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A User Interface for Ontology Repositories

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Abstract. Finding ontologies and concepts from a collection of ontologies is a recurring task in many use cases, such as content indexing, searching, and ontology developing. To facilitate this, efficient search and browsing methods are needed. This paper introduces ONKI2, an ontology browser providing a user interface for a repository of ontologies. The system provides a multi-facet search facility for finding an ontology. Finding concepts is supported by autocompletion-based text search that can be refined with additional restrictions. ONKI2 is in use in the Finnish Ontology Library Service ONKI for a collection of 79 ontologies and vocabularies.

1   Introduction

Tools for finding ontologies and concepts are needed in many use cases, such as ontology development, ontology-based content indexing, and searching [1]. When looking for a suitable ontology for a given task in an ontology repository [1–4], methods for filtering the ontologies based on the needs of the user are needed. This can be facilitated using the metadata of the ontologies (e.g. name, description, subject, type) and the contents of the ontologies (i.e. the concepts of the ontology). Also, getting an overview presentation of an ontology is important for understanding the domain, purpose, and structure of the ontology. When browsing an ontology, the concepts should be presented in a clear, meaningful way to the end-user.

This paper introduces ONKI2[1], an ontology browser providing a user interface for a repository of ontologies and vocabularies. The goal of ONKI2 is to provide means for finding and utilizing ontologies for content indexers, information searchers, and ontology developers. The introduced system is in use providing access to a collection of 79 ontologies of various domains. In the following, means for finding ontologies and concepts in ONKI2 are first presented. After this, the system implementation is described. In conclusion, related work is discussed and the contributions of the paper are summarized.

2   Finding Ontologies

Finding a suitable ontology in a repository of ontologies may be laborious without efficient filtering methods. To facilitate the search process of an ontology,

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[1] http://www.yso.fi/onki2/?l=en

ONKI2 provides a multi-facet search interface integrated with text search. The idea is illustrated in Fig. 1. The available facets are the subject, structure, and publishing status of the ontology. The ontologies are assigned to the facets by utilizing the ontology metadata provided by the ontology developers, allowing filtering ontologies from different perspectives. The autocompletion text search is matched to the names and descriptions of the ontologies. In Fig. 1 the user is searching for a public (publishing status facet) advanced vocabulary (structure facet) in the domain of health or nature (subject facet) with a query string "mes".
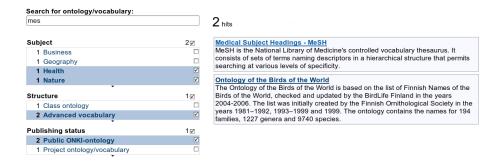

Fig. 1. Multi-facet search view of ontologies.

Once an ontology is found, it can be further examined by accessing the directory view of the ontology. The purpose of the directory is to give an overview of an ontology and act as a starting point for browsing it. Depending on the type of the ontology, the directory is either based on the groups categorizing the concepts, on the topmost concepts of the ontology (in SKOS vocabularies), or on the alphabetical ordering of the concepts. ONKI2 also supports searching ontologies based on their contents. An autocompletion text search is provided, matching to the labels of the concepts in all the ontologies of the collection. Thus, the user can find all the ontologies containing e.g. the concept "cat". Concept searching is discussed in more details in the following section.

3 Finding Concepts

For finding concepts in a collection of ontologies, ONKI2 provides a user interface with searching and browsing functionalities, as depicted in Fig. 2. Concepts can be searched by using autocompletion text search with a possibility to set additional restrictions. All the ontologies in the collection can be searched simultaneously, or alternatively the search can be limited to a single ontology. In both cases, the search is matched to the labels of the concepts. The search can be restricted to the concept labels in a specific language, to a specific concept type, to the group of concepts, or to the subconcepts of a specific concept.
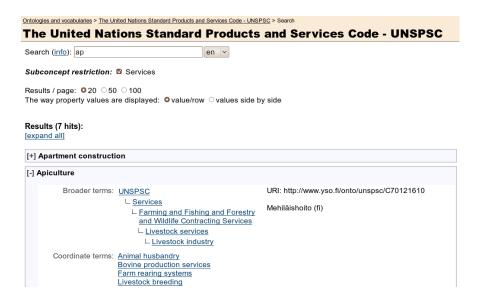
Fig. 2. Concept searching and browsing in the UNSPSC vocabulary.

