

Intelligent Book Mashup: *Using Semantic Web Ontologies and Rules for User Personalisation*

- ❖ **Aikaterini K. Kalou**
- ❖ **Tzanetos Pomonis**
- ❖ **Dimitrios Koutsomitropoulos**
- ❖ **Theodore Papatheodorou**



High Performance Information Systems Laboratory

Semantic Web And Reasoning for Cultural Heritage and Digital Libraries 2010(SWARCH-DL)

September 22-24 2010, Pittsburg, PA, USA



OUTLINE

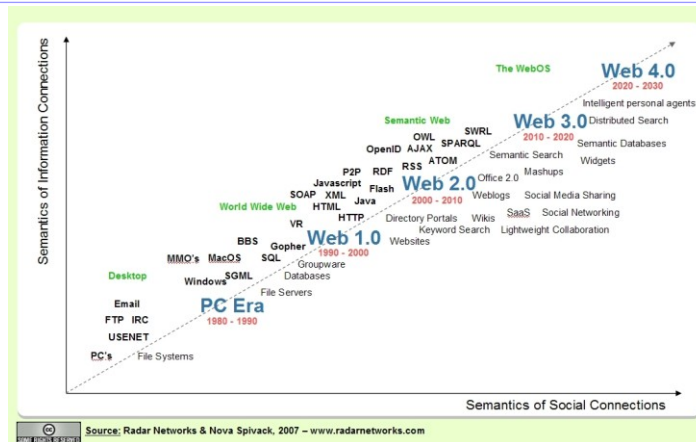
- Introduction to application
- Theoretical Background
- System Architecture and Design
- Collecting Data From Bookstores
- Functionality and Examples
- Future Work
- Conclusions

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Evolution of Web



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Application Features

- Books@HPClab
- Based on a 3-tier architecture
- Combination of the basic principles of Semantic Web and Web 2.0
- Framework of searching and retrieving metadata for books from Amazon and Half EBay
- User personalisation

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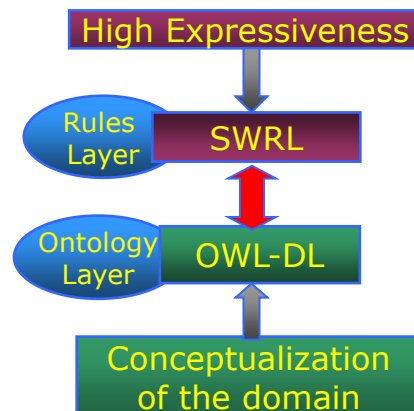
Semantic Web and Personalisation

- The Semantic Web is deeply connected to the idea of personalisation in its very nature
- **Personalisation Techniques**
 - Reasoning about actions
 - Transforming and adopting adaptive hypermedia techniques
 - **Rule based user modelling**



Rules - SWRL

- **Problem:** Restrictions of ontology language expressiveness for the sake of their decidability
- **Solution:** Languages extension with rules
- SWRL = OWL DL + Horn-like rules
- DL-safety



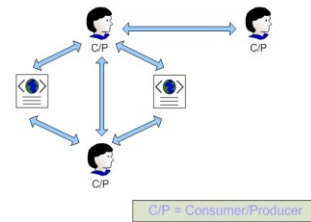
Web 2.0 Background

- A new version of World Wide Web
- Not an update to any technical specifications
- Cumulative use of Web
- **Web 2.0 applications**
 - Mashups
 - Blogs
 - Wikis
 - Social Networks
 - RSS feeds
 - Podcasts
 - Web Services

Web 1.0



Web 2.0



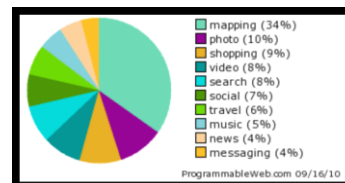
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Mashups

- A mashup is a hybrid web application, which combines heterogeneous data or functionality from two or many more external sources in order to create a new, unified and enhanced service or site.
- **Mashup creation methods**
 - Web APIs
 - Web Feeds (RSS/Atom)
 - Screen Scraping

