D3.3.8 ASPL-v2 Demonstrator and User Guide

Coordinator: Martin Dzbor (OU)

Other authors: Dnyanesh Rajpathak (OU)

Abstract.
EU-IST Network of Excellence (NoE) IST-2004-507482 KWEB
Deliverable D3.3.8 (WP3.3)

Work reported in this deliverable focused mainly on the learner's interaction with resources on the Semantic Web; in particular with the semi-structured data that can be exposed to the user via domain-specific inference templates. We describe the functionality of the learning services in the ASPL-v2 framework in terms of assisting users with interpreting connections in the academic domain; for example, filtering leading scientists, recognizing communities of practice, or associating research topics and issues with particular publication outlets. The services are accompanied by visual screenshots to assist the users with identifying what and how works.

Document Identifier:	KWEB/2006/D3.3.8/v1.0
Class Deliverable:	KWEB EU-IST-2004-507482
Version:	v1.0
Date:	January 20, 2008
State:	Final
Distribution:	Public

Knowledge Web Consortium

This document is part of a research project funded by the IST Programme of the Commission of the European Communities as project number IST-2004-507482 with the following partners:

University of Innsbruck (UIBK) – Coordinator
Institute of Computer Science,
Technikerstrasse 13
A-6020 Innsbruck
Austria
Contact person: Dieter Fensel
E-mail address: dieter.fensel@uibk.ac.at

École Polythechnique Fédérale de Lausanne (EPFL)
Computer Science Department
Swiss Federal Institute of Technology
IN (Ecublens), CH-1015 Lausanne.
Switzerland
Contact person: Boi Faltings
E-mail address: boi.faltings@epfl.ch

France Telecom (FT)
4 Rue du Clos Courtel
35512 Cesson Sévigné
France. PO Box 91226
Contact person: Alain Leger
E-mail address:
alain.leger@rd.francetelecom.com

Freie Universität Berlin (FU Berlin)
Takustrasse, 9
14195 Berlin
Germany
Contact person: Robert Tolksdorf
E-mail address: tolk@inf.fu-berlin.de

Free University of Bozen-Bolzano (FUB)
Piazza Domenicani 3
39100 Bolzano
Italy
Contact person: Enrico Franconi
E-mail address: franconi@inf.unibz.it

Institut National de Recherche en Informatique et en Automatique (INRIA)
ZIRST – 655 avenue de l'Europe – Montbonnot
Saint Martin
38334 Saint-Ismier
France
Contact person: Jérôme Euzenat
E-mail address: Jerome.Euzenat@inrialpes.fr

Centre for Research and Technology Hellas / Informatics and Telematics Institute (ITI-CERTH)
1st km Thermi – Panorama road
57001 Thermi-Thessaloniki
Greece. Po Box 361
Contact person: Michael G. Strintzis
E-mail address: strintzi@iti.gr

Learning Lab Lower Saxony (L3S)
Expo Plaza 1
30539 Hannover
Germany
Contact person: Wolfgang Nejdl
E-mail address: nejdl@learninglab.de

National University of Ireland Galway (NUIG)
National University of Ireland
Science and Technology Building
University Road
Galway
Ireland
Contact person: Christoph Bussler
E-mail address: chris.bussler@deri.ie

The Open University (OU)
Knowledge Media Institute
The Open University
Milton Keynes, MK7 6AA
United Kingdom.
Contact person: Enrico Motta
E-mail address: e.motta@open.ac.uk

Universidad Politécnica de Madrid (UPM)
Campus de Montegancedo sn
28660 Boadilla del Monte
Spain
Contact person: Asunción Gómez Pérez
E-mail address: asun@fi.upm.es

University of Karlsruhe (UKARL)
Institut für Angewandte Informatik und Formale Beschreibungsverfahren – AIFB
Universität Karlsruhe
D-76128 Karlsruhe
Germany
Contact person: Rudi Studer
E-mail address: studer@aifb.uni-karlsruhe.de

University of Liverpool (UniLiv)
Chadwick Building, Peach Street
Liverpool, L69 7ZF
United Kingdom
Contact person: Michael Wooldridge
E-mail address: M.J.Wooldridge@csc.liv.ac.uk

University of Manchester (UoM)
Room 2.32. Kilburn Building, Department of Computer Science, University of Manchester,
Oxford Road
Manchester, M13 9PL
United Kingdom
Contact person: Carole Goble
E-mail address: carole@cs.man.ac.uk

University of Sheffield (USFD)
Regent Court, 211 Portobello street
Sheffield, S1 4DP
United Kingdom
Contact person: Hamish Cunningham
E-mail address: hamish@dcs.shef.ac.uk

University of Trento (UniTn)
Via Sommarive 14
38050 Trento
Italy
Contact person: Fausto Giunchiglia
E-mail address: fausto@dit.unitn.it

Vrije Universiteit Amsterdam (VUA)
De Boelelaan 1081a
1081HV. Amsterdam
The Netherlands
Contact person: Frank van Harmelen
E-mail address: Frank.van.Harmelen@cs.vu.nl

Vrije Universiteit Brussel (VUB)
Pleinlaan 2, Building G10
1050 Brussels
Belgium
Contact person: Robert Meersman
E-mail address: robert.meersman@vub.ac.be

Work package participants

The following partners have taken an active part in the work leading to the elaboration of this document, even if they might not have directly contributed writing parts of this document:

OU
L3S

We gratefully acknowledge their assistance contribution to the discussion regarding ASPL scenarios, functionality and tool usability. We also acknowledge the effort of Joerg Diederich (L3S) and Jerome Euzenat (INRIA) in their roles of quality assessors.

Changes

Version	Date	Change Author	Changes
0.1	20-12-2007	Martin Dzbor	First draft of the user guide
0.2	11-01-2008	Dnyanesh Rajpathak	Review
1.0	20-01-2008	Martin Dzbor	Finalization

Executive Summary

Work reported in this deliverable focused mainly on the learner's interaction with resources on the Semantic Web; in particular with the semi-structured data that can be exposed to the user via domain-specific inference templates. We describe this capability in terms of learning services designed for ASPL-v2 framework and present these services in terms of click- or walk-throughs. These descriptions are intended to assist users with interpreting connections in the academic domain; for example, filtering leading scientists, recognizing communities of practice, or associating research topics and issues with particular publication outlets.

The current report is set on the backstage provided by the previous reports (in particular D3.3.3, D3.3.7, and D3.3.7), which presented and concluded with a theoretical justification of our decision to re-engineer and almost completely revise the suite of learning services, so that more interaction is offered to the user, alongside with novel, semantically driven inferences. One of the outstanding tasks in the previous report was to assess whether the re-engineering actually worked. In particular two aspects came up in this report:

(i) finalizing the design and implementation of learning services for the revised ASPL-v2 framework, and
(ii) carrying out a comparative assessment of ASPL-v2 vis-à-vis other tools that have a similar scope and may be commonly used by the users

While report D3.3.7 addressed the evaluation and assessment objective from the above list, in this report we focus on the former objective – to finish and implement learning services to the standard they can be sustained beyond the project life span.

Contents

1 Overview and Background of the Development

The goal of this work package is to provide a delivery platform for the educational content that is (a) stored in REASE[1], i.e. a portal repository where learning resources can be uploaded and annotated by their authors, and (b) available widely on the Web, e.g. in the form of scientific publications, communities of practice, etc.

ASPL (Advanced Semantic Platform for Learning) intends to support the user in interpreting texts related to Semantic Web Studies. This version of ASPL includes the Magpie semantic browser framework, which was chosen in order to manage the costs of developing ASPL and balancing efficiency of the application development with an effective balance between research and implementation work. Magpie has been designed at OU to serve as a generic platform on which more sophisticated and specialized infrastructures and applications can be built.

ASPL was originally designed and prototyped as a Magpie-based application (see Figure 1 for reference), and it has been available as a plug-in for a number of web browsers. It operates by making use of domain ontologies to dynamically annotate texts. Users can make use of the web services, which have been associated with classes in the domain ontology to access a range of relevant resources and activities. ASPL interacts with the user using the highlighting of entities and concepts in web pages. These lexical keywords are derived and serialized from domain ontologies.

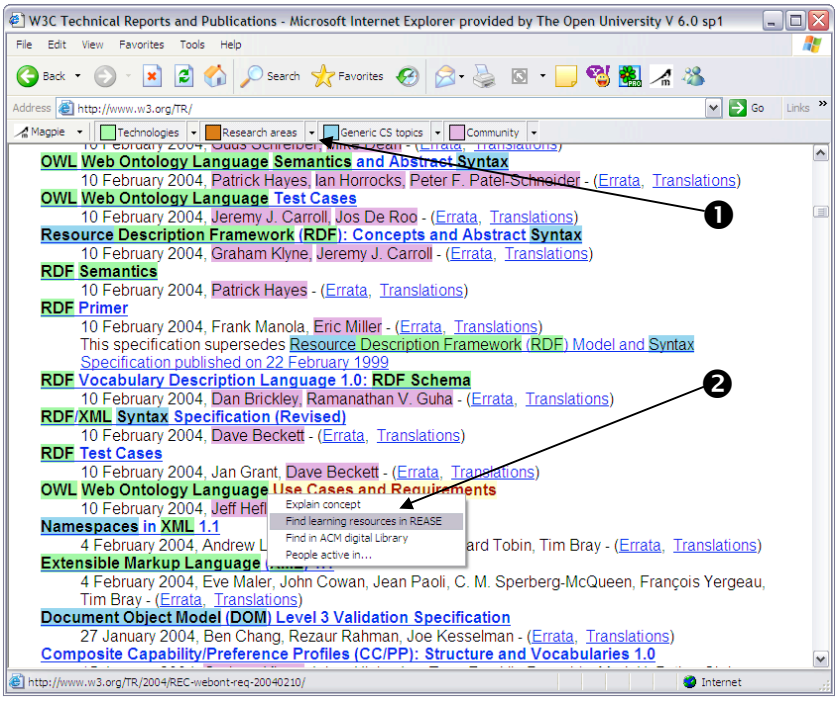


Figure 1. A screenshot showing a Magpie-enhanced web browser and a web page annotated using the lexicon derived for the Semantic Web domain; pointer ❶ shows a user-selected ontology with several abstract categories of identifiable concepts (highlighted in different colours), and pointer ❷ shows a sample menu with semantic services associated with a particular category of concepts.

[1] REASE is one of the outcomes of the project's educational area, it stands for Repository of the European Association for the Semantic Web Education, and is available at http://rease.semanticweb.org

In deliverable D3.3.3 we reported on the first version of that delivery platform, which was referred to as an advanced semantic platform for learning (ASPL). The first phase of the platform development concluded in 2005 by evaluating the application built on top of the platform. The purpose of the evaluation was *formative*; i.e. we intended to identify the gaps in the current platform, which would help us to focus on and elaborate specific strengths of our approach.

The deliverable D3.3.6 presented the theoretical underpinning of the process we intended to pursue to augment the prototype of the advanced semantic platform for learning (ASPL-v2). Rather than merely describing the new version, we also mentioned the rationale for re-engineering the application in particular ways and directions. The current versions of ASPL have two-pronged functionality: (i) ASPL is still drawing upon the Magpie infrastructure — a prototype framework for semantic browsing and for rapidly developing applications involving semantic web browsing, which has been developed at the Knowledge Media Institute at the Open University.; and (ii) ASPL also acts as a lightweight, web-based search tool or a front end its primary data store (the DBLP++ KB).

Finally, in deliverable D3.3.7 we evaluated the ASPL-v2 application with a group of users, and also, we carried out a comparative analysis of ASPL with Google Scholar and Ask, two wide-spread search engines commonly used in tasks similar to those ASPL was tested on. The key outcome of the evaluation was that ASPL-v2 outperformed the other search engines and information retrieval tools in three tasks out of five. Moreover, participants were willing to both use the ASPL services in the future and recommend them to peers.

1.1 Modifications to ASPL learning services

In this report we get back to the key argument from the past reports that for the purposes of learning the interactions between a user/learner are more than mere annotation of web pages, retrieval and subsequent browsing of semantic metadata. In order to apply semantic knowledge, the re-designed version of ASPL supports a more exploratory approach to interacting with distributed learning resources, focusing on creating interpretative pathways rather than merely retrieving simple data.

Specifically we implemented two distinct modes of exploratory learning: (i) convergent, 'spotlight-style' (Collins, Mulholland et al. 2005) browsing of semantically enriched resources, and (ii) divergent, 'serendipitous' browsing into an open web space (Brusilovsky and Rizzo 2002). Together, the two helped us to introduce support for analytic and synthetic learning tasks, and the value of our approach has been corroborated in a user-based study – majority of users liked the way ASPL-v2 helped them to navigate through the problem space in a structured way, which they could mimic and thus develop a skill in analyzing academic data.

Applying Semantic Web to construct multiple exploratory paths and attending to different aspects of the exploration, rather than to the individual nodes of the semantically enriched space, has several side effects. For instance, from the user experience viewpoint, the application becomes more flexible. A semantically enriched application does not confine its user to one specific activity or role. Another side effect is

the dynamics of the semantic application. Ontology-driven solutions are often brittle; often based on closed worlds that enable reasoning solely about the known concepts. Linking the association discovery to the presentation overcomes this brittleness, and also avoids the knowledge acquisition bottleneck.

The previous report (D3.3.6) concluded with a theoretical justification of our decision to re-engineer and almost completely revise the suite of learning services, so that more interaction is offered to the user, alongside with novel, semantically driven inferences. One of the outstanding tasks in the previous report was to assess whether the re-engineering actually worked. In other words, in the past period we focused more resources on two aspects:

(i) finalizing the design and implementation of learning services for the revised ASPL-v2 framework, and
(ii) carrying out a comparative assessment of ASPL-v2 vis-à-vis other tools that have a similar scope and may be commonly used by the users

In terms of the former point, L3S has put a substantial effort into their DBLP++ tool. This tool essentially draws upon the well-known database of publications in computer science, and in its interactive form, it offers the user a rich, faceted interface to access the content of DBLP. Nonetheless, this rich user interface may be somewhat daunting, so it was decided to pursue also a parallel approach promoting a lightweight user interface via the ASPL platform.

The ASPL platform is essentially about associating web services with the concepts and instances from a particular ontology, which is of interest to the user. Thus, OU and L3S developed a suite of web service end points for the DBLP++ data set, and these were later complemented with a user-friendly front end – simple, Google-style user interface for querying the content of DBLP and also for making knowledge-level inferences and connection interpretations. In particular, the following web services were exposed from the DBLP data set:

- *Person's publications and interests* … a combination of a simple data retrieval (of publications) with an interpretative inference based on the publication keywords, Semantic Web Topic Hierarchy matches, etc.
- *Person's interests* … an interpretative inference based on the occurrence of keywords and phrases (also from Semantic Web Topic Hierarchy)
- *Person's community characteristics* … an interpretative inference based on the co-occurrence of co-authors, keywords and themes allowing generalizations from the individual nodes (researchers) to their collections (communities)
- *Person's co-authors and communities* … a combination of the retrieval function with an interpretative function as described above
- *Leading experts on topic* … an interpretative inference based on the occurrence of certain phrases within individuals' profiles combined with a statistics
- *Main publication outlets for topic* … an interpretative inference allowing the user to generalize from single nodes (publications and authors) to their collections (journals, conferences, etc.)

1.2 Report outline

In the following we first present the functionalities of the individual learning services clustered by means of the four main categories ASPL recognizes: People, Research Topics, Technologies and Generic Computer Science Terms. Each section will be presented as a click-through and will contain a series of screenshots.

In addition to the specific functionality, in sections 3 and 4 we briefly discuss some technological aspects related to setting up the ASPL as a web browser plug-in. Since no specific actions are needed to set up the web applications, these are only discussed and shown when talking about specific services.

2 Description of ASPL-v2 Functionalities

The main objective of the following sub-sections is to give the reader an idea of what can be expected from each of the services currently provided by the ASPL platform and to present a sample way of interacting with the services by means of click-through series of screenshots.

2.1 Data sources used ('ASPL lexicons')

ASPL lexicon used in version 2 is broadly the same as before; it has been built partly automatically using the algorithms of Corder – named entity recognition service that can be biased for a particular text corpus, web page corpus, etc. In this way we have acquired entities for 'People' and 'Research Topics'. Following this automatic acquisition, we carried out manual split of a fairly large category of 'Research Topics' into more specific 'Technologies' and also 'Generic Computer Science' terms. Nevertheless, lexicons in terms of their content are broadly the same as before.

2.2 Operationalizing learning activities ('ASPL services')

In order to describe the functionality of the ASPL platform after re-designing, evaluating and finalizing it, we present the services implemented in the plug-in version. The web application version focuses on fewer services, namely, those with a stronger analytic or synthetic component. Nonetheless, for each service we give a short description, a screenshot, and state whether it is available via plug-in, web application, or both.

For structuring the description we reuse the structure of the ASPL lexicon that has been created earlier in the project, and was populated and updated several times since then. The structure is as follows:

- Services taking **(Semantic) Technologies** as an argument
- Services taking **Research Topic and Techniques** as an argument
- Services taking **Generic Computer Science** terms as an argument
- Services taking **People** as an argument

2.3 Services for 'Semantic Technologies' entities

Semantic Web technologies is the first category to be described.

2.3.1 Explaining a 'technology' term

This service is currently available for the plug-in version of the ASPL framework. The main reason for this is its serendipitous nature: It merely retrieves a definition or description of a particular term (e.g. "XML", "eXtensible Markup Language:" or "metadata"), and using the glossaries freely available on the Web, it provides information to explain or clarify a given term.

