Building Virtual Documents by Integrating Hyperbooks

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Outline

Building / augmenting ontology-based Digital Libraries

Context of Digital Libraries: Documents and KOS

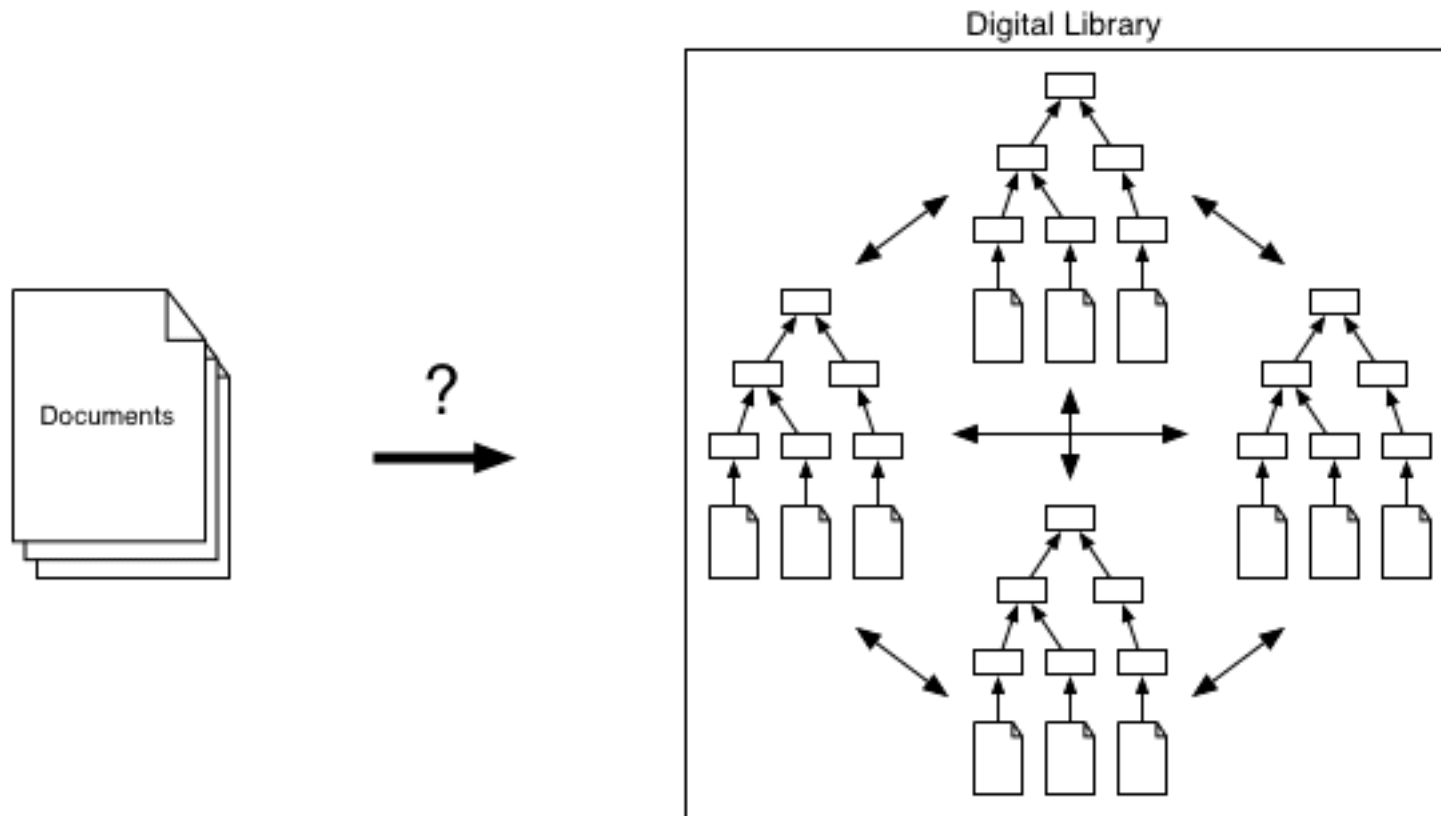Building Hyperbooks and Virtual Documents

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 an Digital Library?