The search result is presented as a list of concept label links. If there are several concepts with a same label, the concepts are grouped together assuming that they might be equivalent. When the user selects a concept, the properties of the concept are shown below the concept label, eliminating the need for unnecessary navigation between different views of the concepts. The properties are displayed in an ontology-specific meaningful order for the end-user in order to support concept understanding. The order can be specified by the developers of the ontology. Also, possible unnecessary properties can be filtered out from the property view. Moreover, the user can choose how the property values are displayed in the view. The values can either be presented compactly to minimize the used screen space, or more loosely for improved clarity. In the loose presentation mode, the superconcepts of the concept are presented as an indented hierarchy tree. In ontologies containing geographical information, a map user interface component can be used for visualizing the concepts, e.g. by placing geographical regions and points on the map.

All the property values of concepts that are resources (concepts, types, groups) are displayed as links leading to a corresponding concept or concept set, enabling the browsing of ontologies. This means that when selecting a concept from the concept hierarchy or among the related concepts of a concept, the properties of the selected concept are shown. If the selected resource is a concept group, the concepts belonging to the group are displayed as a search result list. Similarly, if a concept type is selected, concepts of that type are displayed. Mapping relations between ontologies can be used for inter-ontology browsing.

In Fig. 2 the user is searching for concepts in the vocabulary United Nations Standard Products and Services Code (UNSPSC)[2] that are subconcepts of the concept "Services". The string "ap" was used for querying the concept labels. From the search results, the user has selected the concept "Apiculture" for further investigation.

4   System Implementation

ONKI2 is implemented as a PHP[3] application by using the Zend Framework[4] for providing the Model-View-Controller architecture. The ontology multi-facet search view is generated with the SIMILE Exhibit Publishing Framework[5]. For processing the metadata of the ontologies, the ARC RDF library[6] is used. The map user interface component is provided by Google Maps[7].

The ontologies accessed with ONKI2 are represented by using RDFS, OWL, and SKOS. The ontologies are published in ONKI SKOS ontology server [5] instances. The ONKI SKOS servers are accessed by utilizing their HTTP API[8] for generating the ontology directory views, providing concept search and showing the properties of the concepts.

5   Discussion

The previously developed Ontology Library Service ONKI [1] supports publishing a collection of ontologies in different ontology servers, such as ONKI SKOS [5]. However, the ontologies are displayed only as a simple listing, and searching for concepts from all the ontologies simultaneously is not supported. Browsing between ontologies is possible if the ontologies contain mapping relations. BioPortal [2] is an ontology repository for accessing and sharing ontologies in the biomedical domain. The system is also used in the Open Ontology Repository Initiative [4]. It supports searching for concepts from all the ontologies and browsing between ontologies. Ontologies can be filtered based on their categories and groups.

Another ontology repository supporting concept searching and browsing of a collection of ontologies is Cupboard [3]. It provides an overview for an ontology by generating a graph of the key concepts of the ontology. It also supports collaboration by introducing commenting and reviewing options and shared spaces for publishing and grouping ontologies. Also semantic web search engines such as Watson [6], Swoogle [7], and Sindice[9] provide means for locating ontologies

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[2] http://www.unspsc.org
[3] http://www.php.net
[4] http://framework.zend.com
[5] http://www.simile-widgets.org/exhibit/
[6] http://arc.semsol.org
[7] http://maps.google.com
[8] http://www.yso.fi/onkirest/
[9] http://sindice.com

and concepts on the web. However, as general RDF search engines, their support for understanding and browsing ontologies is rather limited due to the lack of visualization methods suited for ontologies.

ONKI2 is a general-purpose ontology browser for a collection of ontologies, supporting finding ontologies and concepts from the collection. The ontologies and their concepts are displayed in a meaningful, intuitive way for facilitating their understanding and usage as ready to use ontology web services [1,5]. Furthermore, ONKI2 provides access to a network of distributed ontology repositories conforming to the Linked Open Ontology Services (LOOS) architecture [8].

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[10] http://www.seco.tkk.fi/projects/finnonto/