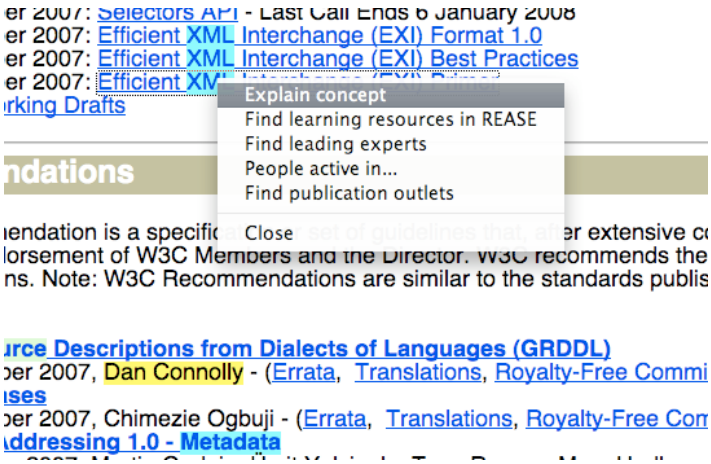


Figure 2. Service "Explain concept" for the entities in category "Technologies": semantic menu for term 'XML'

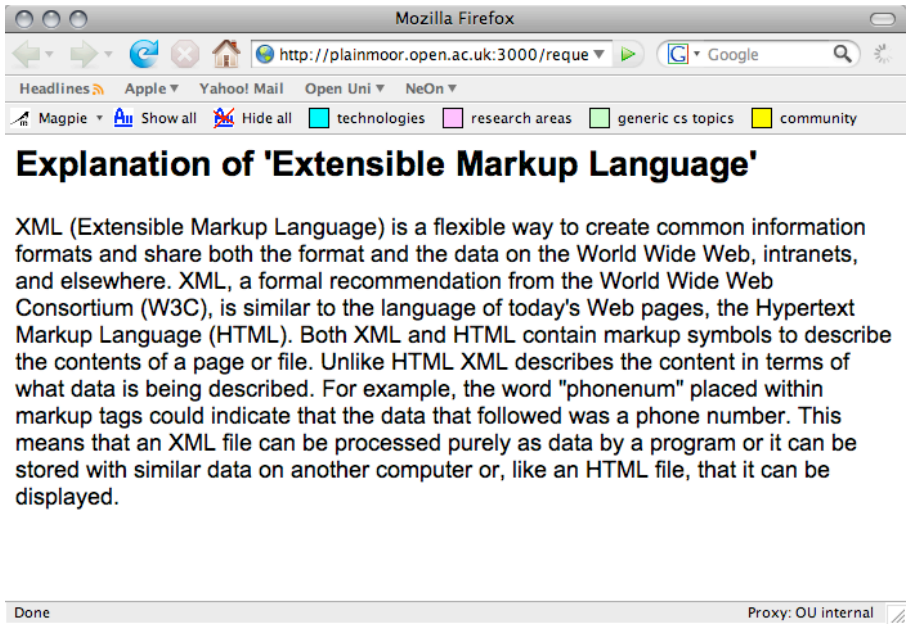


Figure 3. Service "Explain concept" for the entities in category "Technologies": appropriate result of the service for term 'XML'

Figure 2 and Figure 3 show an example of this service in practice, invoked for term 'XML'. Since the result is rendered as a web page in its own right, it can be repeatedly annotated using the toolbar at the top of the result window (see Figure 3). This enables users to semantically navigate through related terms that appear in the definitions.

2.3.2 Finding learning resources about a technology

This service is also available for the plug-in version of the ASPL framework. It acts as a shortcut to a specialized repository of educational materials at REASE and merely retrieves references or descriptions of learning resources relevant to a specific term (e.g. "OWL", "eXtensible Markup Language" or "web services"). The references are rendered into a list of publications (alongside with authors and some statistical data), and each of the entries can be further browsed; i.e. it takes the user directly to the REASE repository, where the resource in question can be booked, opened, etc.

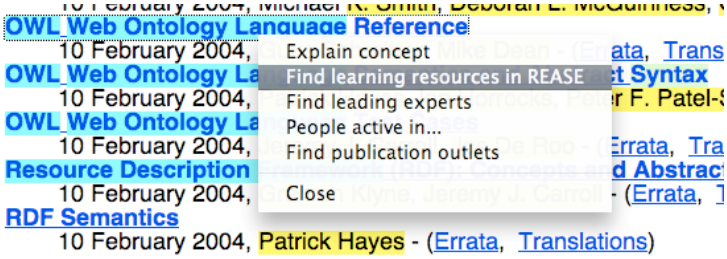


Figure 4. Service "Find learning resources in REASE" for the entities in category "Technologies": semantic menu for term 'OWL' (or 'web ontology language')

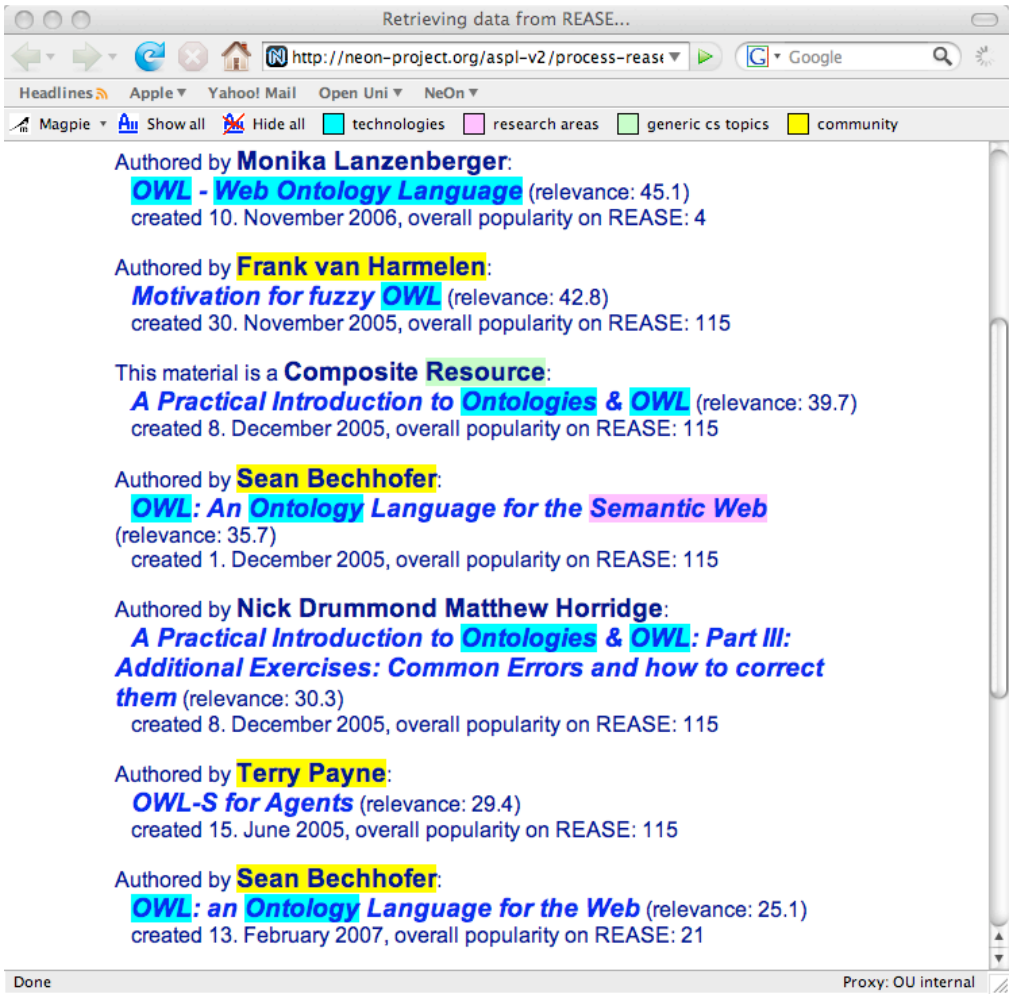


Figure 5. Service "Find learning resources in REASE" for the entities in category "Technologies": appropriate result of the service for term 'OWL'

Figure 4 and Figure 5 show an example of this service in practice, invoked for term 'OWL'. Since the result is rendered as a web page in its own right, it can be repeatedly annotated using the toolbar at the top of the result window – in this case it allows the engine to annotate e.g. people mentioned in the result. As can be seen from Figure 5, results of the service contain some additional information regarding popularity and ranking. The service is also capable of distinguishing between single-file resources and so-called composite resources (one that comprise multiple submissions). Just for information, the result can be opened into a full description of

the resource, which can be booked, read, etc. (buttons to realize this are shown further down in the screenshot from Figure 6).

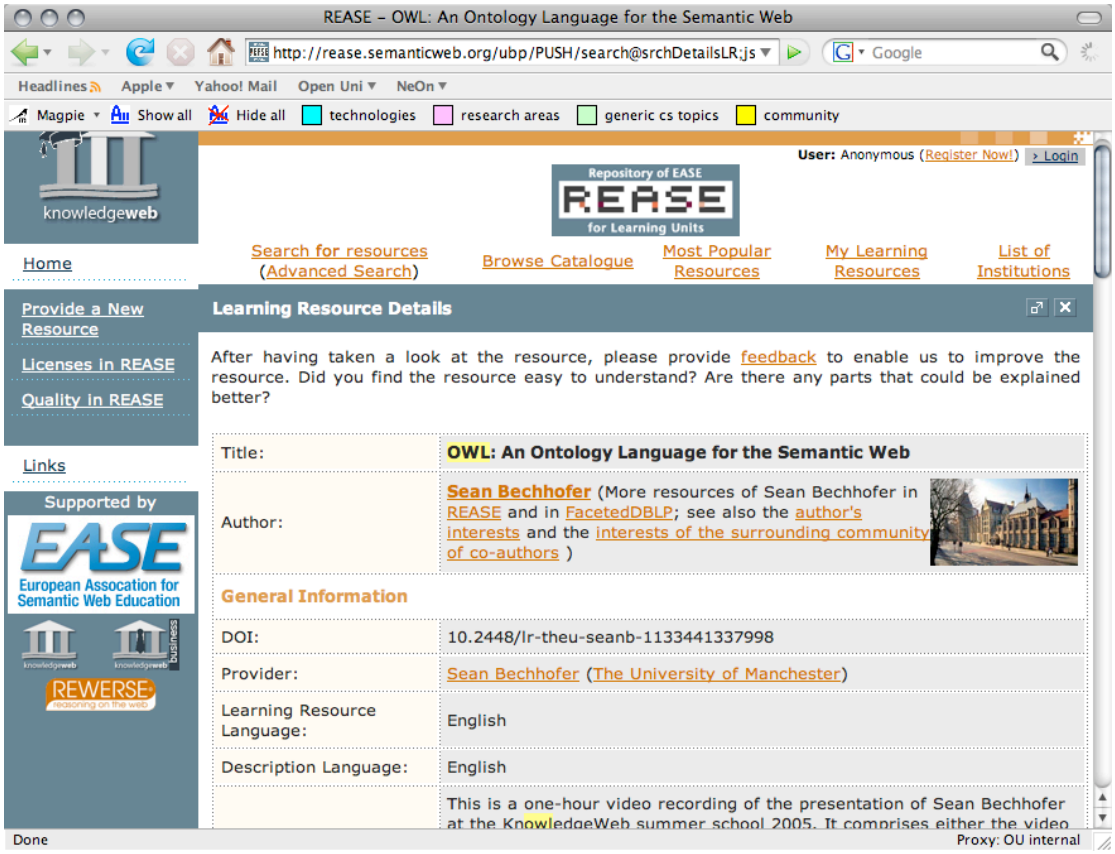


Figure 6. Details of a learning resource browsed to from the ASPL service acting as a shortcut; this particular example is for item "Sean Bechhofer's OWL: An Ontology Language…"

2.3.3 Finding expertise in a technology

The service 'Find leading experts' is available for both, the plug-in and the web version of the ASPL platform. In the web application, it is among the options under the tab 'Search in topic domain'. This service not only retrieves the required results, but it also saves time for the users, because they did not have to look elsewhere to obtain this information. Moreover, because the users can set a specific time period to retrieve the key researchers associated with a specific research area, it helps them to identify leading researchers in a given area without having to process the time interval part of a query.

Figure 7 shows a sample screen, which the users encounter in the web version of this service. In case the query is ambiguous, the web version offers a disambiguation step (see Figure 8), where the user can choose which sense s/he intends to follow. Finally, Figure 9 shows the output produced by ASPL/DBLP for the service and providing a list of 'leading experts' on a given technological term ('ontology').

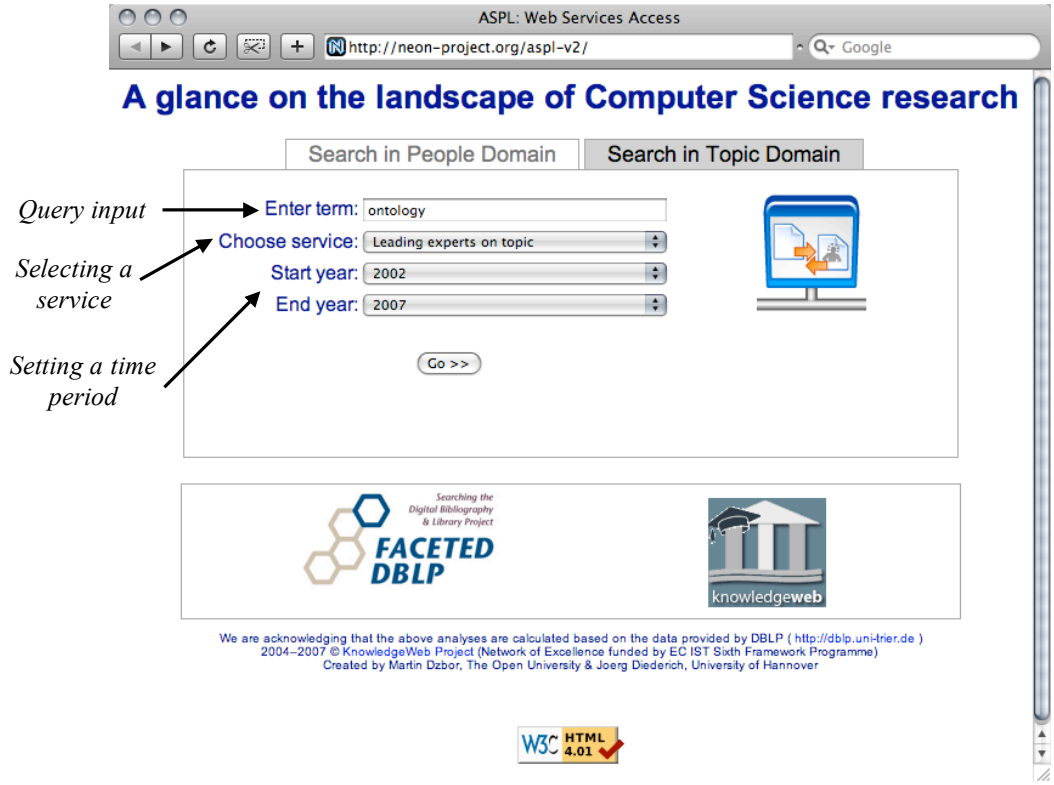


Figure 7. The interface of web version of ASPL/DBLP for service "Find leading experts"

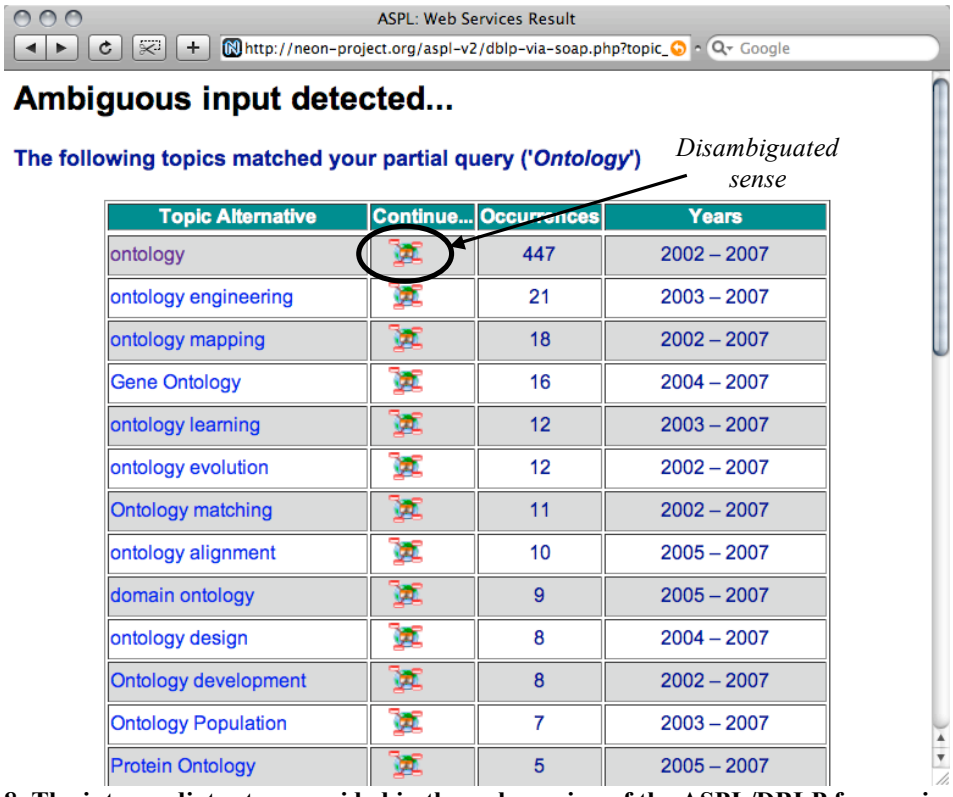


Figure 8. The intermediate step provided in the web version of the ASPL/DBLP for service "Find leading experts" to disambiguate query term, here 'ontology'