=> By considering their glossaries, indexes, ontologies, …

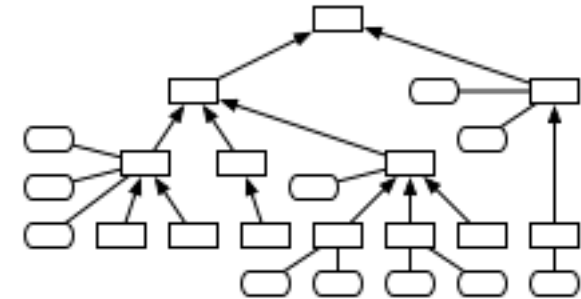# Context of Digital Libraries: Documents and KOS

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
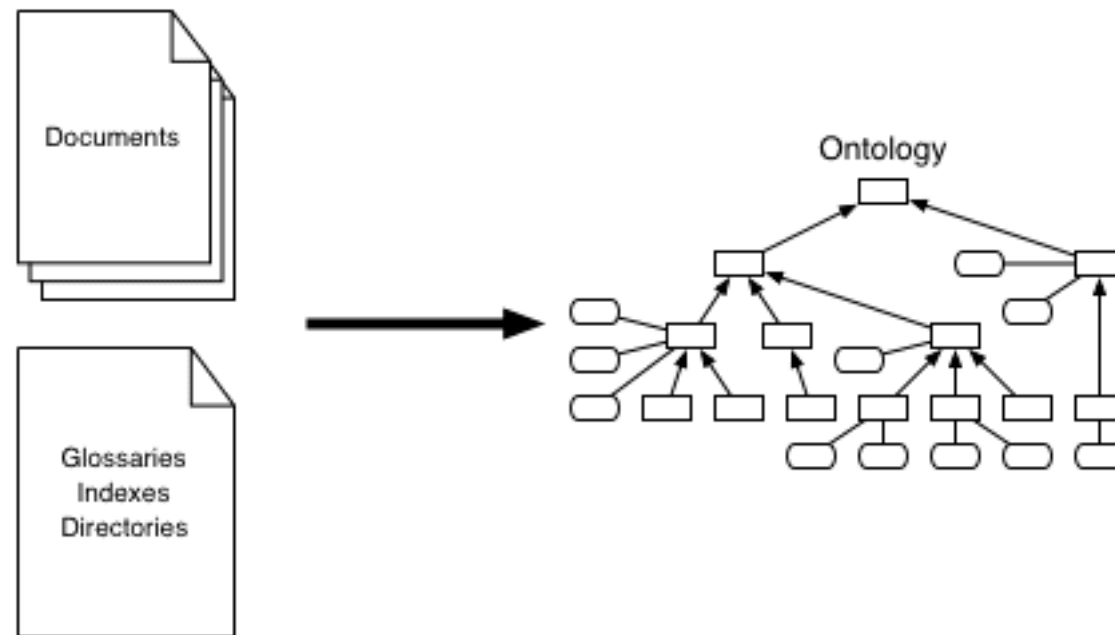Ontologies
Thesauri
Concept maps
Taxonomies

+ availability

– no or weak semantic structure

+ strong semantic
  structure
– not available
– **difficult to construct**

Context of Digital Libraries: Documents and KOS
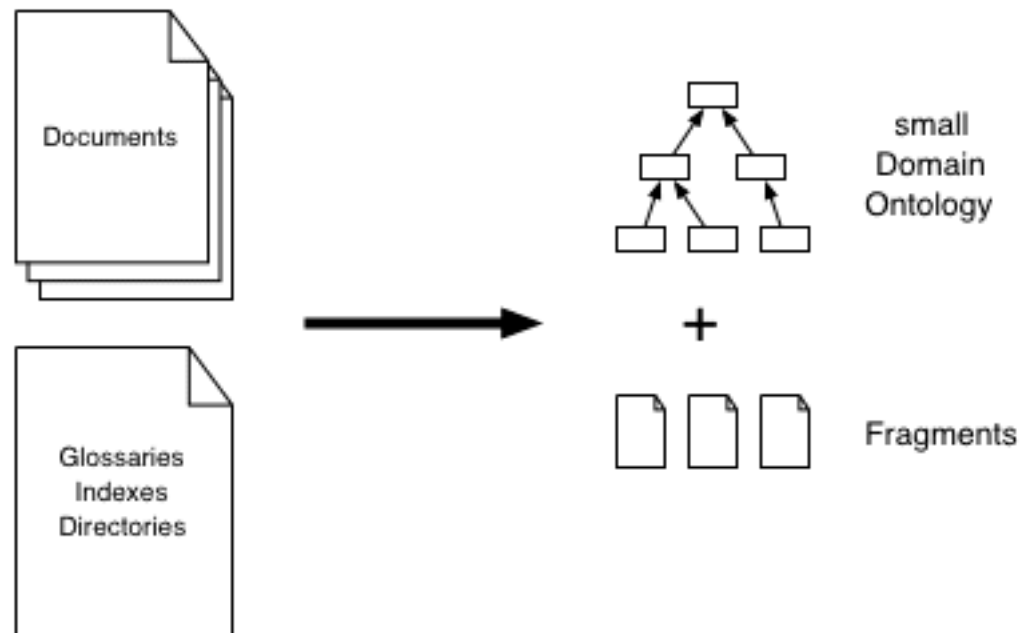
=> **Transferring documents and weakly structured KOS into highly structured KOS**

