technologies, including (but not limited to) modularity, reuse, formalisms and languages, automated reasoning, information hiding and privacy, debugging and repair, management and versioning, as well as mapping and integration. His research has been documented in the leading journals and conferences in the areas of Artificial Intelligence (e.g., JAIR, AIJ, JAR, IJCAI, ECAI, AAAI, KR) and Web technologies (e.g., WWW, JWS, ISWC). He has been the recipient of several

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prestigious awards, including a Royal Society Fellowship, and an outstanding paper award from the Association for the Advancement of Artificial Intelligence (AAAI).

Ernesto Jimenez-Ruiz is a postdoctoral research assistant at the Department of Computer Science, University of Oxford. In 2010 he got the doctor degree with honors in Computer Science from the University Jaume I (Spain), under the supervision of Dr. Rafael Berlanga Llavori and Dr. Bernardo Cuenca Grau. His Ph.D. research was fully funded by a prestigious 4-years doctoral fellowship from the Valencian government. His research has covered several areas, including bio-medical information processing and integration, ontology/thesaurus reuse, ontology versioning, ontology/thesaurus mapping, and application of thesaurus to text mining tasks. He has published in top-tier conferences (KR, ISWC, ESWC) and journals (DKE, BMC Bioinformatics). During his Ph.D he visited several leading institutions in the UK, including the Text Mining Group at the European Bio-informatics Institute in Cambridge, the Information Management Group at University of Manchester, and the Oxford University Computing Laboratory (now Department of Computer Science).

Evgeny Kharlamov is a research assistant at the Free University of Bozen-Bolzano (FUB), Italy, where he works in the team led by Diego Calvanese. He obtained his PhD (2011) in computer science from FUB, while the actual research was conducted in both FUB, under the supervision of Werner Nutt, and Télécom ParisTech, under the supervision of Pierre Senellart. In 2011 Evgeny was a postdoctoral visiting researcher at the Department of Computer Science of Oxford University working with Michael Benedikt and at the University of Edinburgh working with Leonid Libkin. In 2009-2010 Evgeny was an intern and a research assistant at Inria Saclay, France, working with Serge Abiteboul. His research interests focus around theoretical and algorithmic aspects of the Semantic Web and database management systems. Evgeny has published papers in top-tier conferences (VLDB, KR, ICDT, EDBT, ISWC) and journals (TODS).

Dmitriy Zheleznyakov is a PhD candidate at the Free University of Bozen-Bolzano (FUB). He got his European M.Sc. degree in Computer Science from both Universidad Politécnica de Madrid and Libera Università di Bolzano in 2009. He is an alumni of the Novosibirsk State University, the Russian leading research school in several applied mathematical disciplines, where he studied mathematics. His research interests focus around theoretical and algorithmic aspects of Semantic Web Technologies. He is working under a supervision and together with Professor Diego Calvanese from FUB. Dmitriy has published several papers in the leading conferences in the areas of Artificial Intelligence and Web Technologies (KR, ISWC).

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