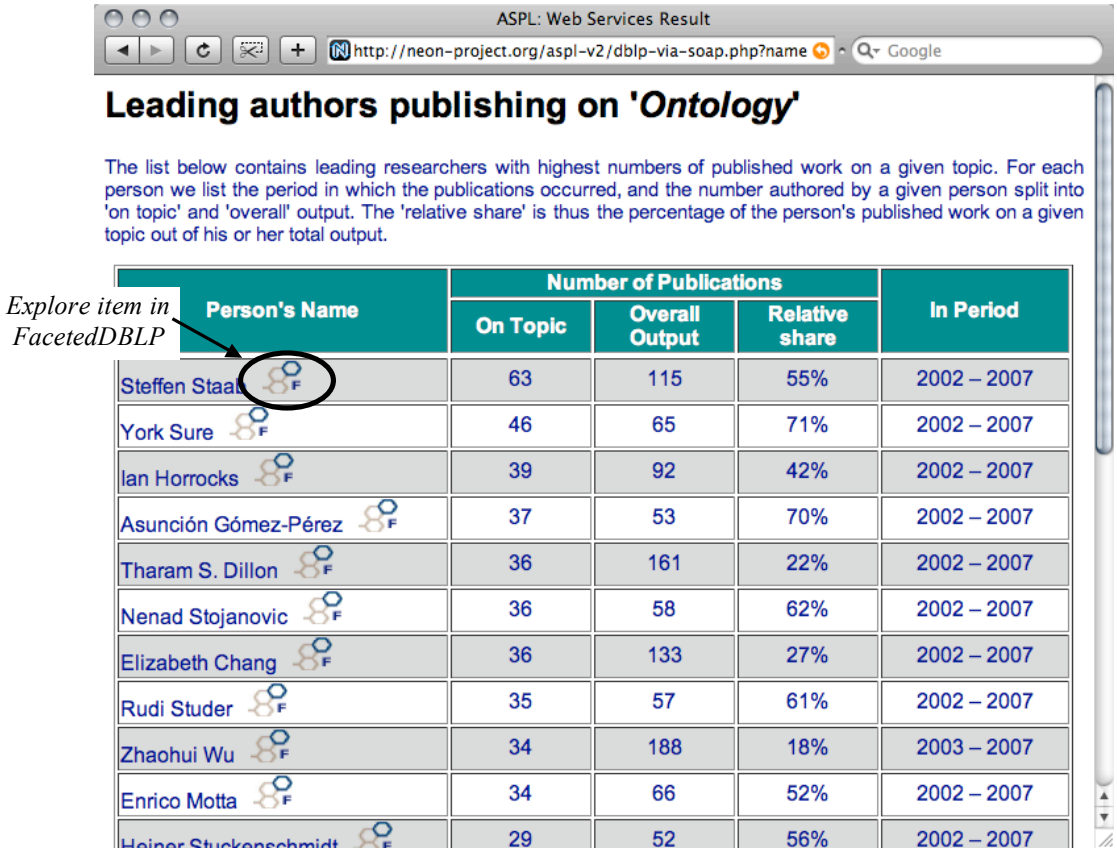


Figure 9. The output of service "Find leading experts" for term 'semantic web services'

In the case of plug-in version, the intermediate step is de-activated, and the user moves from a selection in the semantic menu (shown in Figure 10) directly to the result (shown in Figure 9). As can be seen in Figure 9, the results contain not only the names of experts, but also some supportive information; e.g. number of papers on a given topic, relative share of publishing output, period, etc. The list is implicitly ordered by the absolute number of "on topic" publications. Clicking on the icon next to people's names, the user can navigate into FacetedDBLP and explore the space further using the metaphor of faceted browsing.

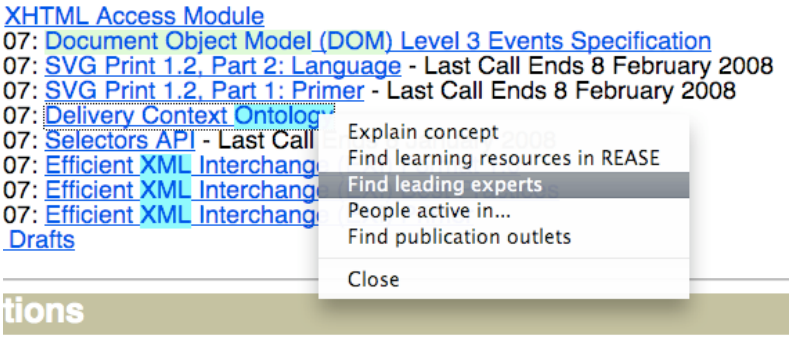


Figure 10. Service "Find leading experts" for the entities in category "Technologies": semantic menu for term 'ontology'

2.3.4 Finding related people

Service 'Find related people' is one of the older ones, i.e. remaining from ASPL-v1. Although it has been superseded by such services as finding expertise or publishing outlets, we believe it still contains an interesting approach to appreciating semantic proximity. Hence, we retained it also in ASPL-v2; if for no other reason to see the evolution of the ASPL application.

The service is available for both, the plug-in and the web version[2] of the ASPL platform. The service gives rather unstructured output, less rich and expressive than the output of the services from redesigned version ASPL-v2.

Figure 11 shows a sample screen, which the users encounter in the web version of this service, and Figure 12 shows the output produced by ASPL/DBLP for the service and providing a list of 'related topics' on a given research topic ('artificial intelligence'). Unlike services mentioned e.g. in section 2.3.3, there is no disambiguation step.

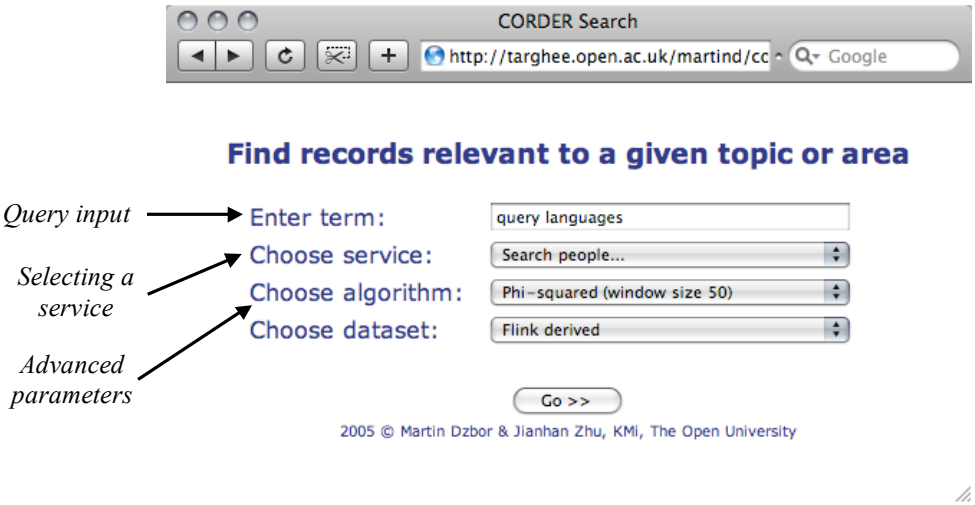


Figure 11. The interface of web version of ASPL/DBLP for service "Find related people" for research topic "query languages"

In the case of plug-in version, the user moves from a selection in the semantic menu (shown in Figure 13) directly to the result (shown in Figure 12).

[2] Accessible from http://targhee.open.ac.uk/martind/corder/corder.php.

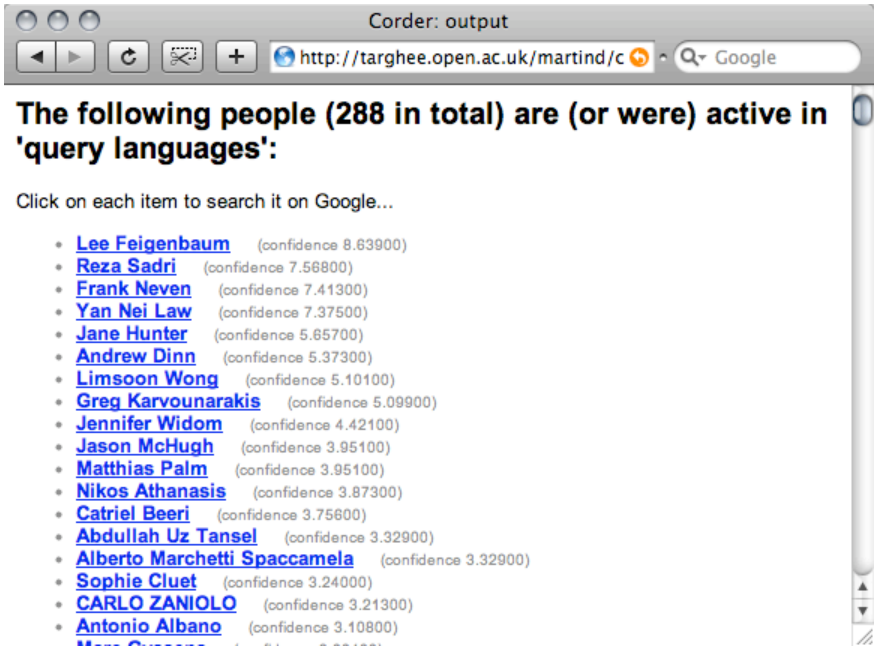


Figure 12. The output of service "Find related people" for term 'query languages'

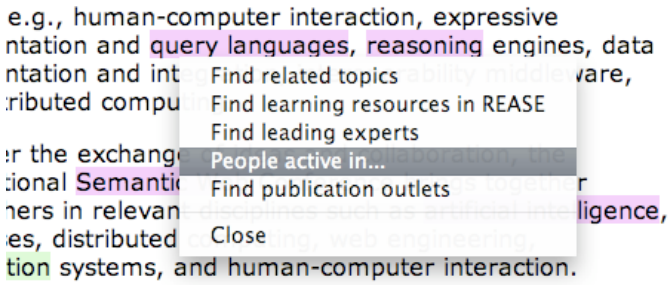


Figure 13. Service "Find related people": semantic menu for term 'query languages'

2.3.5 Finding publishing outlets for work in a technology

The service 'Find publishing outlets' is available for both, the plug-in and the web version of the ASPL platform. In the web application, it is among the options under the tab 'Search in topic domain'. This service not only retrieves the required results, but it also saves time for the users, because they did not have to look elsewhere to aggregate this information. The service distinguishes between unique publication outlets (e.g. a journal issue) and a publication series (e.g. conference series).

Figure 14 shows a sample screen, which the users encounter in the web version of this service. In case the query is ambiguous, the web version offers a disambiguation step (see Figure 15), where the user can choose which sense s/he intends to follow.

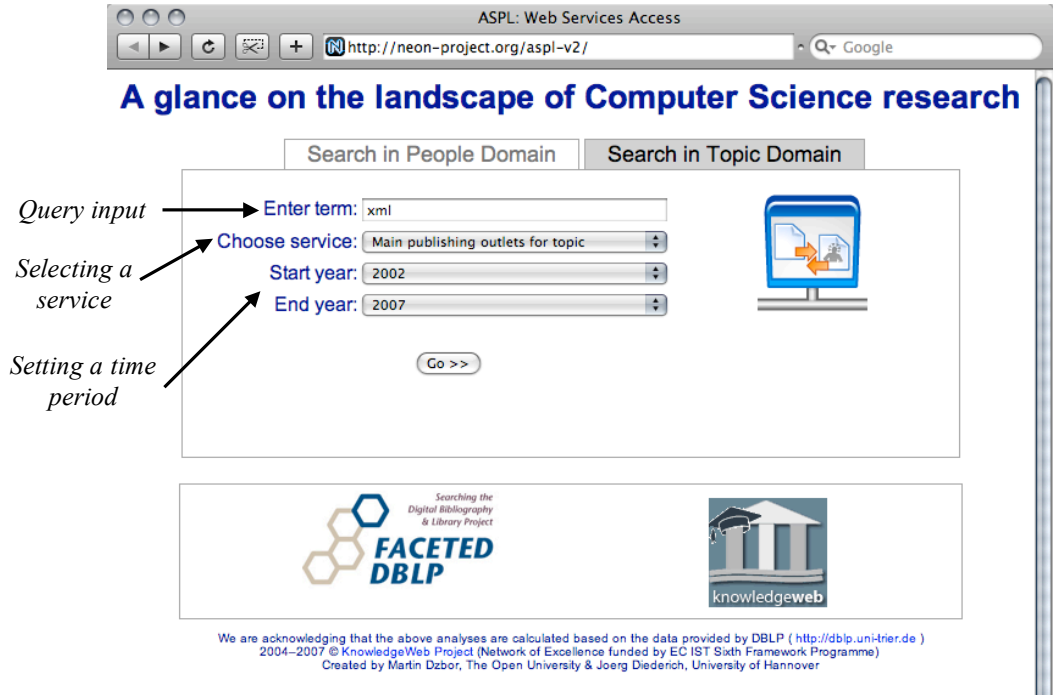


Figure 14. The interface of web version of ASPL/DBLP for service "Find publishing outlets"

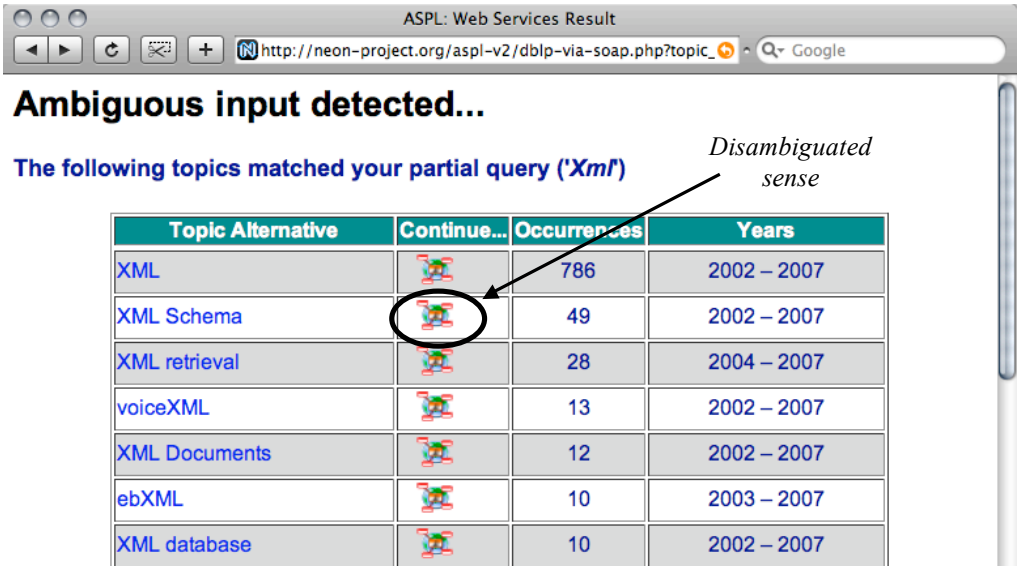


Figure 15. The intermediate step provided in the web version of the ASPL/DBLP for service "Find publishing outlets" to disambiguate query term, here 'XML'

Finally, Figure 16 shows the output produced by ASPL/DBLP for the service and providing a list of 'leading experts' on a given technological term ('ontology'). Figure 17 shows the same, but with a detailed view on instances rather than series.

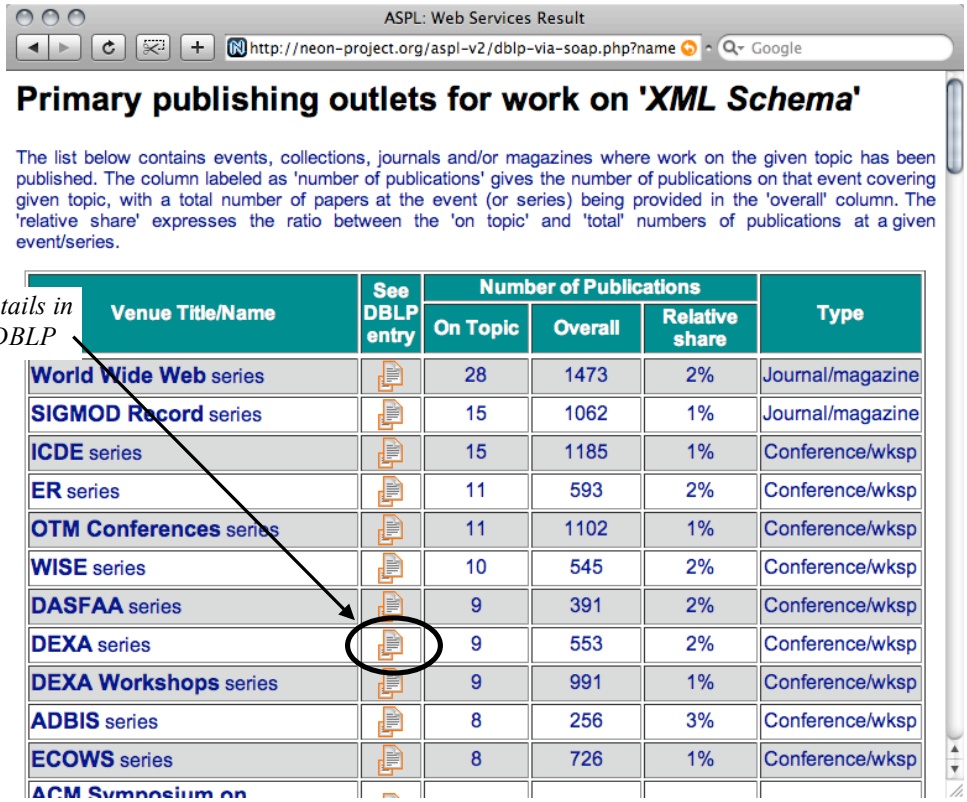


Figure 16. The output of service "Find publishing outlets" for term 'XML Schema': the series views (i.e. journal and conference series)

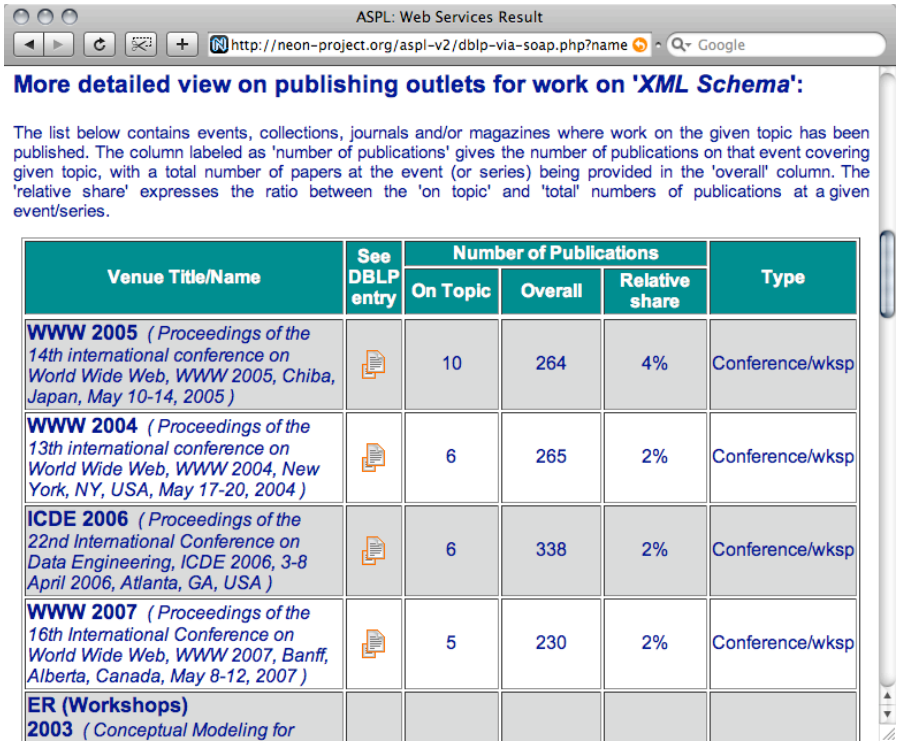


Figure 17. The output of service "Find publishing outlets" for term 'XML Schema': the instances views (i.e. journal issues and concrete conferences)

In the case of plug-in version, the intermediate step is de-activated, and the user moves from a selection in the semantic menu (shown in Figure 18) directly to the

result (shown in Figure 16 and Figure 17). As can be seen in the result screenshots, the results contain not only the names of venues or journals, but also some supportive information; e.g. number of papers on a given topic, relative share of publishing output, period, etc. The list is implicitly ordered by the absolute number of "on topic" publications. Clicking on the icon next to venue names, the user can navigate into FacetedDBLP and explore the space further using the metaphor of faceted browsing. Sample details are given in Figure 19.