=> **By considering only ontologies, it is necessary to create full-fledged ontologies**

Context of Digital Libraries: Documents and KOS
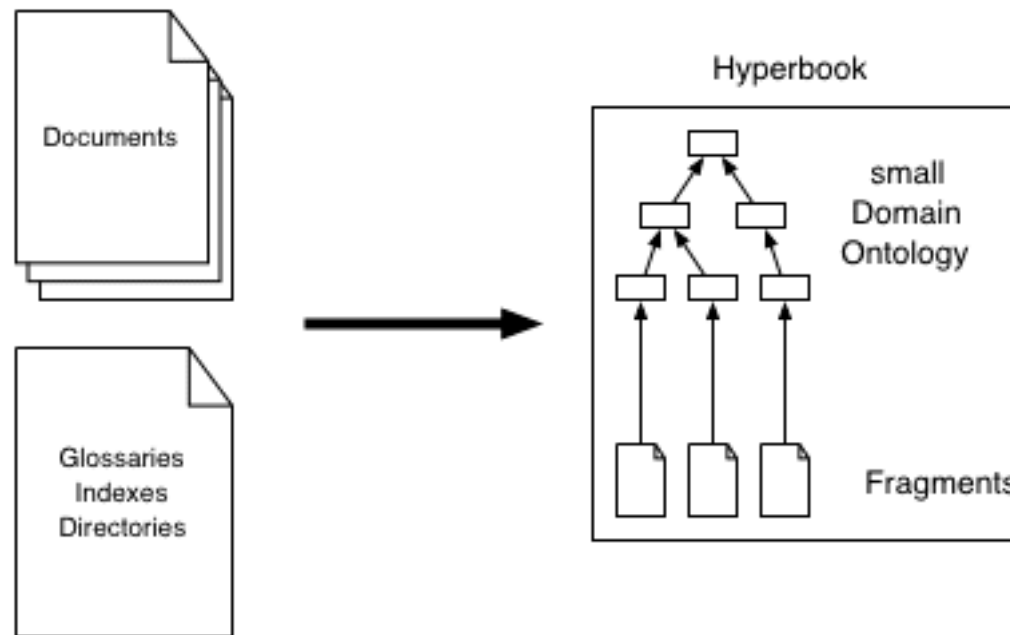
=> **Considering highly structured KOS and fragments**

=> 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

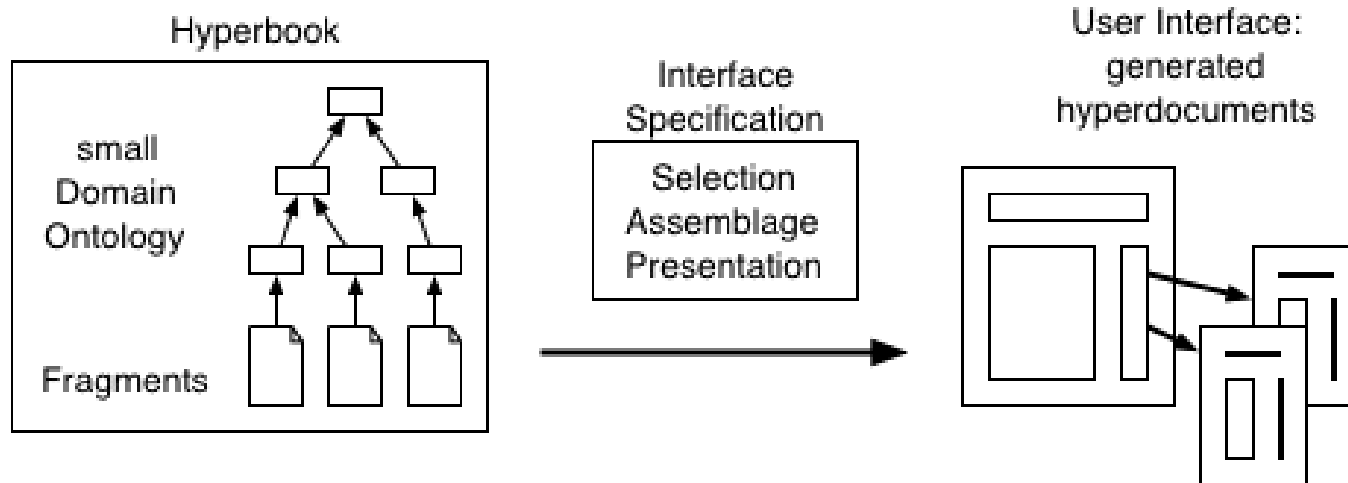# Context of Digital Libraries: Documents and KOS