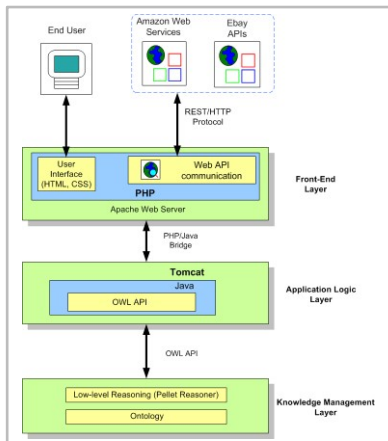


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System Architecture and Design



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Implementation Backbone

- Ontology Development
- Mashup Creation with the use of Web APIs
- User personalisation implemented with the use of rules

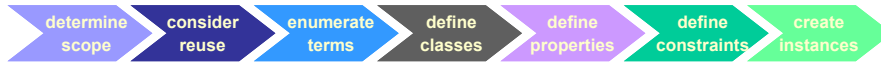
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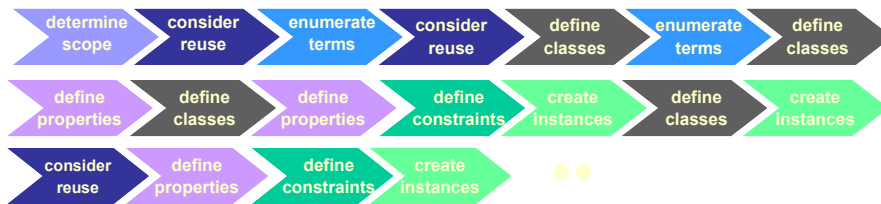


Ontology-Development Process

- The main steps :



- In reality - an iterative process:



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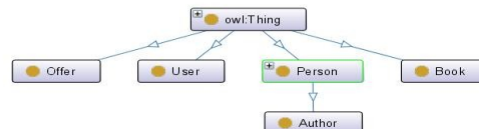
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BookShop Ontology - Classes

■ Classes

- Book
- Author
- Offer
- User

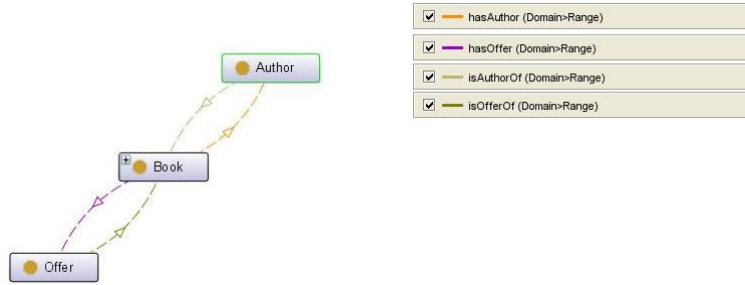


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BookShop Ontology Object Properties

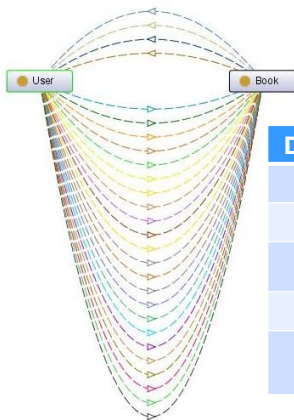


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BookShop Ontology Object Properties



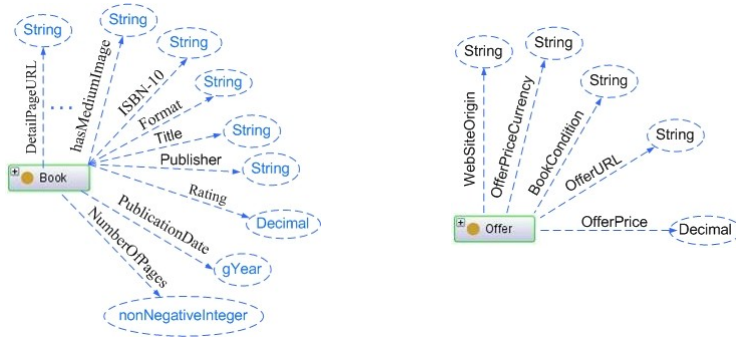
Domain	Object Property	Range
Book	hasHisFavoriteCondition	User
Book	hasHisFavoritePrice	User
Book	hasHisFavoriteRating	User
Book	hasHisFavoritePublicationDate	User
User	prefersBook_byRate_#criteria_ombination_of_criteria	Book