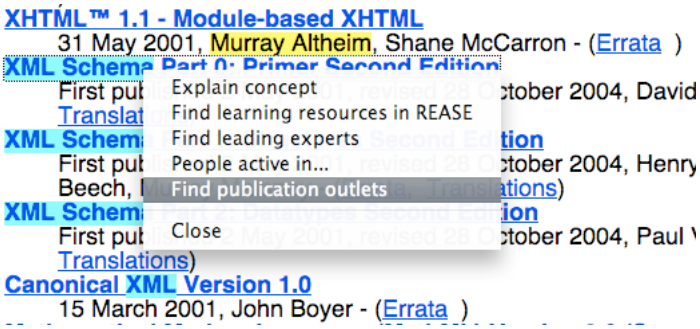


Figure 18. Service "Find publishing outlets" for the entities in category "Technologies": semantic menu for term 'XML Schema'

Figure 19. Details for a publishing venue related to term 'XML Schema'; in this case showing the occurring events within the 'DEXA' series of conferences

2.4 Services for 'Research Topic' entities

Research topics and areas related to Semantic Web is the next category.

2.4.1 Finding related topics/areas

Service 'Find related topics' is one of the older ones, i.e. remaining from ASPL-v1. Although it has been superseded by such services as finding expertise or publishing outlets, we believe it still contains an interesting approach to appreciating semantic proximity. Hence, we retained it also in ASPL-v2; if for no other reason to see the evolution of the ASPL application.

The service is available for both, the plug-in and the web version[3] of the ASPL platform. The service gives rather unstructured output, less rich and expressive than the output of the services from redesigned version ASPL-v2.

Figure 20 shows a sample screen, which the users encounter in the web version of this service, and Figure 21 shows the output produced by ASPL/DBLP for the service and providing a list of 'related topics' on a given research topic ('artificial intelligence'). Unlike services mentioned e.g. in section 2.3.3, there is no disambiguation step.

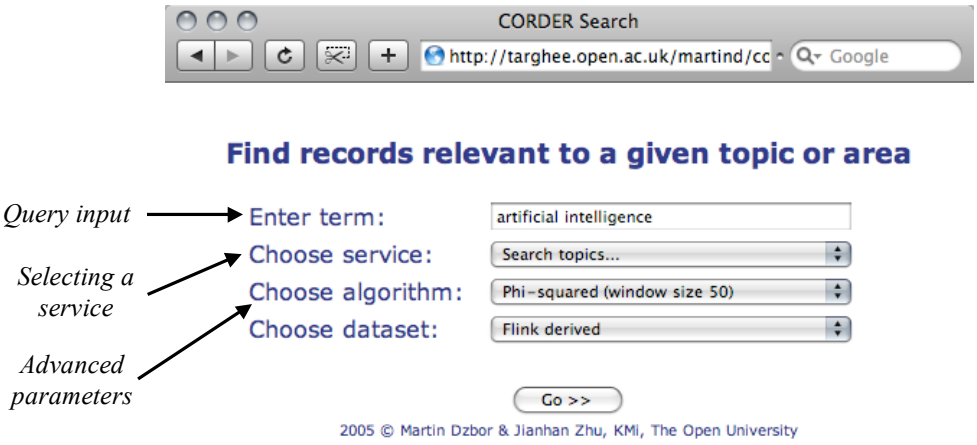


Figure 20. The interface of web version of ASPL/DBLP for service "Find related topics" for research topic "artificial intelligence"

In the case of plug-in version, the user moves from a selection in the semantic menu (shown in Figure 22) directly to the result (shown in Figure 21).

[3] Accessible from http://targhee.open.ac.uk/martind/corder/corder.php.

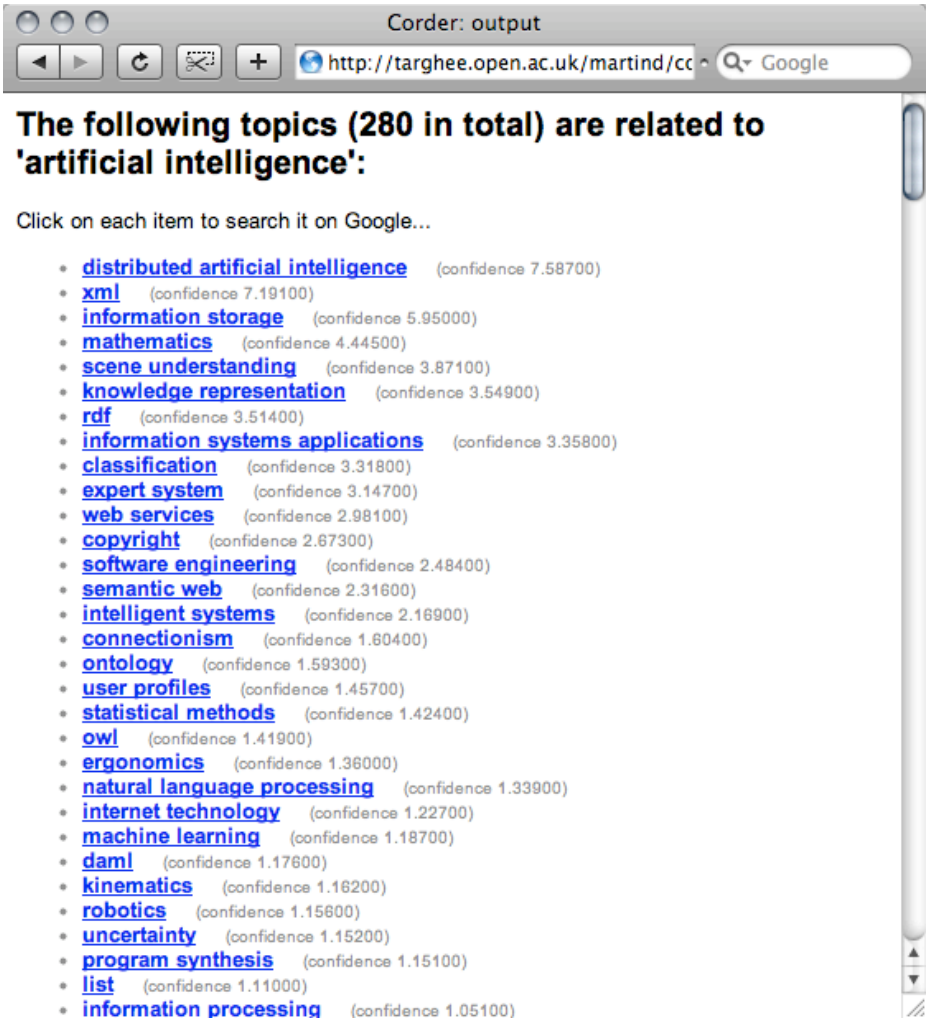


Figure 21. The output of service "Find related topics" for term 'artificial intelligence'

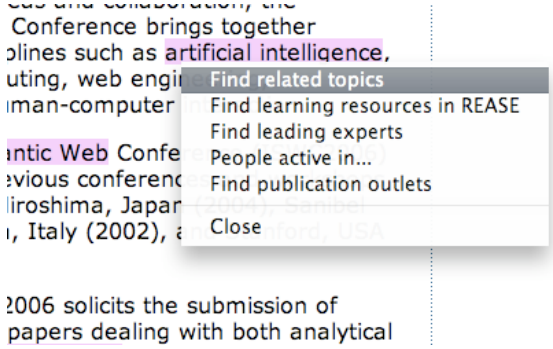


Figure 22. Service "Find related topics" for the entities in category "Research topics": semantic menu for term 'artificial intelligence'

2.4.2 Finding learning resources for a research topic

Since this service has precisely the same behaviour for research topics as the one described earlier in section 2.3.2 for technologies, we do not repeat the description again.

2.4.3 Finding expertise in a research topic/area

The service 'Find leading experts' is available for both, the plug-in and the web version[4] of the ASPL platform. In the web application, it is among the options under the tab 'Search in topic domain'. This service not only retrieves the required results, but it also saves time for the users, because they did not have to look elsewhere to obtain this information. Moreover, because the users can set a specific time period to retrieve the key researchers associated with a specific research area, it helps them to identify leading researchers in a given area without having to process the time interval part of a query.

Figure 23 shows a sample screen, which the users encounter in the web version of this service, and Figure 24 shows the output produced by ASPL/DBLP for the service and providing a list of 'leading experts' on a given research topic ('semantic web services'). Similarly as mentioned in section 2.3.3, for the web application there is an option of a disambiguation screen, which is not shown again – its purpose is precisely the same as in section 2.3.3.

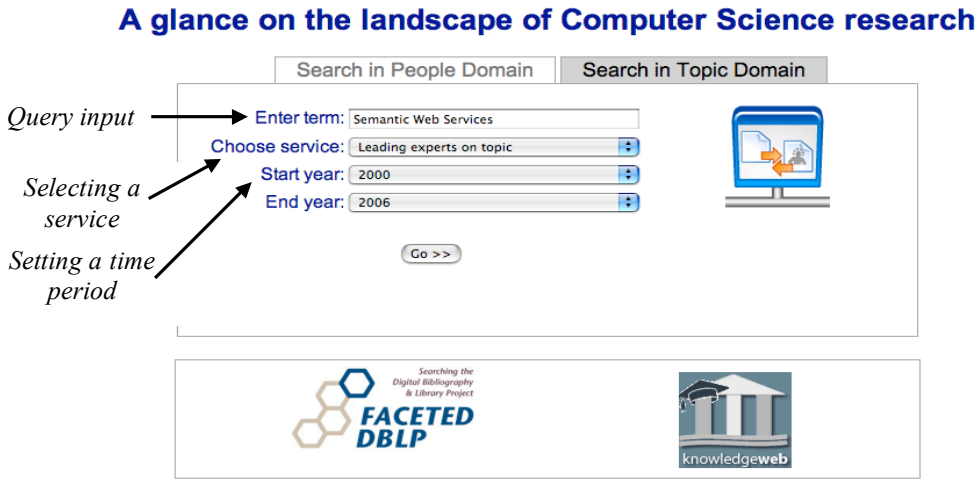


Figure 23. The interface of web version of ASPL/DBLP for service "Find leading experts" for research topic "semantic web services"

Leading authors publishing on '*Semantic Web Services*'

The list below contains leading researchers with highest numbers of published work on a given topic. For each person we list the period in which the publications occurred, and the number authored by a given person split into 'on topic' and 'overall' output. The 'relative share' is thus the percentage of the person's published work on a given topic out of his or her total output.

Person's Name	Number of Publications			In Period
	On Topic	Overall Output	Relative share	
Dieter Fensel	17	80	21%	2003 – 2006
Katia P. Sycara	13	93	14%	2003 – 2006
Christoph Bussler	13	60	22%	2003 – 2006
Amit P. Sheth	12	74	16%	2004 – 2006
Massimo Paolucci	11	43	26%	2003 – 2006
John Domingue	11	40	28%	2003 – 2006

Figure 24. The output of service "Find leading experts" for term 'semantic web services'

In the case of plug-in version, the intermediate step is de-activated, and the user moves from a selection in the semantic menu (shown in Figure 25) directly to the result (shown in Figure 24). As can be seen in Figure 24, the results contain not only the names of experts, but also some supportive information; e.g. number of papers on

[4] Accessible from http://neon-project.org/aspl-v2.

a given topic, relative share of publishing output, period, etc. The list is implicitly ordered by the absolute number of "on topic" publications. Clicking on the icon next to people's names, the user can navigate into FacetedDBLP and explore the space further using the metaphor of faceted browsing.

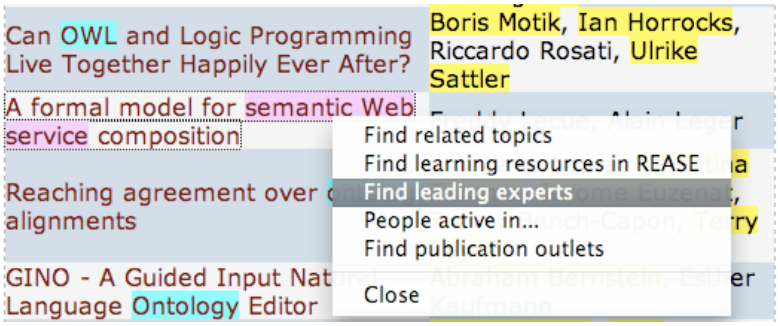


Figure 25. Service "Find leading experts" for the entities in category "Research topics": semantic menu for term 'semantic web services'

2.4.4 Finding related people for a research topic

Since this service has precisely the same behaviour for research topics as the one described earlier in section 2.3.4 for technologies, we do not repeat the description again.

2.4.5 Finding publishing outlets for a research topic

Since this service has precisely the same behaviour for research topics as the one described earlier in section 2.3.5 for technologies, we do not repeat the description again.

2.5 Services for 'Computer Science' entities

There is only one service implemented in this category – as a proof of concept.

2.5.1 Reading about a 'computer science' term

This service is currently available for the plug-in version of the ASPL framework. The main reason for this is its serendipitous nature: It merely retrieves a definition or description of a particular term (e.g. "document" or "application") from a specialized online glossary called "foldoc.org" in a manner similar to the explanation service described in section 2.3.1. "Foldoc.org" is a free online dictionary of computing that is replicated across several web servers worldwide. The dictionary is live and maintained, and at the time of writing contained 14,527 terms. We used the version supported by Imperial College Department of Computing.

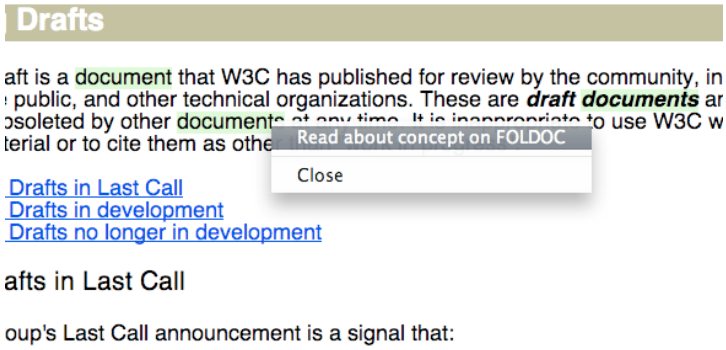


Figure 26. Service "Read about… in Foldoc" for the entities in category "Generic Computer Science": semantic menu invoked for term 'document'

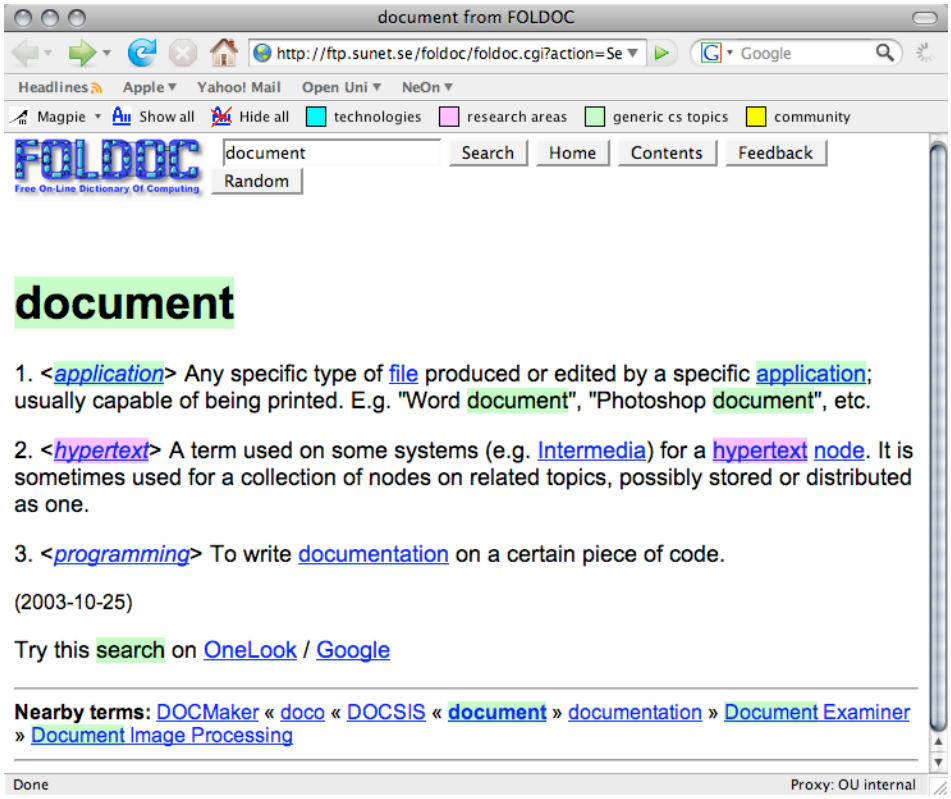


Figure 27. Service "Read about… in Foldoc" for the entities in category "Generic Computer Science": results of the service invoked for term 'document'

Figure 26 and Figure 27 show an example of this service in practice, invoked for term 'document'. Since the result is taken directly from the foldoc.org web server, and is thus rendered as a web page in its own right, it can be repeatedly annotated using the toolbar at the top of the result window. This enables users to semantically navigate through related terms that appear in the definitions – some examples are shown in Figure 27; e.g. 'hypertext' or 'application'.