=> Considering highly structured KOS and fragments

=> Hyperbook
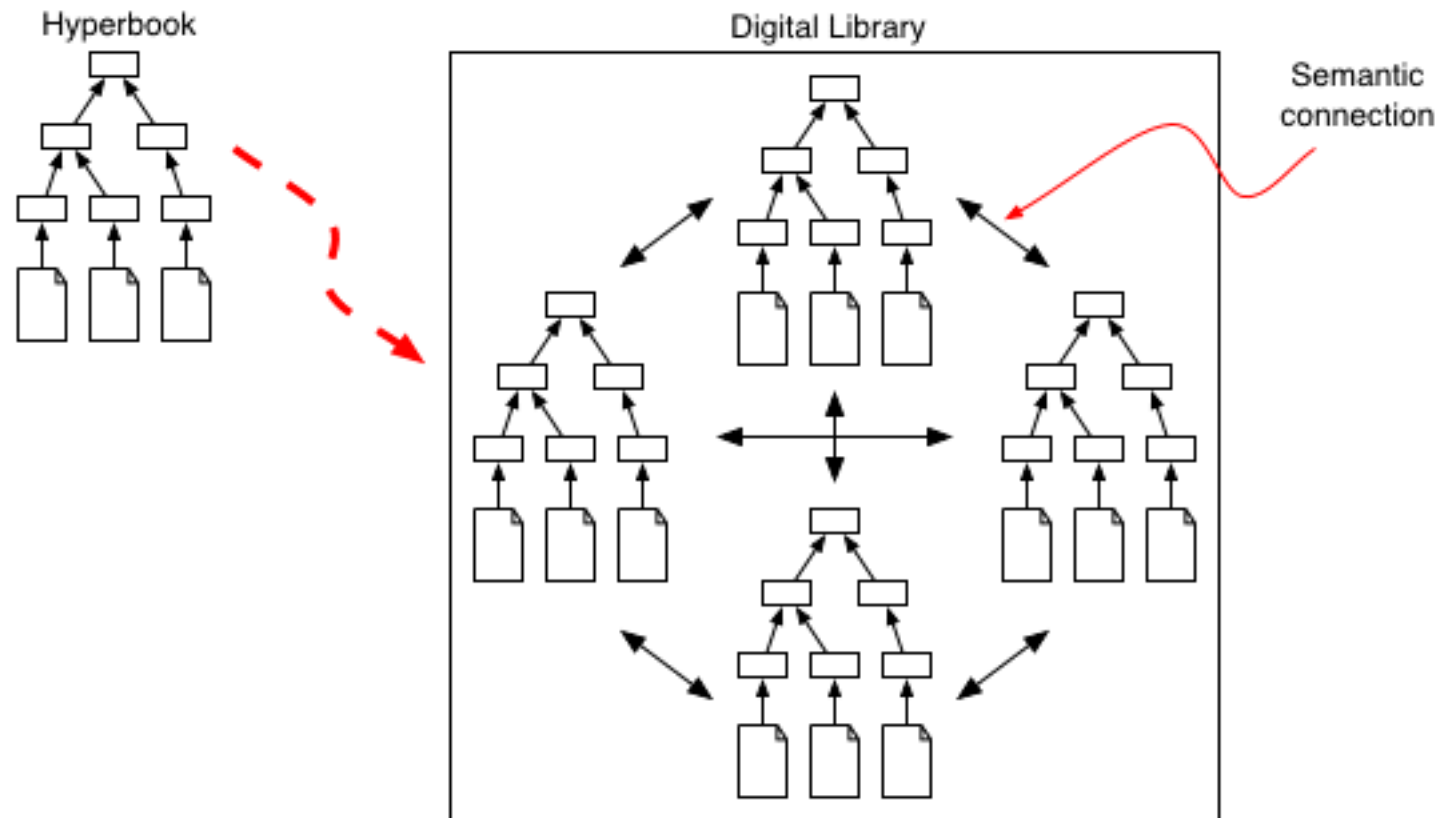
Building Hyperbooks and Virtual Documents