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BookShop Ontology Datatype Properties

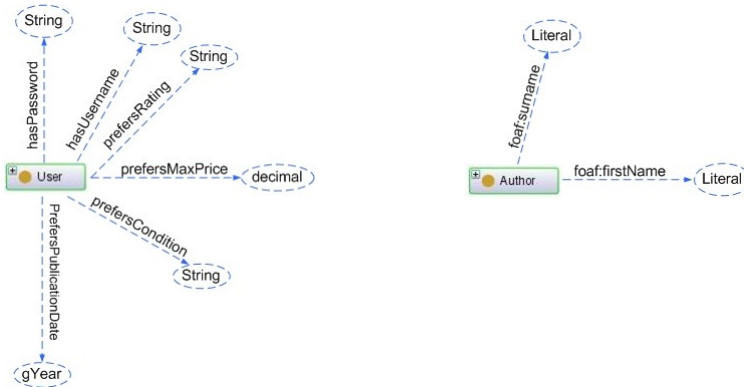


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BookShop Ontology Datatype Properties



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Personalisation Rules

- Checking the satisfiability of each preference's criteria separately

$\text{Book}(?y) , \text{Offer}(?z) , \text{User}(?x) , \text{isOfferOf}(?z, ?y) , \text{OfferPrice}(?z, ?price) , \text{prefersMaxPrice}(?x, ?max_price) , \text{lessThanOrEqual}(?price, ?max_price) \rightarrow \text{hasHisFavoritePrice}(?y, ?x) \wedge \text{prefersBookbyPrice}(?x, ?y)$

(1) Rule for Price of Book

$\text{Book}(?y) , \text{User}(?x) , \text{Rating}(?y, ?rating) , \text{prefersRating}(?x, ?preferred_rating) , \text{greaterThanOrEqual}(?rating, ?preferred_rating) \rightarrow \text{hasHisFavoriteRating}(?y, ?x) \wedge \text{prefersBookbyRating}(?x, ?y)$

(2) Rule for Rating of Book

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Personalisation Rules

- Checking the number of satisfiable criteria and cover all the possible combinations

$\text{Book}(?y) , \text{User}(?x) , \text{prefersBookbyCondition}(?x, ?y) , \text{prefersBookbyPrice}(?x, ?y) , \text{prefersBookbyPublicationDate}(?x, ?y) \rightarrow \text{prefersBook_byRate3_Con_Price_Date}(?x, ?y)$

(1) Rule for three criteria

$\text{Book}(?y) , \text{User}(?x) , \text{prefersBookbyCondition}(?x, ?y) , \text{prefersBookbyPrice}(?x, ?y) \rightarrow \text{prefersBook_byRate2_Con_Price}(?x, ?y)$

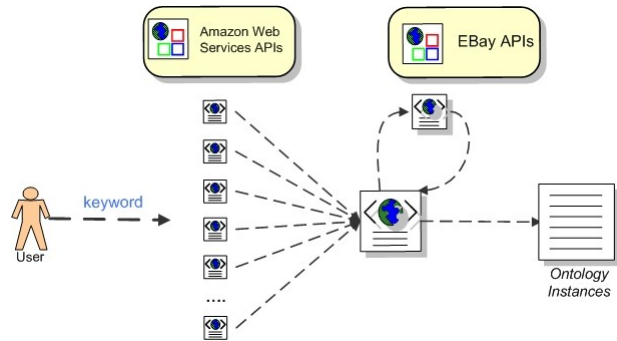
(2) Rule for two criteria

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Collecting Data From Bookstores



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Ontology Individuals

```
.....
<Author>Toby Segaran</Author>
.....
```

XSLT

```
<Author rdf:ID="Author_id2134438">
  <foaf:firstName xmlns:foaf="http://xmlns.com/foaf/0.1/
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    rdfs:datatype="http://www.w3.org/2001/XMLSchema#Literal"
    >Toby
  </foaf:firstName>
  <foaf:surname xmlns:foaf="http://xmlns.com/foaf/0.1/"
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    rdfs:datatype="http://www.w3.org/2001/XMLSchema#Literal"
    >Segaran
  </foaf:surname>
  <isAuthorOf rdf:resource="#Book1"/>
</Author>
```