2.6 Services for 'People' entities

Finally, services taking people's names as an argument is the last category to be described.

2.6.1 Exploring a person's community of practice

Service 'Explore person's community' draws on the collocations and co-publications among different individuals. This service gives as an output an ordered list of research topics that characterize a given individual's social neighbourhood in a given time period. The web application version allows the user to provide a partial input, e.g. only a surname or a part of a person's name ('Schreiber' instead of 'Guus Schreiber') – as shown in Figure 30. If the query yields potentially several results, disambiguation screen offers a range of possible meanings or senses (see Figure 29).

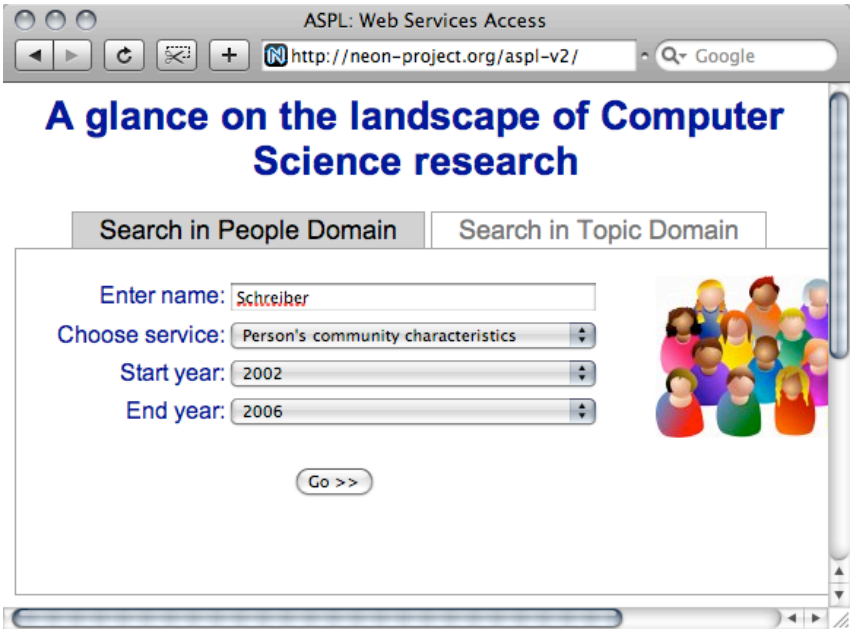
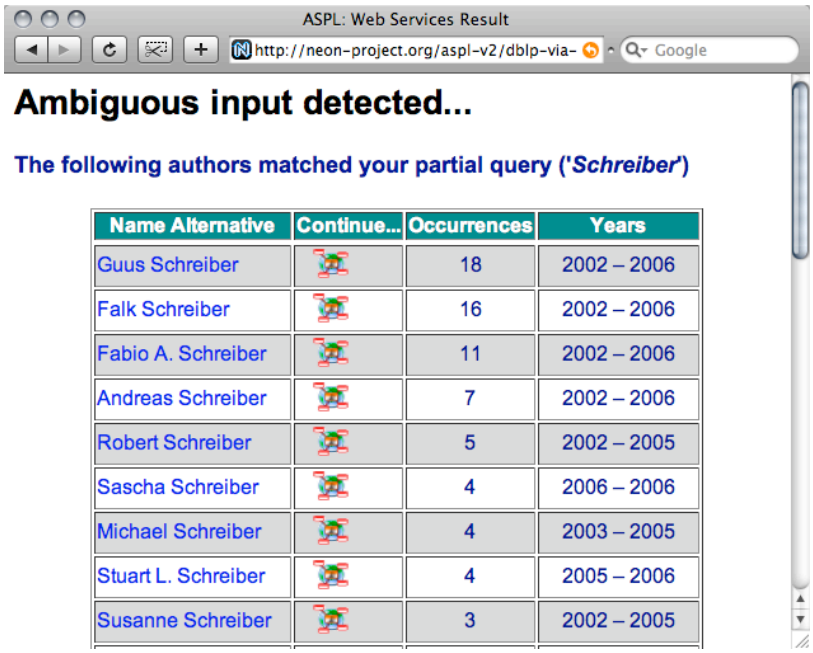
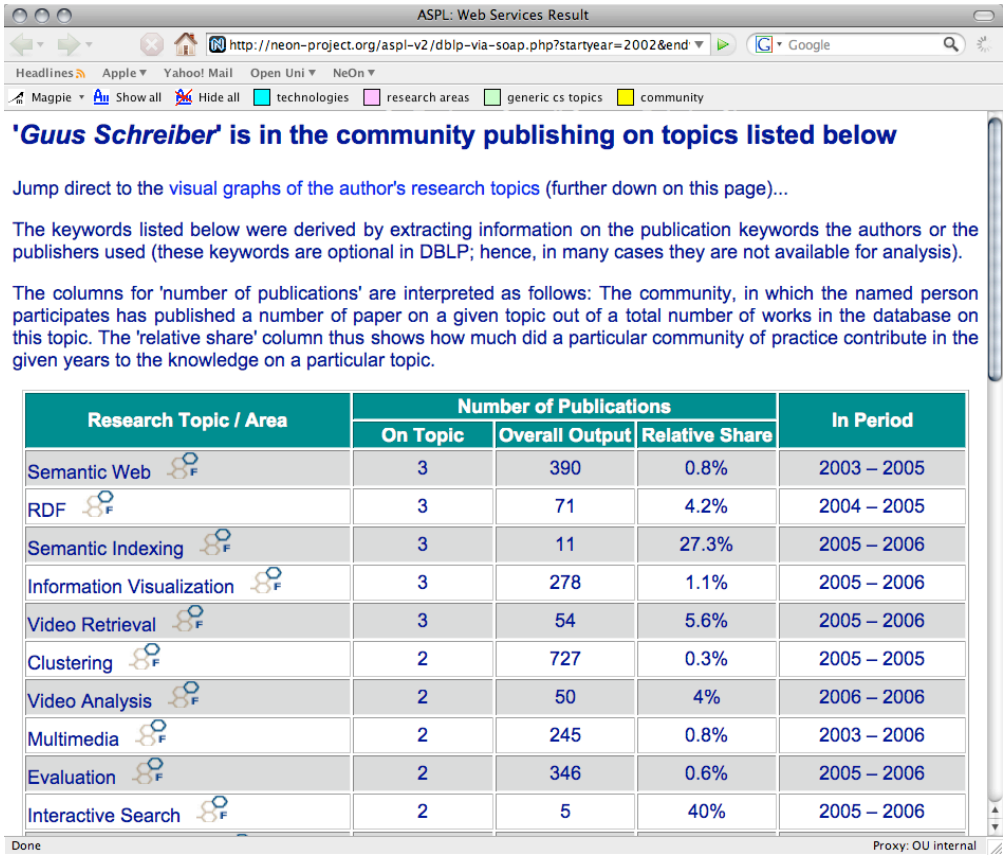


Figure 28. Service "Explore person's community" for the entities in category "People": query page of the web application for term 'Schreiber'



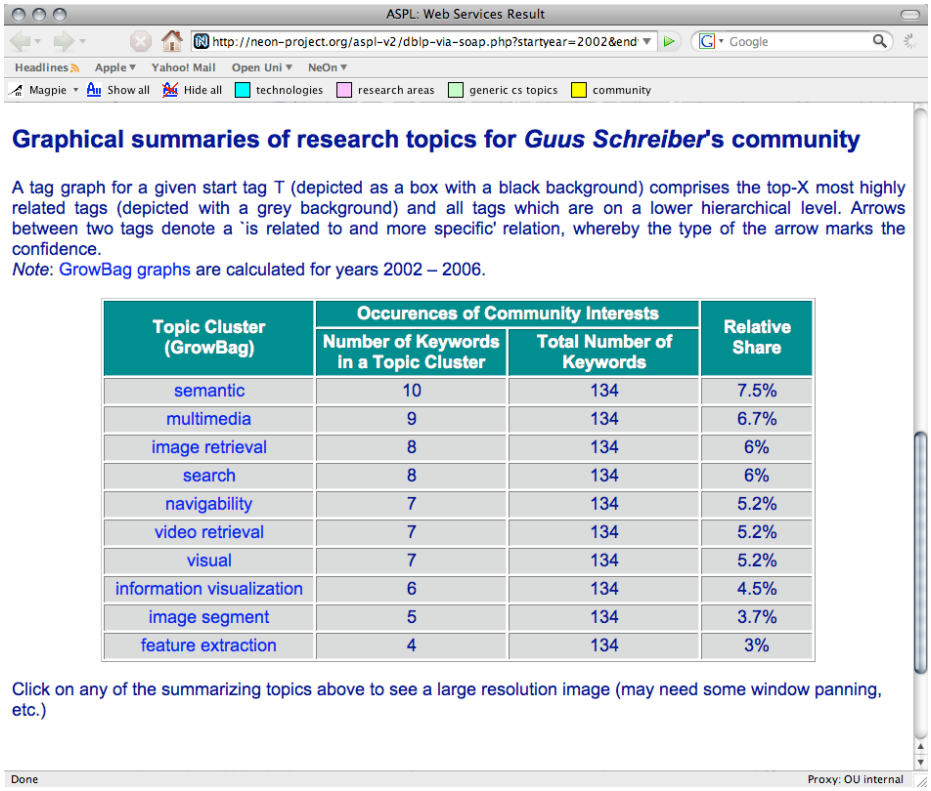
Name Alternative	Continue...	Occurrences	Years
Guus Schreiber		18	2002 – 2006
Falk Schreiber		16	2002 – 2006
Fabio A. Schreiber		11	2002 – 2006
Andreas Schreiber		7	2002 – 2006
Robert Schreiber		5	2002 – 2005
Sascha Schreiber		4	2006 – 2006
Michael Schreiber		4	2003 – 2005
Stuart L. Schreiber		4	2005 – 2006
Susanne Schreiber		3	2002 – 2005

Figure 29. Disambiguation step for service "Explore person's community" (if necessary) for the entities in category "People": query page of the web application for term 'Schreiber'



Research Topic / Area	Number of Publications			In Period
	On Topic	Overall Output	Relative Share	
Semantic Web	3	390	0.8%	2003 – 2005
RDF	3	71	4.2%	2004 – 2005
Semantic Indexing	3	11	27.3%	2005 – 2006
Information Visualization	3	278	1.1%	2005 – 2006
Video Retrieval	3	54	5.6%	2005 – 2006
Clustering	2	727	0.3%	2005 – 2005
Video Analysis	2	50	4%	2006 – 2006
Multimedia	2	245	0.8%	2003 – 2006
Evaluation	2	346	0.6%	2005 – 2006
Interactive Search	2	5	40%	2005 – 2006

Figure 30. Service "Explore person's community" for the entities in category "People": results of the service invoked for term 'Guus Schreiber'



Topic Cluster (GrowBag)	Occurences of Community Interests		Relative Share
	Number of Keywords in a Topic Cluster	Total Number of Keywords	
semantic	10	134	7.5%
multimedia	9	134	6.7%
image retrieval	8	134	6%
search	8	134	6%
navigability	7	134	5.2%
video retrieval	7	134	5.2%
visual	7	134	5.2%
information visualization	6	134	4.5%
image segment	5	134	3.7%
feature extraction	4	134	3%

Figure 31. Abstractions of community of practice descriptions for service "Explore person's community" invoked for term 'Guus Schreiber'

In the plug-in version, the system bypasses the disambiguation step (as the entities are well-defined thanks to the ASPL lexicon), and the user is taken straight to the results screen. This consists of two sections: first, a description of research interests applying to a specific person's community of practice (see Figure 30), followed by a list of abstracted research areas typical for a given community (see Figure 31). Note that the abstracted areas listed may not apply directly to the queried person; these might simply be prevailing community characteristics.

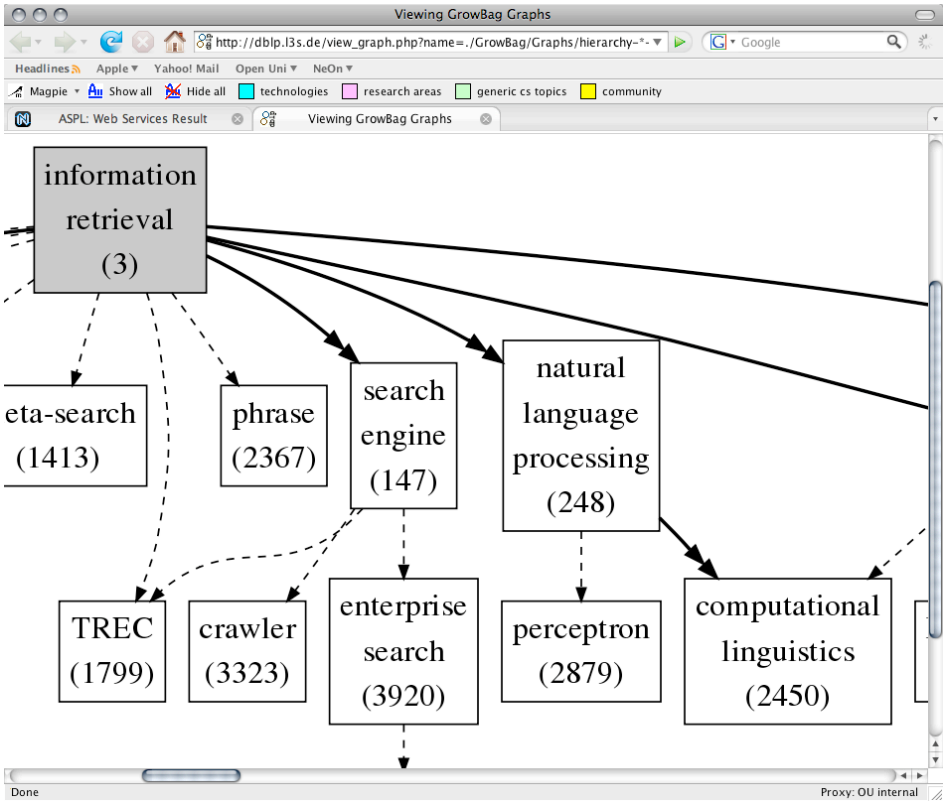


Figure 32. Alternative outcome of service "Explore person's community" for the entities in category "People": visual diagrams of the service invoked for term 'information retrieval'

The records listed in the output screen are further navigable, and in the case of the abstracted research areas, the user would get to the visual snapshots of what comprises a particular (abstracted) area – shown in Figure 32. Otherwise, the meaning of icons next to research interests is the same as earlier, they take the user to a richer interface of the FacetedDBLP, where further exploration can occur.

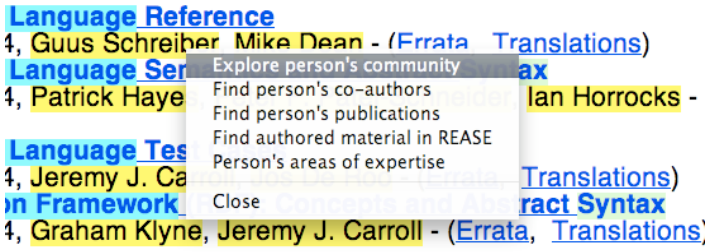


Figure 33. Service "Explore person's community" for the entities in category "People": menu of the service invoked for term 'Guus Schreiber'

2.6.2 Finding a person's co-authors

Service 'Find person's co-authors' draws on the common publications among different individuals. This service gives as an output an ordered list of co-authors followed by a list of research topics that characterize a given individual's research interests in a given time period. The web application version allows the user to provide a partial input, e.g. only a surname or a part of a person's name ('Frank' instead of 'Frank van Harmelen') – similarly as shown in section 2.6.1.