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

[Crampes], [Garlatti], [DeBra], [Brusilowsky], [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
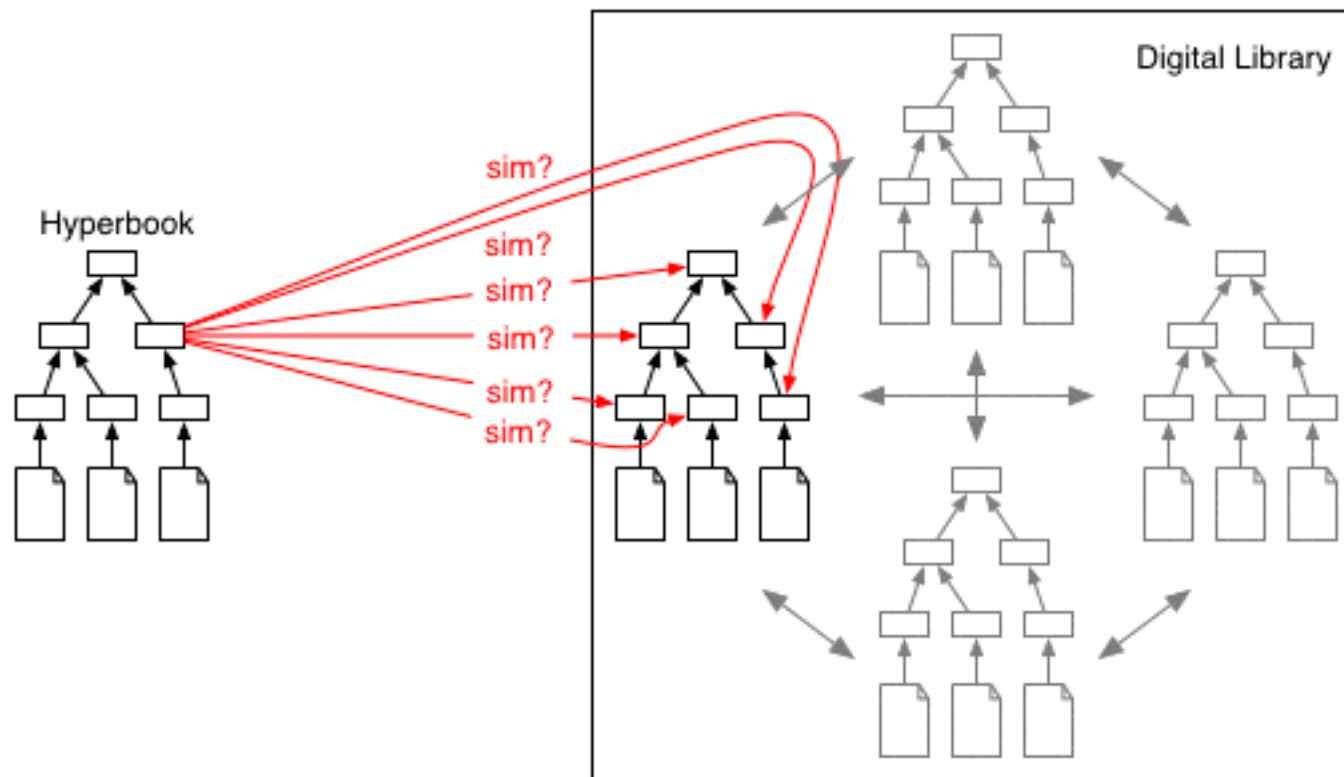
Building Digital Libraries through Ontology Alignment

