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Web Reasoning and Rule Systems

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Navigating among Educational Resources in the Web of Linked Data

Abstract

Linked Data seem to play a seminal role in the establishment of the Semantic Web as the next-generation Web. This is even more important for digital object collections and educational institutions that aim not only to promote and disseminate their content but also to aid its discoverability and contextualization. Having already 'semantified' a popular digital repository system, DSpace, in this paper we show how repository metadata can be exposed as Linked Data, thus enhancing their machine understandability and contributing to the LOD cloud. Our effort comes complete with an updated UI that allows for reasoning-based search and navigation between linked resources within and outside the scope of the digital repository.

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Navigating among Educational Resources in the Web of Linked Data

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Abstract. Linked Data seem to play a seminal role in the establishment of the Semantic Web as the next-generation Web. This is even more important for digital object collections and educational institutions that aim not only to promote and disseminate their content but also to aid its discoverability and contextualization. Having already 'semantified' a popular digital repository system, DSpace, in this paper we show how repository metadata can be exposed as

Linked Data, thus enhancing their machine understandability and contributing to the LOD cloud. Our effort comes complete with an updated UI that allows for reasoning-based search and navigation between linked resources within and outside the scope of the digital repository.

1 Introduction

Linked and Open Data (LOD) [2] appear to be the “silver-bullet” in the forming Semantic Web ecosystem, that promise to breathe new life to the latter’s benefits for real-world web applications. This is often combined with lightweight semantics [3] so that known scalability problems and reasoning inefficiencies could be sidestepped and still to retain some essence of the knowledge discovery capabilities of ontologies. However, tried-and-true systems like digital repositories for educational and other institutions need a little more incentive to embark on such a migration and to get tempted to adopt this new paradigm.

In this paper we present our work for publishing Linked Data and navigating among resources of a popular digital repository system, DSpace. Semantics play a crucial role and this is exhibited by an OWL 2 inference-based knowledge acquisition mechanism that lies at the core of this implementation, aka *Semantic Search for DSpace* [6]. Challenges for imposing semantic searching over otherwise semantically-oblivious systems are well-known and have been discussed earlier (e.g. [5]). Further, Linked Data provision requires a careful replication design for existing resource descriptions; a data linking and resolution mechanism; and a content negotiation strategy to serve information both to end-users and machines.

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Next, in Section 2 we describe the process of publishing and minting Linked Data out of DSpace resources; Section 3 presents the semantic querying interface and the Linked Data facility; and Section 4 summarizes our conclusions and future work.

Semantic Search is hosted and maintained as a Google Code project¹ and is listed as an official DSpace add-on². A working demo of this implementation is also available³.

2 Linking Data for DSpace

2.1 Publication and Linking of Entities

Linked Data principles are in essence a few simple rules that foster the idea of an interlinked 'Web of Data'. In our context this means that resource URIs need to be dereferenceable, to provide meaningful information for users and services alike and to give references (or links) to other related entities whenever possible.

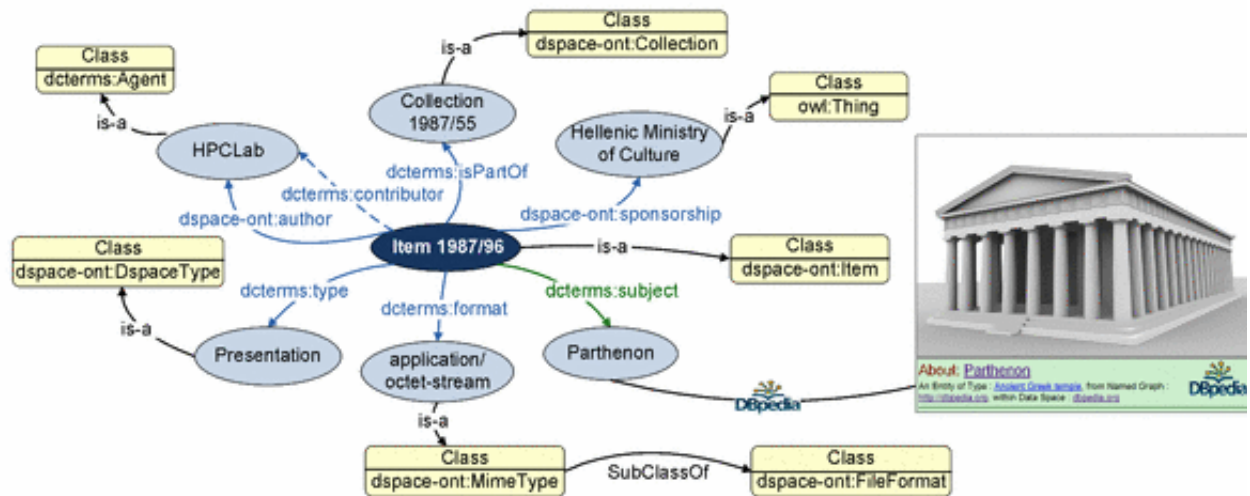


Fig. 1. Example repository item and its relationships to other entities

In DSpace the main unit of information is the 'item', i.e. a publication or learning object that is described with a set of metadata based on Dublin Core (DC). During the mapping to OWL however, we identify additional implicit entities and assign resolvable URIs to them too (see below, section 2.2). Further, these entities are linked together or refer to other external datasets like DBpedia (see section 3.2). Fig.1 illustrates a sample instance of the resulting DSpace ontology and the way it gets inter-linked with other entities and/or datasets. Using the Jersey framework⁴, the reference implementation of the Java API for RESTful services, both HTML as well as

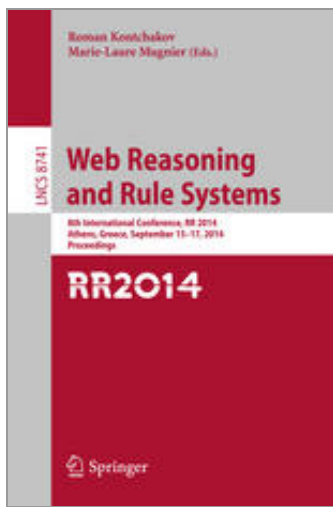
¹ <http://code.google.com/p/dspace-semantic-search/>

² <https://wiki.duraspace.org/display/DSPACE/Extensions+and+Addons+Work#Extensionsand+AddonsWork-SemanticSearchforDSpacev2.0>

³ <http://apollo.hpclab.ceid.upatras.gr:8000/dspace-ld>

⁴ <https://jersey.java.net/>

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