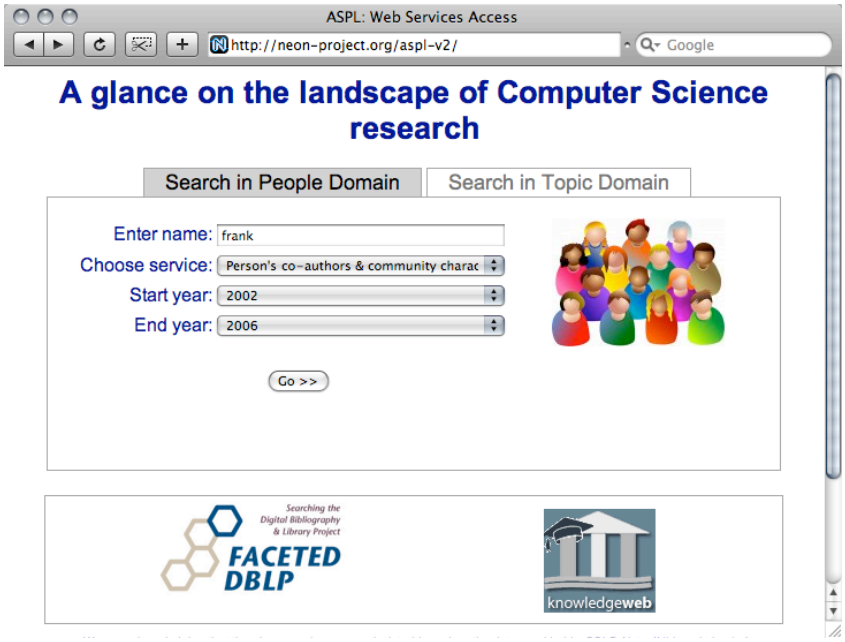


Figure 34. Service "Find person's co-authors" for the entities in category "People": query page of the web application for term 'Frank'

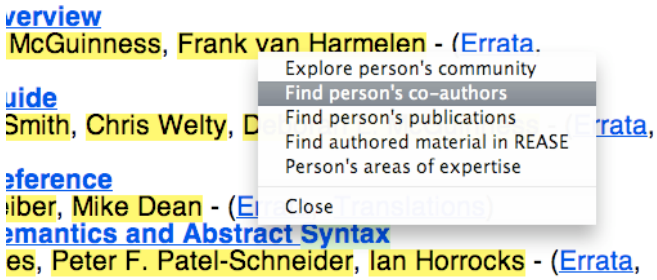


Figure 35. Service "Find person's co-authors" for the entities in category "People": menu of the service invoked for term 'Frank van Harmelen'

In the plug-in version, the system bypasses the disambiguation step (as the entities are well-defined thanks to the ASPL lexicon), and the user is taken straight to the results screen. This consists of 0three sections: first, a list of co-authors is given alongside with a number of shared publications and some statistics, next, a description of research interests applying to a specific person, and finally followed by a list of abstracted research areas typical for a given person. Figure 36 only shows the first part of the result (the actual names of co-authors), the second and third parts are rather similar to those shown in section 2.6.1, so are not repeated here.

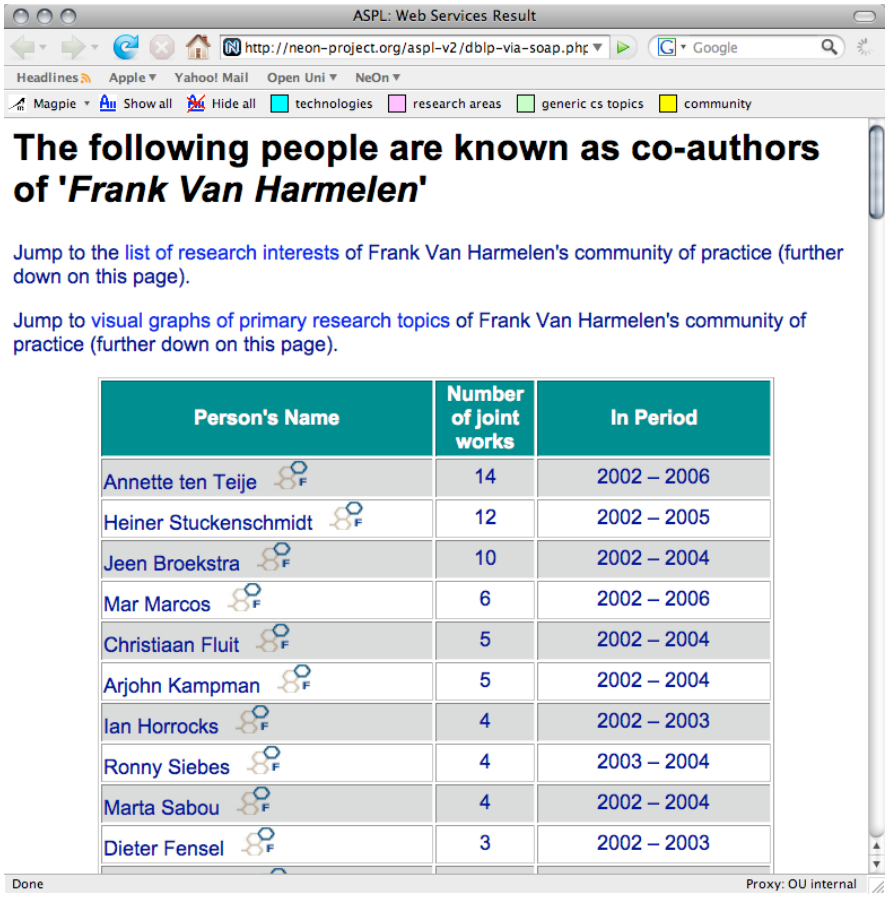


Figure 36. Service "Find person's co-authors" for the entities in category "People": results of the service invoked for term 'Frank van Harmelen'

The records listed in the output screen are further navigable; the meaning of icons next to persons' names is the same as earlier, they take the user to a richer interface of the FacetedDBLP, where further exploration of common publications can occur.

2.6.3 Finding a person's publications

Service 'Find person's publications' draws on the DBLP repository of publications in the domain of computer science. This service gives as an output an ordered list of papers and articles followed by a list of research topics that characterize a given individual's research interests in a given time period. The web application version allows the user to provide a partial input, e.g. only a surname or a part of a person's name ('McIlraith' instead of 'Sheila McIlraith') – similarly as shown in section 2.6.1.

Retrieved publications are not only listed, but the service also offers the user direct access to further information. In this case, the user may preview the record of a given publication from the DBLP (see the outcome of clicking on icon A from Figure 38 in Figure 39), or retrieve a BibTex citation of a specific paper (see the outcome of clicking on icon B from Figure 38 in Figure 40), or retrieve the actual full-text electronic copy of a given paper (see icon C from Figure 38).

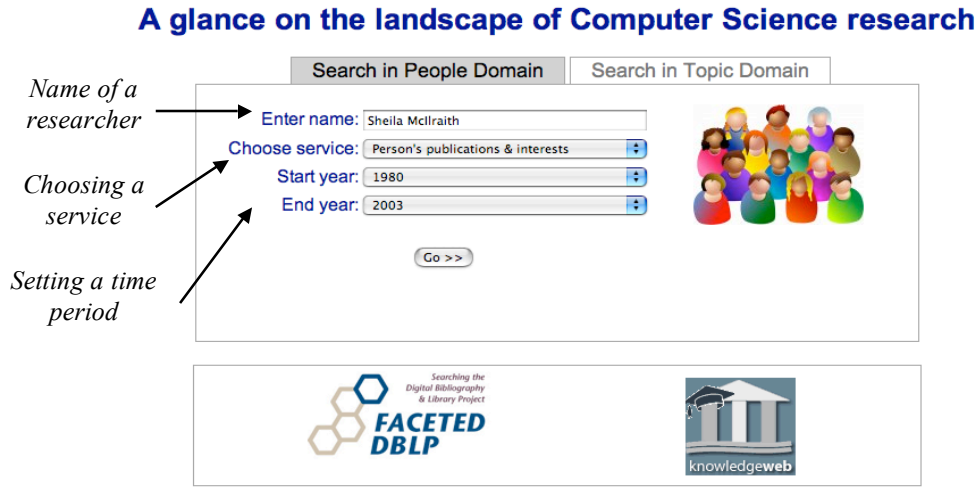


Figure 37. The interface of ASPL/DBLP showing how the users can set inputs for person's publications & interest

Should the input given in the web application version of the ASPL platform be ambiguous, a disambiguation screen shows up, as mentioned in section 2.6.1, allowing the user to choose one of the alternative meanings. Figure 38 then shows a partial view of the output produced by the ASPL for service 'person's publications & interests'. We highlight the three icons mentioned above.

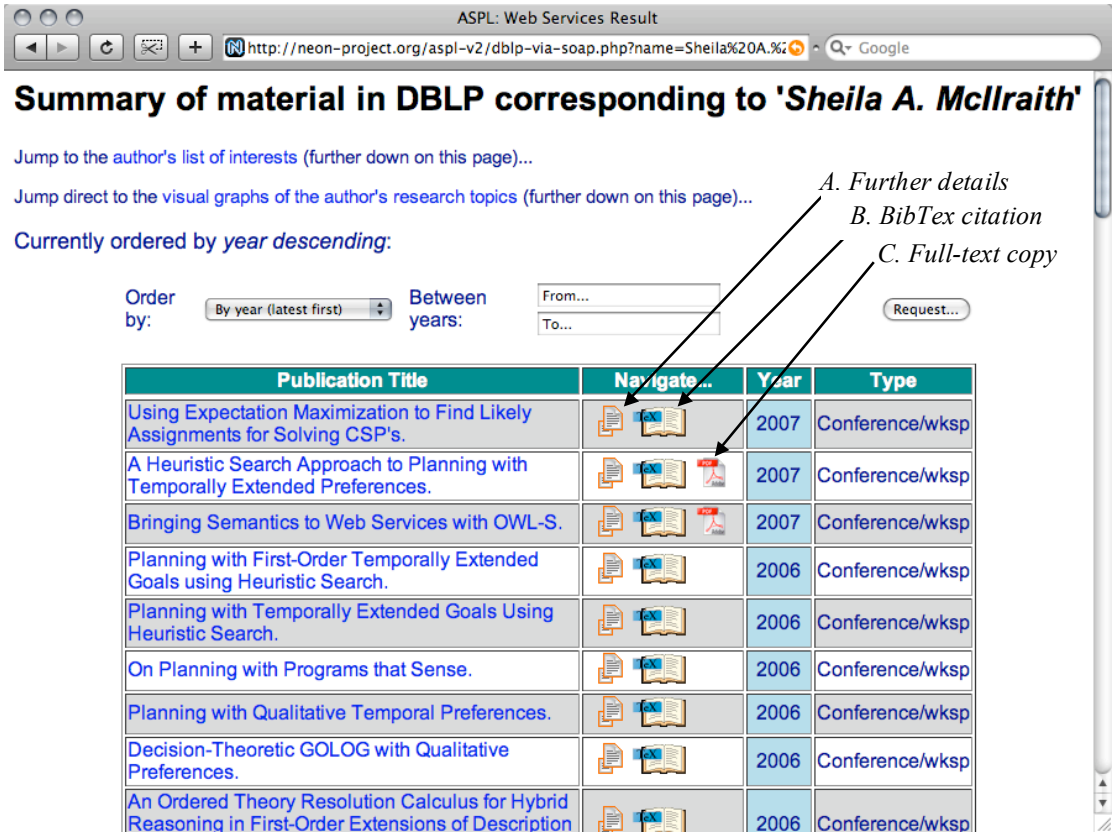


Figure 38. The output produced by ASPL/DBLP for the service 'person's publications & interest'

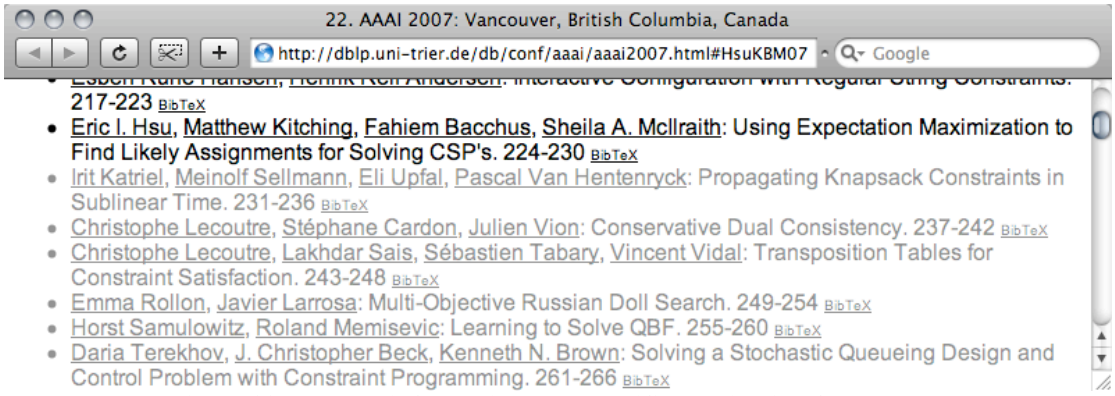


Figure 39. Further information on a specific publication from DBLP

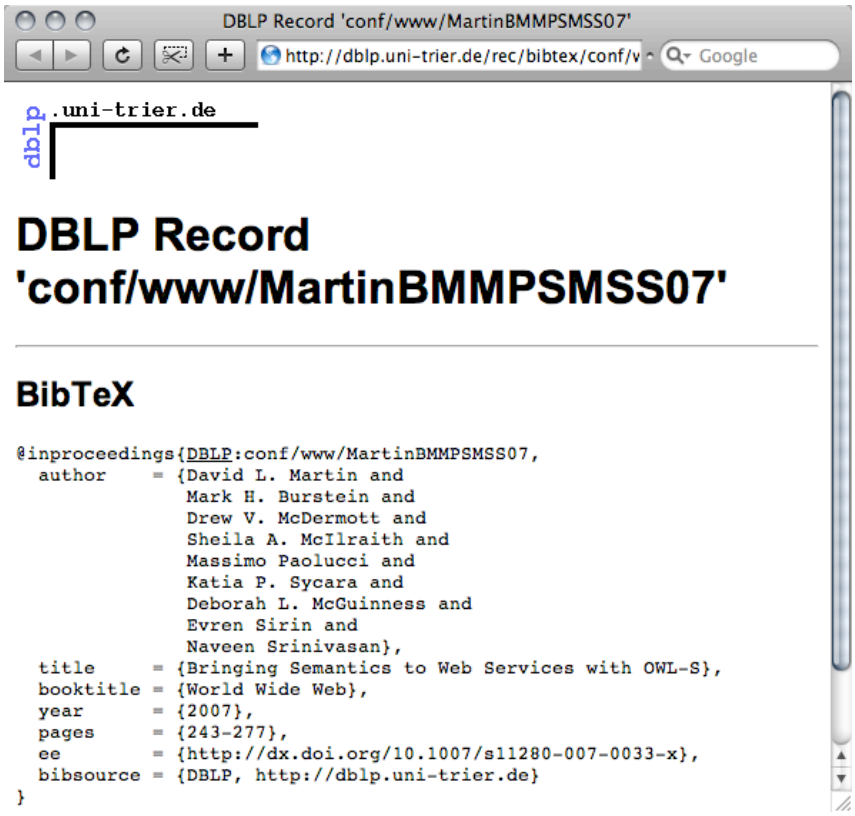


Figure 40. BibTex reference record for a specific publication from DBLP

In the plug-in version, the system bypasses the disambiguation step (as the entities are well-defined thanks to the ASPL lexicon), and the user is taken straight to the results screen. This consists of two sections: first, a list of publications is given a number of actions that can be done with publications, and next, a description of research interests applying to a specific person, and finally followed by a list of abstracted research areas typical for a given person. Figure 38 only shows the first part of the result (the actual publications), the second part is rather similar to the one shown in section 2.6.1, so is not repeated here.

3 Technical Aspects

3.1 System requirements for ASPL/Magpie

ASPL is based on the Magpie framework, which is essentially a plug-in suitable for Microsoft Internet Explorer or Mozilla/Firefox browsers, and this fact determines most of the requirements your system must satisfy to use ASPL in its plug-in version, and thus semantic browsing effectively:

- Operating system: *MS Windows* (Win32 platform) … this constraint only applies to the Internet Explorer version and is due to the fact that Magpie is shipped as DLL, which only runs on Win32 systems. We have tested the plug-in on the following operating systems: *Windows 2000 Pro*, *Windows XP Home* and *Pro*.
- Operating system: *Mac OS X* or *Linux* … on these systems only the Mozilla-based web browsers (such as e.g. Netscape or Firefox) support the ASPL plug-in that exists in a form suitable for these architectures.
- Web browser: *MS Internet Explorer*, releases 5.5 or higher. We strongly recommend using currently most up-to-date *Internet Explorer 6*. Alternatively, *Mozilla* release 1.7 or higher and *Firefox* release 1.0 or higher are suitable platforms for the Mozilla/Firefox version.
- Hard disk space: At least *20MB free space* on your C: drive (applies mostly to the Internet Explorer version; Mozilla-based plug-in has a negligible footprint in terms of disk space).
- Connection to Internet: This is not needed if you wish to only highlight the ontological entities on off-line web pages. However, Internet link *is essential* if you want to take advantage of ontology-supported semantic browsing and semantic services.

Magpie and ASPL plug-in has been tested on all systems and applications mentioned above. Please, inform us if you find additional operating systems or IE versions where it works.

System requirements for using other forms of presenting ASPL data: e.g. FacetedDBLP[5] or ASPL via web-based application[6], there are no specific requirements or prerequisites. Only a Javascript compatible web browser is needed. Hence, in the next section we only describe how to set up and install the plug-in of ASPL.

3.2 Installation and basic setup

We start with the installation and setup of ASPL/Magpie extension on the user's computer. The current configuration of ASPL/Magpie prototype assumes that working folder is "C:\Magpie". While the user may change the settings, this folder

[5] http://dblp.l3s.de
[6] http://neon-project.org/aspl-v2

will be used for the storage of web page snapshots, as well as ontology storage. The entire functionality of Magpie is implemented as dynamically loaded library (DLL). This library has to be registered with your operating system before anything can be tested. In the case you are installing Magpie from an executable installer (`magpie-setup.exe`), the registration should happen automatically.

However, the DLL registration may fail in the case you have a running instance of Internet Explorer! If this happens, follow the instructions below to find out whether a running instance of Internet Explorer is a problem. Once there are no applications or processes of Internet Explorer running, go to the directory you installed Magpie to (e.g. C:\Magpie), and run/double-click on the file:

```
register-magpie-dll.bat
```

Alternatively, you may do the registration manually. The following command must be executed in the DOS prompt (launch the DOS prompt window using `Start` → `Run…` and type "`cmd`" – a DOS window with a prompt should show):

```
regsvr32 C:\Magpie\Magpie.dll
```

The only significant difference in setting up ASPL/Magpie for Mozilla is that the installer (*.xmi file downloadable from the web site) shall be opened inside a Mozilla browser's window. XMI is a simple scripting support for installing plug-ins, which has a fairly straightforward sequence of steps. Note the troubleshooting advice further down, which is particularly likely to help in case of Mac OS X and Linux.