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)~~
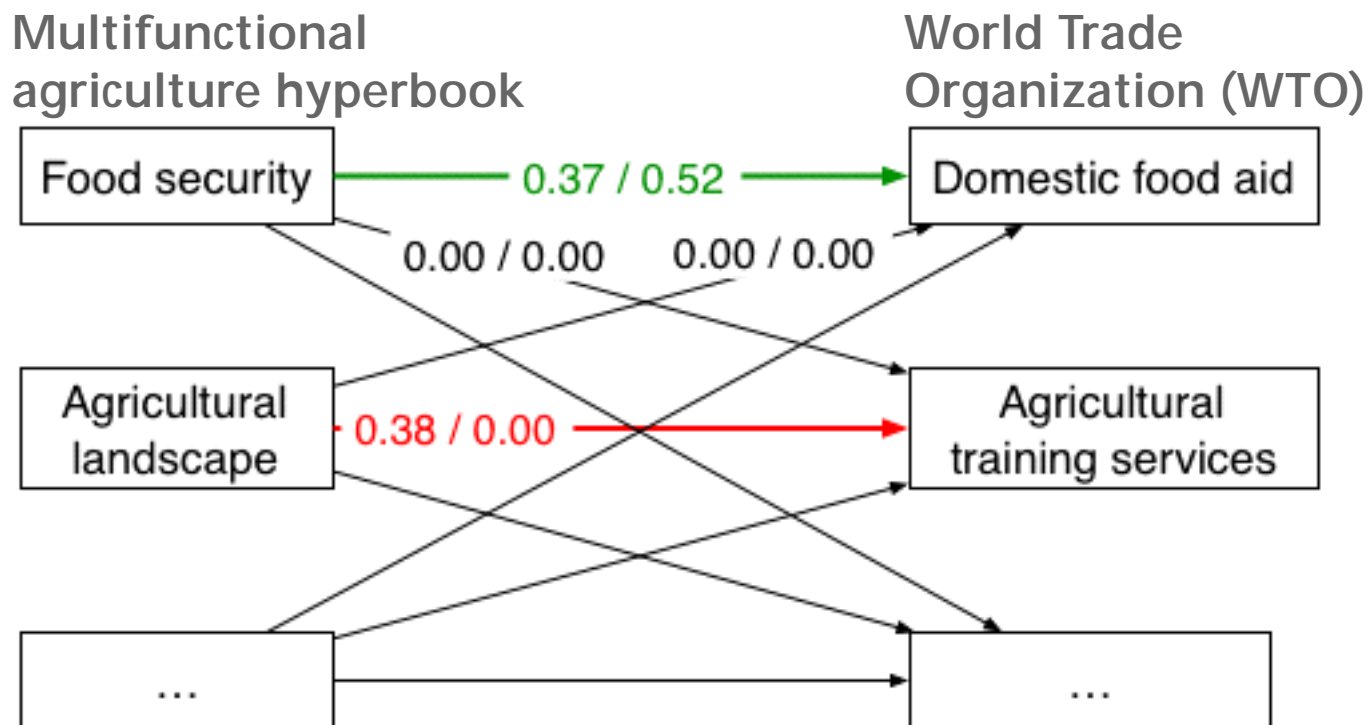
Building Digital Libraries through Ontology Alignment