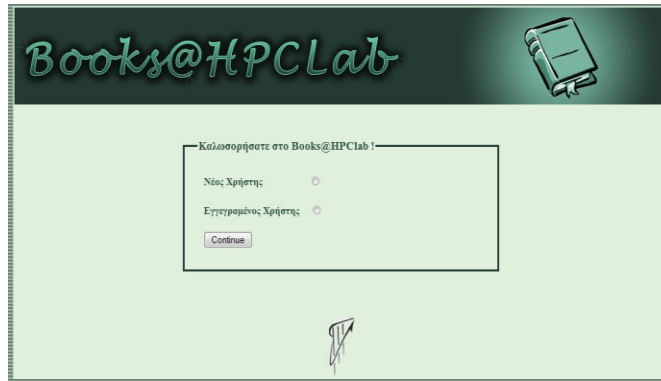
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Application User Interface

■ Main Page



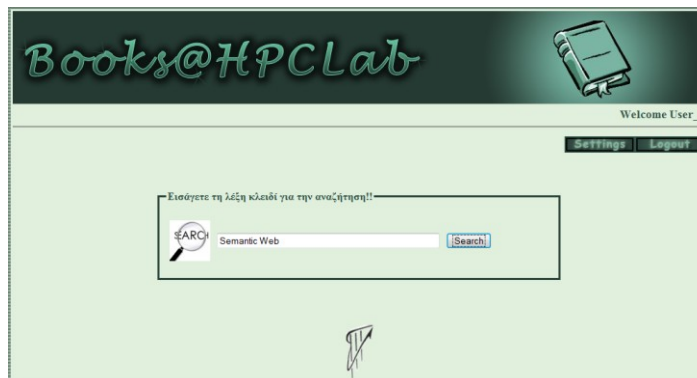
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Application User Interface

■ Search Form



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Application User Interface

■ Presentation of preferred books



The screenshot shows the 'Books@HPCLab' application interface. At the top, there is a header with the text 'Books@HPCLab' and a book icon. Below the header, there is a navigation bar with 'Search', 'Settings', and 'Logout' buttons. The main content area is titled 'Αγαπημένα Βιβλία' (Favorite Books) and contains a table with the following data:

α/α	Τίτλος Βιβλίου	Score
1	Programming the Semantic Web	★★★★
2	Semantic Web For Dummies (For Dummies (Computer/Tech))	★★★★
3	Semantic Web Programming	★★★★
4	Sprining the Semantic Web: Bringing the World Wide Web to Its Full Potential	★★★★
5	A Semantic Web Primer (Cooperative Information Systems)	★★★★
6	Thinking on the Web: Berners-Lee, Godel and Turing	★★★★

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Application User Interface

■ Pop-up Window



The screenshot shows a pop-up window titled 'Books presentation' for the book 'Semantic Web Programming'. The window displays the book's cover, a 5-star rating, and detailed information:

- Λεπτομέρειες Προϊόντος
- Συγγραφείς : John Heibel , Matthew Fisher
- Ρόλφ Βλάκ , Andrew Preece-Lopez
- ISBN : 047041801X
- Εκδόσεις : Wiley
- Χρονολογία Έκδοσης : 2009
- Format : Paperback
- Πλήθος Σελίδων : 648
- Βάρος Μεταφοράς : 205 Pounds
- Διαστάσεις Βιβλίου : 140 X 920 X 740

Below the details is a table with the following data:

α/α	Τιμή	Κατάσταση	Web Origin
1	New	19.72	ebay
2	New	19.88	ebay
3	New	20.27	ebay
4	New	20.8	ebay

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Future Work

- Demonstrate and evaluate application's features and potentials by testing it in real conditions
- Replace OWL DL by OWL 2
- Increase the number and the types of data sources for the mashup creation
- Pilot application more known to public to get feedback so as to be enriched
- Improve the response time of application



Conclusions

- Personalisation in Semantic Web with rules use
- Integration of Semantic Web and Web 2.0 technologies
- A step towards the idea of Web 3.0
- A model for practical implementation in other domains



Thank you for your attention!!!!!!



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