If the DLL registration was accomplished successfully, a window with a respective system message should appear on your screen. Similarly for Mozilla/Firefox, the message on screen would inform the user about successful setup. In case that Magpie registration with the system was not successful, the most typical reasons are:

- You don't have sufficient privileges to install/register a new application.

  Resolution: Please log in as 'Administrator', or ask your system administrator for assistance. This applies to both, IE and Mozilla version. In case of IE, one needs to have permission to register new dynamic library. In case of Mozilla, one needs the right to write into a shared folder (e.g. /usr/local/bin) if a shared mode of ASPL/Magpie installation is chosen.

- You have an Internet Explorer and/or Mozilla application open, and the system cannot modify its settings while running. A similar error may occur when the system reports that installation was successful but ASPL/Magpie is not visible in the browser.

  Resolution: Close all windows of your web browser, and re-run the above registration command if necessary. Since Internet Explorer occasionally stays in the computer memory as a process (with no visible windows showing), it may be necessary to have a look at the running processes, too.

- I see no Internet Explorer windows on my desktop, what about the processes?

  Resolution: Right-click on your system bar (the one where '`Start`' button is), and in the menu choose option '`Task Manager…`'. In the Task Manager

window, go to tab labelled '`Processes`', find one called 'IEXPLORE.EXE', and highlight it. Next, click on button '`End Process`', and confirm it.

These are the most common reasons for failing to operate Magpie extension properly. If you encounter anything else, please, let us know. To test whether Magpie really is in your web browser, launch Internet Explorer or Mozilla – depending on which version you installed. Both versions have 90% the same functionality and appearance so steps/figures applicable to one browser also apply to the other. Once your browser starts up, you should see a little button (usually towards the right-hand end of the Internet Explorer's button bar). The button is depicted using marker A in Figure 41, and if you click on it an initial Magpie toolbar appears showing a single button labelled "Magpie" and a little arrow (pointer B).

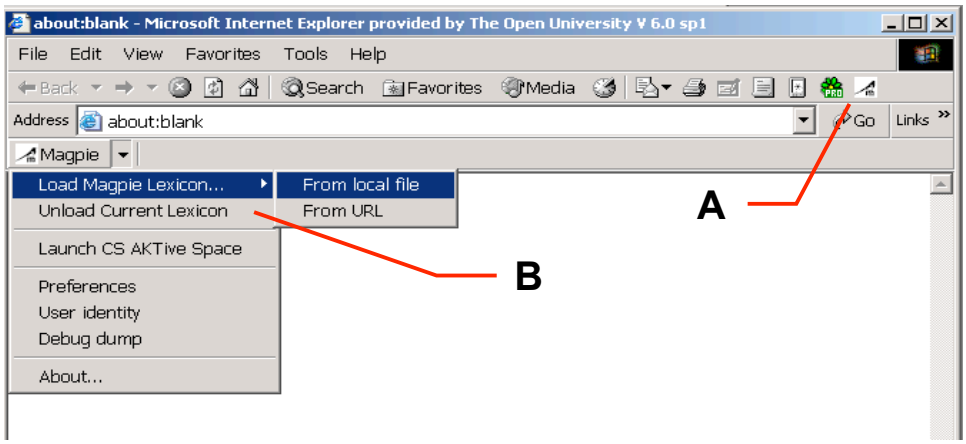


Figure 41. Magpie toolbar as an integral part of Internet Explorer showing a button for activating and deactivating the Magpie toolbar (A) and the initial appearance of the toolbar with menu (B)

3.3 Preparation – ontology definition/download

Once you can get as far as described in the previous section, ASPL/Magpie is likely to be installed and registered correctly. To test its functionality, you will need to load at least one ontological lexicon. A lexicon is a serialized version of an ontological network or simply, a mapping from strings to entities within an ontology (Domingue, J., Dzbor, M. *et al.* 2003). Each entity in the ontology is referred by its instance name and class. Instances may have more than one lexical representation. For instance, assume there is an instance known as "`JOE-DOE`". This would translate to different strings, incl. "`Joe Doe`", "`J Doe`", "`Doe J`", "`Doe Joe`", etc.

Lexicon containing the instances such as those mentioned earlier represents items the Magpie extension would be able to work with and find in the web page. Moreover, thanks to the lexicon and underlying ontology, Magpie is able to offer a suite of semantic services that are dependent on a class of a particular instance. For example, our "`JOE-DOE`" is classified as a "`RESEARCHER-AUTHOR`", which reflects the focus of ASPL application on supporting literature review, or more generally as a "`PERSON`". Hence, semantic services related to the "`PERSON`" class would show when clicked on "`Joe Doe`" in the web page.

Lexicons currently come (i.e. in this beta release) in form of two files. The main lexicon has the extension "`*.onto`", and contains the actual instances from the ontology. The second file – with the extension "`*.menu`" is self-explanatory; it contains the definitions and labelling of the semantic menus associated with the classes from this particular ontological lexicon. Unless you want to create your own ontology, you do not need to worry too much about the syntax of each file. In the future releases, we shall move towards standard web language such as RDF for lexicon definition. Similarly, we will try to offer a web service creating a Magpie-compatible lexicon from 'any' arbitrary ontology submitted as an input. Nonetheless, these are future extensions!

In order to test your Magpie, you need to load the lexicon first. Assuming you have downloaded/installed the default Magpie application, follow these steps:

1. Click on Magpie button to show the Magpie toolbar in your web browser. You should see a situation similar to that in Figure 41.
2. Next, click on the little arrow next to the label "`Magpie`" on the Magpie toolbar (see pointer B in Figure 41). A menu similar to that depicted in the figure should appear.
3. Choose the first option labelled "`Load Ontology`"; and then "`From local file`". A file selection dialog window appears, letting you choose the lexicon (with `*.onto` extension). Alternatively, you may obtain the latest update of this lexicon from a shared web location by choosing option "`From URL`" and typing the following address:
   http://kmi.open.ac.uk/projects/kweb/resources/semweb-studies.onto
4. Navigate to the location (folder) where you stored the lexicon; usually it would be found in "C:\Magpie" or "Ontology Store" sub-folder of the main installation directory (mostly "C:\Magpie").
5. Choose "semweb-studies.onto" for the purposes of interacting with a knowledge management application of Magpie.
6. Clicking on "`Open`" button Magpie starts loading lexicon. Note that this may take a while (around 2-5 seconds for "semweb-studies.onto" lexicon) depending on the size of the lexicon, number of instances, and of course computer power.
7. If the loading and lexicon initialisation is successful, you should see the Magpie toolbar changing its appearance and showing the top-level classes/categories from a particular ontology. Each class is a button with a different colour label. For details of the screen, see Figure 42.

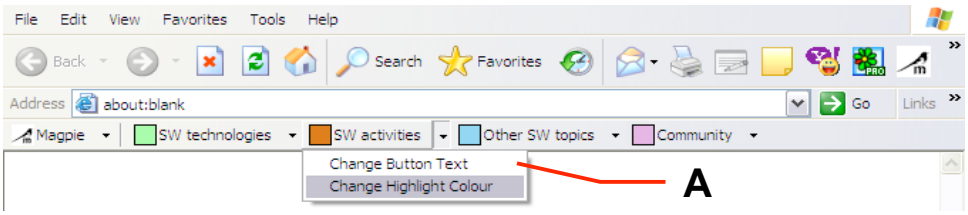


Figure 42. Magpie toolbar after loading a lexicon and showing the top-level classes

Having come so far means that the ASPL/Magpie extension is properly set up and ready to be used for browsing. Now you may start browsing the web by typing a URL (web address) in your web browser, or by searching your favourite web engine. We shall look at the actual behaviour during browsing in the next section, and we shall use the W3C as a starting web site (http://www.w3c.org). However, let us mention two simple configuration changes you can perform at this stage first with the Internet Explorer version of ASPL/Magpie.

First, you can change a button label for each of the top-level classes/categories by using the first option ("`Change Button Text`") in the pull-down menu shown by pointer A in Figure 42. To access the pull-down menu, you click on the little arrow next to the button you want configure, and then choose the option you want.

Similarly, you may want to change the colours used by ASPL to highlight entities of a particular class found in the web page. Currently, all research areas that are known within the loaded ontological lexicon would be highlighted in sky blue. While this is a good colour for a page with white background, it may be inappropriate for say light blue background. In such a case, you may easily change the colour of highlighters. To perform the change, access the pull-down menu for a particular button/category, and choose second option ("`Change Highlight Colour`") as shown in Figure 42. A colour picker dialog would show allowing you to choose your preferred shade.

3.4 Using ASPL/Magpie while browsing

In order to get in grips with ASPL/Magpie functionality, we suggest starting with the organizational memory lexicon (semweb-studies.onto file). This file provides a sample lexicon for the semantic web studies ontology[7], which describes concepts relevant to the studied domain; e.g. paper authors, research themes, key concepts, etc. To see Magpie with the semantic web studies lexicon in its 'native' environment we suggest using the `http://www.w3c.org` web site. Type this URL into your Magpie-enabled browser, and wait until it appears on screen. Once the site is visible, you may load the semantic studies lexicon if you haven't done so yet (see previous section for how to go about it).

There are essentially two basic ways for a user to interact with ASPL/Magpie and any web page enrichments facilitated by the ASPL/Magpie extension:

[7] Available in several formats from http://www.aktors.org/publications/ontology

- First, the user may highlight concepts of any particular class/category shown in the ASPL toolbar that happen to appear in the web page.
- Second, for each highlighted item or phrase, the user may invoke a semantic or contextual menu for browsing the value-added information about the instance.

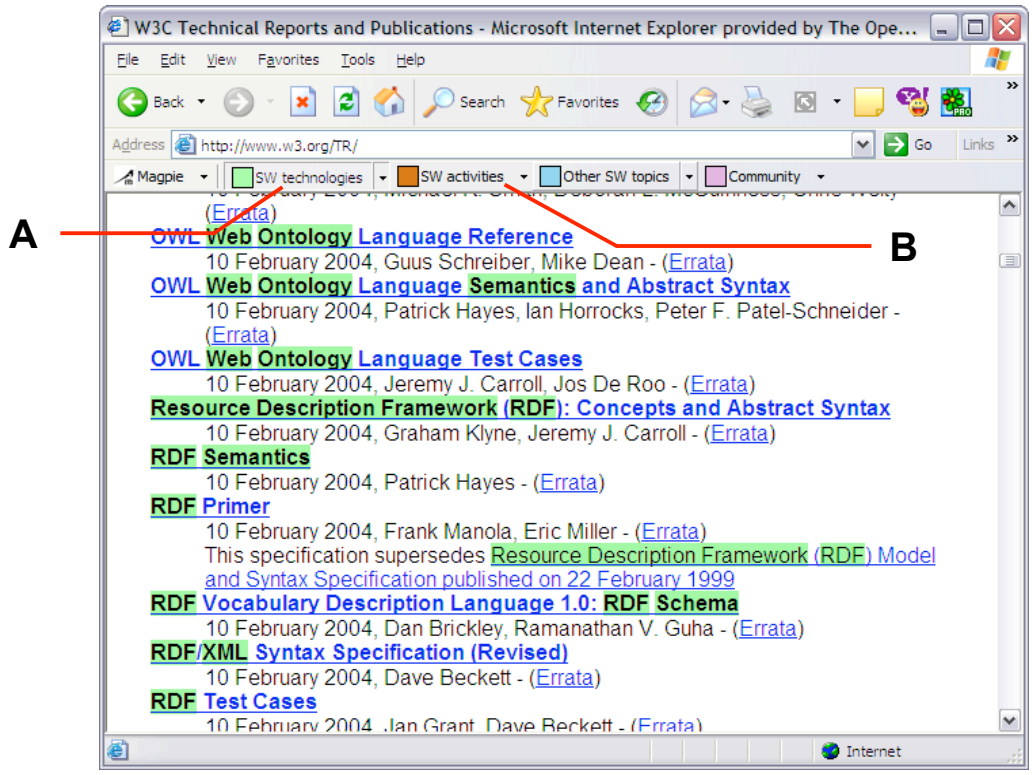


Figure 43. Web page after clicking on button "`SW technologies`"; i.e. highlighting semantic technologies in the page that are known in the ontological lexicon (semweb-studies.onto)

3.4.1 Concept highlighting

As we mentioned above, we explain the highlighting functionality on W3C's technical report web page. Assuming you already navigated to the appropriate URL[8], and loaded semweb-studies.onto lexicon, start with clicking on button labelled "`SW Technologies`" on the ASPL/Magpie toolbar (see pointer A in Figure 43). This button instructs ASPL/Magpie to find any phrase on the page that might be considered as a semantic web technology (in this constrained lexicon). By default, the button highlights concepts with light green colour (see snapshot in Figure 43). As could be expected, ASPL/Magpie found and highlighted such concepts as RDF or schema.

Before we start exploring the semantic menus and associated semantic services, we can highlight other – perhaps less obvious concepts and phrases on the web page or concepts that are more distant to the core theme of semantic web studies. For example, to annotate activities one can perform on the semantic web, click on the appropriate button. This one has an orange icon and is labelled "`SW activities`" (see pointer B in Figure 43). One can repeat the same clicking action on each ASPL

[8] http://www.w3c.org/TR

button. Each button would highlight instances from the respective category in the web page. The fully annotated web page is shown in Figure 44, and shows technologies, activities and other themes broadly related to semantic web studies.

More specifically, ASPL/Magpie correctly recognized phrase "`Resource`" as a concept frequently seen in the context of semantic web (see pointer A in Figure 44), and "`Resource Description Framework`" as one of key technologies one needs to know about (see pointer B in Figure 44). The fact that a particular category is actually highlighted is shown on ASPL/Magpie toolbar by a 'relief button' (see compressed buttons pointed by C in Figure 44).

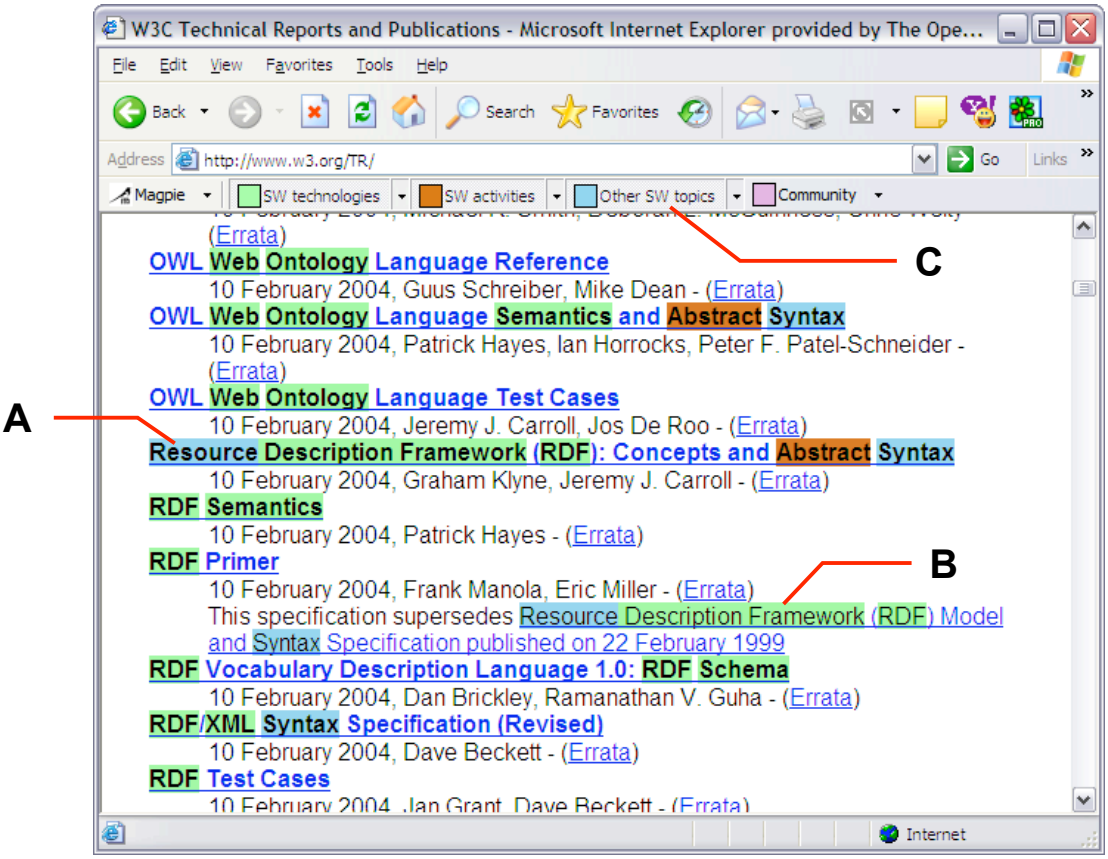


Figure 44. Fully annotated web page showing several categories turned on and highlighted in appropriate colours: technologies – light green, activities – orange, and other themes – sky blue.

3.4.2 Contextual, semantic menus

The next functionality the user of ASPL/Magpie can interact with – after successfully highlighting concepts and phrases in the text – is to invoke some of the semantic services. The adjective 'semantic' means that the actual suite of services is chosen based on the class membership of a clicked-on phrase. Please, note that only phrases that were highlighted by Magpie would respond with a menu of semantic services! To invoke a semantic menu, you need to move with the mouse pointer over a particular entity, and click with the *right button* in Internet Explorer and with the *left button* in Mozilla. The current selection of services available for the semantic web studies domain reflects the scenario of writing a literature review. For the semweb-studies.onto lexicon that comes with ASPL, distinct semantic menus appear

depending on the category membership of a particular entity, as shown in the previous sections when we described the services.

Now, click on one entity/phrase in the text denoting a technology. For example, let us assume right-clicking on highlighted phrase "`Resource Description Framework`". Since this phrase became visible after pressing the button "`SW technologies`", we expect a menu with semantic services specific for this category (option A in **Error! Reference source not found.**)[9].