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
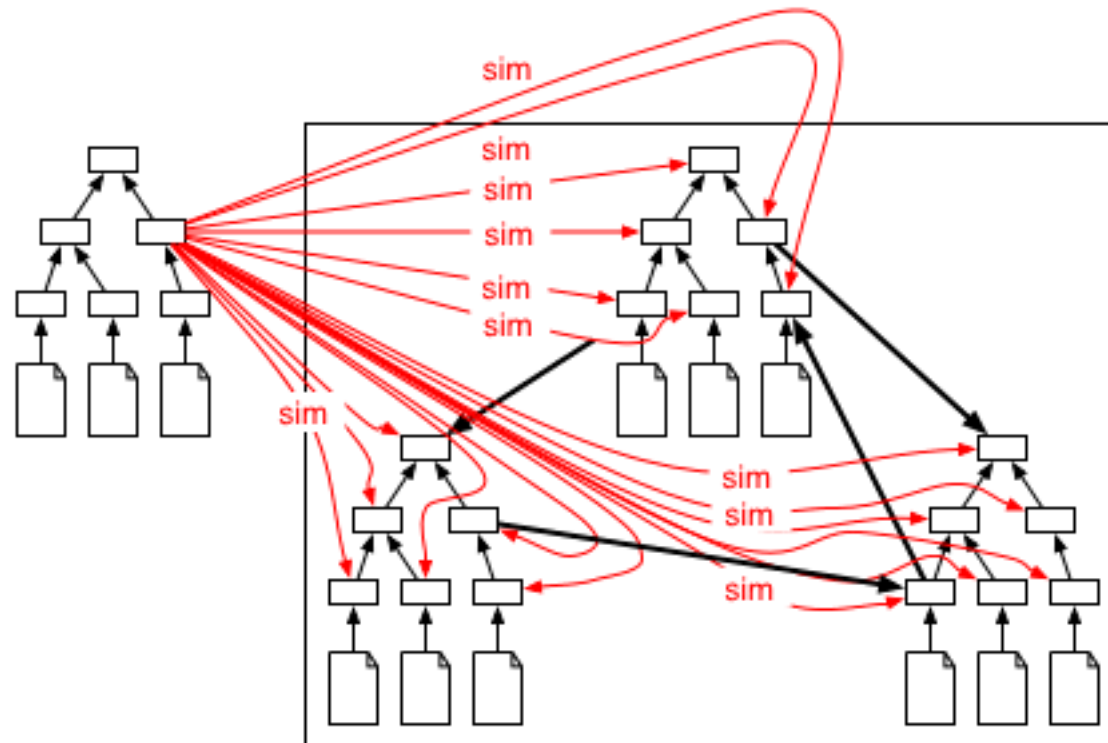
Digital Library with a reference hyperbook and link inference

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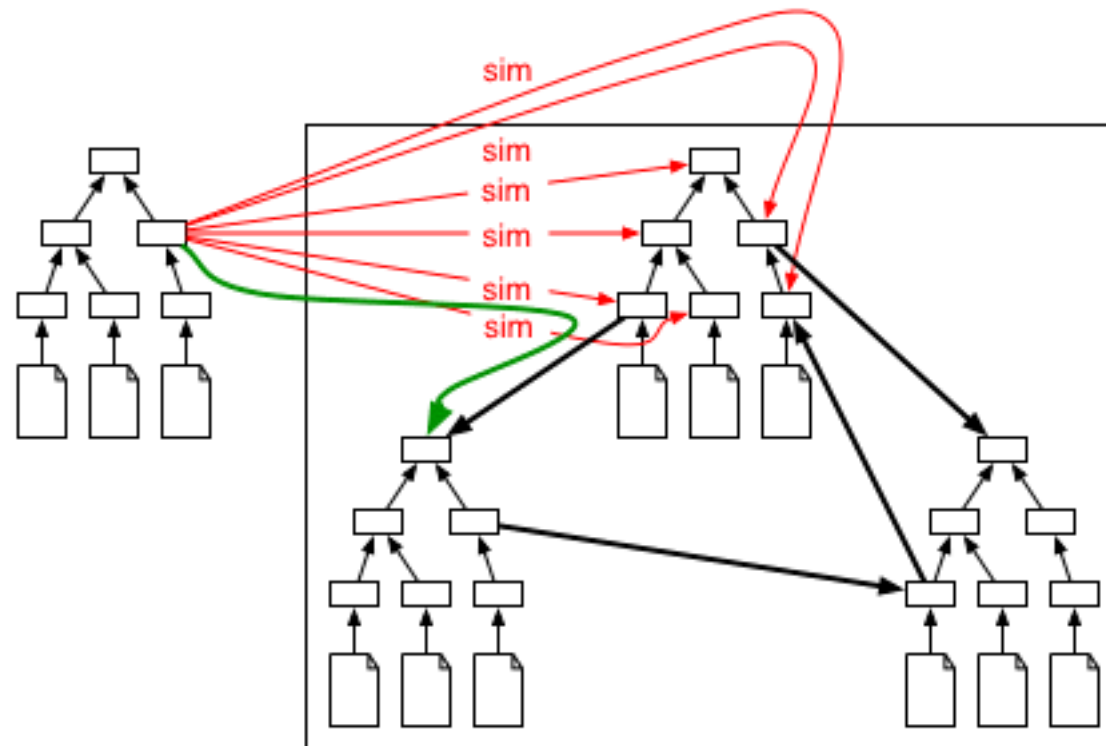
Building Digital Libraries through Ontology Alignment

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

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!

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