Building Virtual Documents
by Integrating Hyperbooks

Gilles Falquet
Luka Nerima
Claire-Lise Mottaz Jiang
Jean-Claude Ziswiler

Centre universitaire d’informatique
University of Geneva - Switzerland
Outline

Building / augmenting ontology-based Digital Libraries

Context of Digital Libraries: Documents and KOS

Building Hyperbooks and Virtual Documents

Building Digital Libraries

Building Digital Libraries through Ontology Alignment

Virtual Document of a Hyperbook Including Similar Concepts of a Second Hyperbook

Conclusion
Building / augmenting ontology-based Digital Libraries

How to integrate documents into a Digital Library?

=> By considering their glossaries, indexes, ontologies, ...
Context of Digital Libraries: Documents and KOS

Electronic versions of documents
- Book chapters
- Journal articles
- Web pages

Weakly structured KOS
- Glossaries
- Directories
- Indexes, Folksonomy
- Metadata annotated models (Learning Objects)

Highly structured KOS
- Ontologies
- Thesauri
- Concept maps
- Taxonomies

+ availability
- no or weak semantic structure

+ strong semantic structure
- not available
- difficult to construct
Context of Digital Libraries: Documents and KOS

=> Transferring documents and weakly structured KOS into highly structured KOS

=> By considering only ontologies, it is necessary to create full-fledged ontologies
Context of Digital Libraries: Documents and KOS

=> Considering highly structured KOS and fragments

=> By considering ontologies and fragments, it is no longer necessary to create full-fledged ontologies

=> There is no distance between the content represented in the ontology and the content of the documents
Context of Digital Libraries: Documents and KOS

=> Considering highly structured KOS and fragments

=> Hyperbook
Building Hyperbooks and Virtual Documents

- Fragments are linked to concepts (optionally typed)
- Generating virtual documents out of the hyperbook structure through an interface specification

[Crampes], [Garlatti], [DeBra], [Brusilovsky], [Falquet]
Building Digital Libraries

= Building a Digital Library of Hyperbooks
Building Digital Libraries

= Building a Digital Library of Hyperbooks

Hyperbooks
- Break the monolithic aspect of the documents
- New access methods / reading possibilities
- Synthesize books

Digital Library of Hyperbooks
- Compare books
- Extend a book with the contents of others

Virtual document
- Global reading interfaces
- Re-use the interface specification of one hyperbook for
Building Digital Libraries through Ontology Alignment

=> Integrating the ontologies of the hyperbooks

Compute similarity between concepts of the hyperbook ontology to integrate and concepts of the hyperbook ontologies already in the Digital Library.
Building Digital Libraries through Ontology Alignment

Alignment method

- Problem: Most ontology alignment methods need well-structured ontologies. But hyperbook writers are not knowledge engineers.

[C. Marshall, F. Shipman. Which semantic web?] «The difficulty of knowledge acquisition, representation and reasoning has a long history of being underestimated ... »

=> Alignment method that works with less formalized (incomplete) ontologies, adapted from [Rodríguez&Egenhofer03] by involving fragments
Building Digital Libraries through Ontology Alignment

Alignment method

- **Word Matching** (terms of the concepts, often 0.00)
- **Fragment Matching** (terms of the fragments, often > 0)
- **Feature Matching** (terms of the concept’s features)
Building Digital Libraries through Ontology Alignment

Digital Library as network of hyperbooks

All hyperbooks of the Digital Library serve as target hyperbooks of the integration process that means to compute many similarity values.
Building Digital Libraries through Ontology Alignment

Digital Library with a reference hyperbook and link inference

A reference hyperbook of the Digital Library could serve as the single target hyperbook of the integration process
Building Digital Libraries through Ontology Alignment

Digital Library with a reference hyperbook and link inference

Ontology alignment through a reference hyperbook if subjects of hyperbooks are close to each other

-> To avoid creating too many similarity links

=> Infer links to other hyperbooks
Virtual Document of a Hyperbook Including Similar Concepts of a Second Hyperbook

Multifunctional Agriculture [concepts] [fragments]

Ensuring Food Security

All countries have to ensure food security for their people, through domestic production, stockholding and imports. Several background elements contribute to such a conclusion. First, market mechanisms alone may not be sufficient to ensure food security. Food security therefore has the characteristics of a public good the provision of which may require government intervention. Second, the WTO agricultural reform process must be consistent with other relevant multilateral commitments such as those relating to the right to food. Article 11 of the International Covenant on Economic, Social and Cultural Rights recognises the fundamental right of everyone to be free from hunger, emphasises the responsibility of the state in this respect and underlines the necessity of taking into account the problems of both food-importing and food-exporting countries, to ensure an equitable distribution of world food supplies in relation to need. Third, we need to recognise that agriculture is a complex and longterm activity, which only slowly responds to changes in demand. This has important implications for our national food security strategies. One, since agriculture is a biological production characterised by seasonality and constrained by climatic conditions and the limits that exist for
Virtual Document of a Hyperbook Including Similar Concepts of a Second Hyperbook
Conclusion

KOS to build Digital Libraries

- strong semantic structure
- but not necessarily complete (well formed)

=> Hyperbook: small domain ontology and fragments

=> Building Digital Libraries by aligning hyperbook ontologies

=> Virtual Document to generate global reading interfaces

Further experiments (blended learning, October 2005):

integrate / augment hyperbooks written by students
Building Virtual Documents by Integrating Hyperbooks

Thank you!

Gilles Falquet
Luka Nerima
Claire-Lise Mottaz Jiang
Jean-Claude Ziswiler

Centre universitaire d’informatique
University of Geneva - Switzerland