4 Setting up ASPL/Magpie options

In addition to the basic functionality of highlighting ontological entities and providing additional information about them, the ASPL/Magpie plug-in can be customized – either on the level of knowledge presentation or on the level of communication with semantic services. The following are the most frequently used options of the original Magpie framework that are applicable to ASPL:

- Mechanism for remembering last used lexicon,
- Mechanism for user identification,
- Mechanism for browser customisation

4.1 Remembering last lexicon

The functionality of loading a lexicon and using it to interpret the web page to start semantically driven exploration of applicable knowledge space is the core aspect of ASPL and Magpie. However, the browsing process is very dynamic and our initial studies showed that the need to re-initialize the plug-in with the same lexicon each time the user moves in the semantic space adds to the cognitive costs and affects the usability and acceptability of the tool.

Therefore, a simple measure has been put in place enabling the user to express his or her preferences and store these persistently in (semantically marked-up) preference file. The file being annotated can be easily edited manually or the user may use ASPL/Magpie dialog boxes to set the preference. The preference setting dialog is accessible by clicking on the little arrow next to the "Magpie" logo in the toolbar and choosing the option "Preferences" (see marker A in Figure 45). As shown in Figure 45, to remember the currently loaded lexicon, the user ticks the box labelled with marker B.

[9] Note that the style may differ if you choose a different scheme or fonts in your Windows settings.

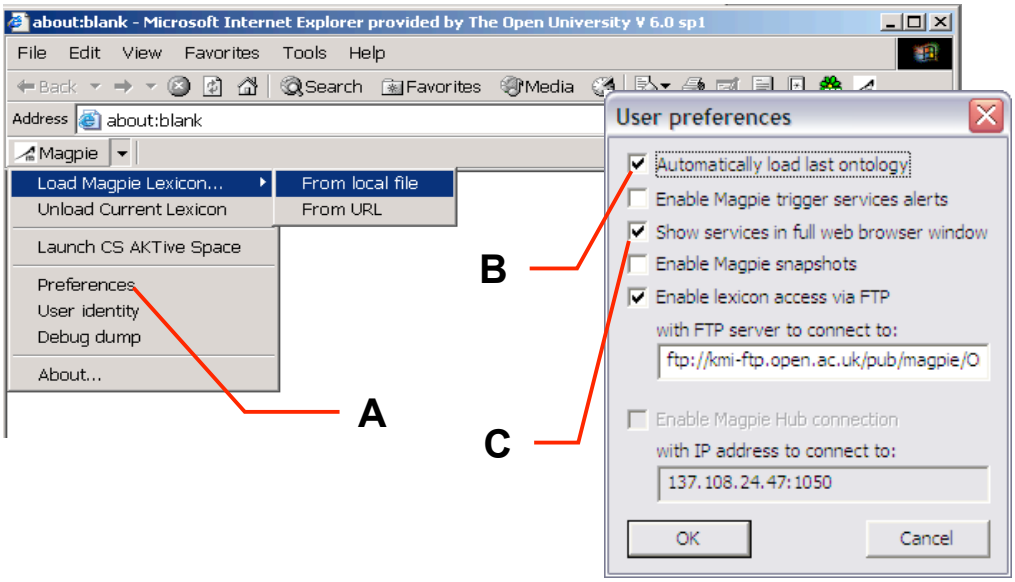


Figure 45. (A) Invoking preference dialog and (B) remembering the last used lexicon.

4.2 Browser window customisation

In addition to loading the last available lexicon, ASPL/Magpie also enable to alter the way responses from the semantic services are presented. The option marked by C in Figure 45 shows the responses in normal-size web browser windows, the size of which depends on the user's general settings of their browser. This functionality is very simple and its sole purpose is to improve the usability of the tool – by reducing the need to constantly resize the dialogs with responses to fit all the response in one proper window.

The other options seen in the preferences dialog relate to more specialized Magpie functionality, which includes trigger services, visual bookmarking, user alerts, etc. These functionalities were not used into ASPL; however, the conceptual and implementation details can be found in our previous publications.

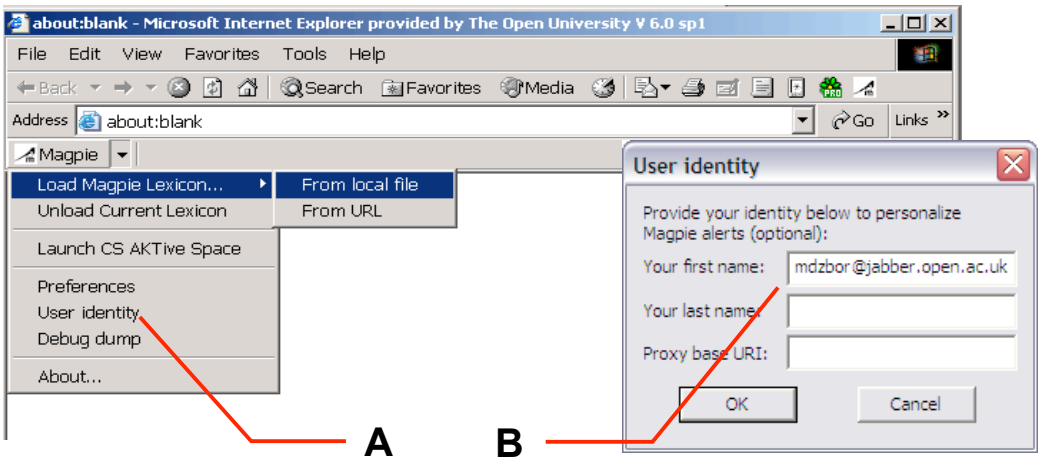


Figure 46. "Who am I" – ASPL/Magpie support for service personalization via user identities

4.3 User identity and personalization in ASPL

Finally, one aspect of Magpie framework that is enabled in ASPL is user's identity. Presently, none of the services as demonstrated above makes any use of the user identification. However, the concept of a user's ID is necessary to satisfy one of our objectives for the future releases – personalization. When talking about personalizing the user interaction with ASPL/Magpie, we mean customizing the responses of the semantic services based on knowledge the system may have about the particular user. For example, material on an appropriate level of difficulty or in a particular language might be preferred or highlighted in the responses.

The user identity is set up in a dialog accessible from the main Magpie menu and after choosing the option "User identity" as indicated by marker A in Figure 46. Marker B in the same figure then shows how the dialog appears. Nevertheless, note that this is a highly prototypic functionality, and we have currently no publicly available services that are truly capable of processing this information. In any case, should the user decide to enter this information about him- or herself, the inputs would be used each time a semantic service is requested from any semantic menu. On the server side, this would be ignored; however, this does not affect any user-side aspects of ASPL.

5 Summary and conclusions

Applying Semantic Web to construct multiple exploratory paths and attending to different aspects of the exploration, rather than to the individual nodes of the semantically enriched space, has several side effects. For instance, from the user experience viewpoint, the application becomes more flexible. A semantically enriched application does not confine its user to one specific activity or role. Another side effect is the dynamics of the semantic application. Ontology-driven solutions are often brittle; often based on closed worlds that enable reasoning solely about the known concepts. Linking the association discovery to the presentation overcomes this brittleness, and also avoids the knowledge acquisition bottleneck.

Previous reports (e.g. D3.3.6) concluded with a theoretical justification of our decision to re-engineer and almost completely revise the suite of learning services, so that more interaction is offered to the user, alongside with novel, semantically driven inferences. One of the outstanding tasks in the previous report was to assess whether the re-engineering actually worked. In other words, in the past period we focused more resources on two aspects:

(i) finalizing the design and implementation of learning services for the revised ASPL-v2 framework, and
(ii) carrying out a comparative assessment of ASPL-v2 vis-à-vis other tools that have a similar scope and may be commonly used by the users

In terms of the former point, L3S has put a substantial effort into their DBLP++ tool. This tool essentially draws upon the well-known database of publications in computer science, and in its interactive form, it offers the user a rich, faceted interface to access the content of DBLP. Nonetheless, this rich user interface may be somewhat daunting, so it was decided to pursue also a parallel approach promoting a lightweight user interface via the ASPL platform.

The ASPL platform is essentially about associating web services with the concepts and instances from a particular ontology, which is of interest to the user. Thus, OU and L3S developed a suite of web service end points for the DBLP++ data set, and these were later complemented with a user-friendly front end – simple, Google-style user interface for querying the content of DBLP and also for making knowledge-level inferences and connection interpretations. In particular, the following web services were exposed from the DBLP data set and described in this report in more depth:

- *Person's publications and interests* … a combination of a simple data retrieval (of publications) with an interpretative inference based on the publication keywords, Semantic Web Topic Hierarchy matches, etc.
- *Person's interests* … an interpretative inference based on the occurrence of keywords and phrases (also from Semantic Web Topic Hierarchy)
- *Person's community characteristics* … an interpretative inference based on the co-occurrence of co-authors, keywords and themes allowing generalizations from the individual nodes (researchers) to their collections (communities)
- *Person's co-authors and communities* … a combination of the retrieval function with an interpretative function as described above
- *Leading experts on topic* … an interpretative inference based on the occurrence of certain phrases within individuals' profiles combined with a statistics
- *Main publication outlets for topic* … an interpretative inference allowing the user to generalize from single nodes (publications and authors) to their collections (journals, conferences, etc.)

In terms of the latter area of focus, outcomes of the evaluation and positioning analysis have been report in deliverable D3.3.7.

ASPL features several rather different capabilities ranging from data and document retrieval to problem space navigation and to query expansion, amendment and re-formulation. So far, majority of Semantic Web tools focus on partial functions compared to ASPL; they are more specialized and optimized for a single task. On the contrary, ASPL has been conceived as a flexible framework addressing different stages of a fairly complex learning task (in particular, gathering date for literature review). The ASPL tasks are far less well defined and more open than mere named entity recognition or document retrieval. Hence, these aspects need to be taken in account in the remaining time of the project – both to inform the evaluation and to drive the selection of appropriate services in the final revision of the ASPL system.

The outstanding issues identified in D3.3.7 were addressed in this deliverable, and they are largely related to the areas where ASPL-v2 was observed as underperforming. In particular, the development of the capability to handle incompletely and vaguely formulated queries by means of tapping into tools that came into existence in the meantime (e.g. SemSearch engine may help to disambiguate an incomplete query into a set of alternative full names)

6 References

[1] Park, J. and Kim, J. Effects of contextual navigation aids on browsing diverse web systems. In Proceedings of CHI 2000, 257-264.

[2] Jimmy Lin, Dennis Quan, Vineet Sinha, Karun Bakshi, David Huynh, Boris Katz, David R. Karger. The role of context in question answering systems conference on Human Factors in Computing Systems, CHI '03 extended abstracts on Human factors in computing systems, t. Lauderdale, Florida, US, Pages: 1006 – 1007, 2003, ACM Press, New York, NY, USA.

[3] B. J. Jansen, A. Spink, and T. Saracevic. Real life, real users, and real needs: a study and analysis of user queries on the web. Information Processing and Management, 36(2):207–227, 2000.

[4] Nenad Stojanovic: On the Role of Query Refinement in Searching for Information: The Librarian Agent Query Refinement Process. 4th International Conference on Web Information Systems Engineering (WISE 2003), 10-12 December 2003, Rome, Italy. IEEE Computer Society 2003.

[5] Lotfi A. Zadeh. From Search Engines to Question-Answering Systems - The Need for New Tools. Advances in Web Intelligence: First International Atlantic Web Intelligence Conference (AWIC 2003), Volume 2663/2003. Lecture Notes in Computer Science. Madrid, Spain, May 5-6, 2003.

[7] Gilad Mishne and Maarten de Rijke. Query Formulation for Answer Projection. Advances in Information Retrieval, Volume 3408/2005. Lecture Notes in Computer Science, Pages 523-526. Springer Berlin / Heidelberg. 2005.

[8] Efthimis N. Efthimiadis. Query Expansion. Annual Review of Information Systems and Technology (ARIST), Williams, Martha E., (ed.) vol. 31, pp. 121-187, 1996.

[9] Michael K. Buckland and Fredric Gey. The relationship between Recall and Precision. Journal of the American Society for Information Science vol. 45, no. 1, pp. 12-19, 1994.

[10] David J. C. MacKay. Information Theory, Inference & Learning Algorithms. Cambridge University Press, 1st edition, June 15, 2002. ISBN-10: 0521642981.

[11] Lopez, V., Uren, V., Motta, E. and Pasin, M. AquaLog: An ontology-driven question answering system for organizational semantic intranets. Journal of Web Semantics, Vol.5, 2, (72-105), (2007). Elsevier.

[12] Popescu, A., M., Etzioni, O., Kautz, H., A.: Towards a theory of natural language interfaces to databases. In Proceedings of the International Conference on Intelligent User Interfaces, Miami, FL, USA, Jan. 12-15 (2003): 149-157.

[13] I. Androutsopoulos and G. Ritchie and P. Thanisch. Masque/sql: An Efficient and Portable Natural Language Query Interface for Relational Databases. Proc. of the 6th International Conference on Industrial & Engineering Applications of Artificial Intelligence and Expert Systems, 1993.

[14] Min Wu, Mingyuan Duan, Samira Shaikh, Sharon Small and Tomek Strzalkowski. ILQUA--An IE-driven question answering system. In *Proceedings of TREC 2005,* Washington, D.C, 2005.

[15] Lei, Y., Uren, V., and Motta, E. SemSearch: A Search Engine for the Semantic Web. Managing Knowledge in a World of Networks. In Proceedings of 15th EKAW Conference, Podebrady, Czech Republic, October 2006.

[16] Anagnostopoulos, A., A. Broder, et al. (2005). Sampling search-engine results. 14th Intl. WWW Conf., Japan.

[17] Bloom, B. S. (1965). A Taxonomy of Educational Objectives Handbook 1: Cognitive Domain. New York, US.

[18] Brown, J. S., A. Collins, et al. (1989). "Situated Cognition and the Culture of Learning." Educational Researcher **18**(1): 32-42.

[19] Brusilovsky, P. and R. Rizzo (2002). "Map-Based Horizontal Navigation in Educational Hypertext." Journal of Digital Information **3**(1): 156.

[20] Collins, T., P. Mulholland, et al. (2005). Semantic Browsing of Digital Collections. Proc. of the 4th Intl. Semantic Web Conf., Ireland.

[21] Dzbor, M., A. Stutt, et al. (2007). "Representations for semantic learning webs: Semantic Web technology in learning support." Journal of Computer Assisted Learning **23**(1):69-82.

[22] Hirschman, L. and N. Chinchor (1997). Named Entity Task Definition. 7th Message Understanding Conf. (MUC-7).

6.1 Related deliverables

Dzbor, M. and Stutt, A. (2005). D3.3.3: Prototype of advanced learning platform (ASPL-v1), Deliverable report for work package WP3.3, Knowledge Web Network of Excellence, delivered in July 2005.

Stutt, A., Dzbor, M., Maynard, D., Ronchetti, M. and Motta, E. (2005). D3.3.5: Evaluation of prototype (ASPL-1), Deliverable report for work package WP3.3, Knowledge Web Network of Excellence, delivered in January 2006.

Dzbor, M., Diederich, J., Rajpathak, D. and Dehors, S. (2006). D3.3.6v1: Report on the current status of ASPL, Deliverable report for work package WP3.3, Knowledge Web Network of Excellence, delivered in January 2007.

Dzbor, M. and Diederich, J. (2007). D3.3.8: Final demonstrator of ASPL and its components, Deliverable software demonstrator concluding work package WP3.3, Knowledge Web Network of Excellence, expected end December 2007.

6.2 Related publications

At the time of releasing this report there is no explicit publication covering the work discussed in it; i.e. evaluation of ASPL. However, the authors are shortening the report and adapting it, in order to make a submission to a journal in early 2008. Publications related to ASPL generally include the following:

Journal articles

- Dzbor, M., Motta, E. and Domingue, J. (2007). Magpie: experiences in supporting semantic web browsing. Journal of web semantics: Science, services and agents on the World Wide Web, 5 (3). pp. 204-222. ISSN 1570-8268

- Dzbor, M., Stutt, A. and Motta, E. and Collins, T. (2007). Representations for semantic learning webs: Semantic Web technology in learning support. Journal of Computer Assisted Learning, 23 (1). pp. 69-82. ISSN 0266-4909
- Dzbor, M., Motta, E. and Stutt, A. (2005). Achieving Higher-level Learning Through Adaptable Semantic Web Applications. International Journal of Knowledge and Learning, 1 (1/2). pp. 25-44. ISSN 1741-1009

Conference and workshop papers

- Dzbor, M. and Motta, E. (2007). Semantic web technology to support learning about the semantic web. In: Artificial Intelligence in education - building technology rich learning contexts that work. Frontiers in Artificial Intelligence and Applications, 158. IOS Press, pp. 25-32. ISBN 1-58603-764-1 & 978-1-58603-764-2, pp. 25-32.
- Dzbor, M. and Motta, E. (2006). Study on Integrating Semantic Applications with Magpie, 15th Conf. on AI Methodology, Systems & Applications (AIMSA), Varna, Bulgaria, eds. Jerome Euzenat and John Domingue, pp. 66-76, Springer Verlag.
- Pasin, M. and Dzbor, M. (2006). A Task Based Approach to Support Situating Learning for the Semantic Web, Workshop: Workshop on Applications of Semantic Web Technologies for E-Learning, SW-EL-06 at Adaptive Hypermedia 2006, Dublin, Ireland.

Book chapters and keynotes

- Dzbor, M. (2008). Best of Both: Using Semantic Web Technologies to Enrich User Interaction on the Web. Invited keynote at 34th SofSem Conference, Novy Smokovec, Slovak Republic, January 2008.
- Dzbor, M. (2006). Evolution of the idea of the Semantic Web and its implications on practice. Invited keynote at Znalosti 2006 - Annual conference of Czech and Slovak Societies for AI in knowledge capture, etc., Hradec Kralove, Czech Republic, February 2006.
- Dzbor, M., Motta, E. and Stutt, A. (2005). From Knowledge Repository to Knowledge Space. Book chapter in: Intelligent Learning Infrastructure for Knowledge Intensive Organizations: A Semantic Web Perspective, eds. Lytras, M.D. and Naeve, A., Hershey PA: Information Science Publishing.