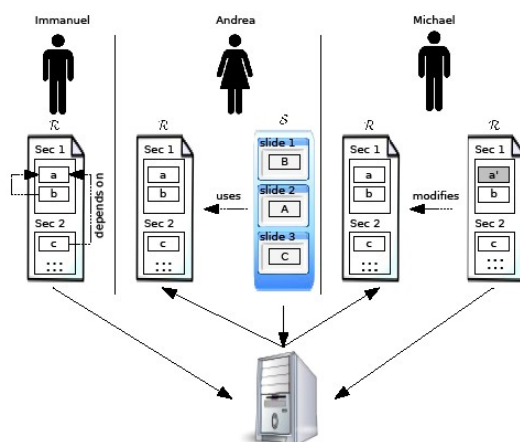


OMoC - Ontology-Driven Management of Change

OMoC develops an approach for ontology-driven management of change to support the evolution, revision and adaption of collections of technical, but informal documents. Change management techniques are adapted and extended from formal methods to the informal setting. Instead of a formal semantics, OmoC only requires syntactical and semantic structuring mechanisms formalized in a document model ontology. These also provide a notion of consistency and allow for propagating effects of individual changes to entire document collections. Conversely, the ontology provides a means to localize effects of changes by introducing a notion for semantic dependencies between document parts.

It has been estimated that our globalized information society produces, maintains, and publishes about 5 Petabyte (i.e. ca. 3trillion pages) worth of documents a year for documenting events, plans, and results in society, jurisdiction, economy, politics, technology, and science. Some of these documents - e.g. newswire texts - are just written for the moment, while others - like technical documentation, progress reports, or company mission statements - persist in multiple versions being continually adap-



ted, rewritten and adapted to changing situations. We are faced with a huge management problem, which is aggravated by the fact that the documents are inter-related and that changes in one --- e.g. a company's mission statement - will make changes in

others necessary - e.g. planning documents or the company web site. Since such document collections can no longer be authored and maintained by individuals, the information society has increasingly become dependent on document management systems (DMS).

Current DMS are designed to coordinate the collaborative creation and maintenance process of documents through the provision of a centralized repository. The focus of these systems is primarily on the documents themselves. Semantic relations between and within documents as well as effect of changes on these relations are largely neglected. Therefore human reviewers are needed to maintain consistency after modifications: a costly, tedious, and error-prone factor in document life-cycle.

OMoC provides semantic techniques for:

- **Differencing and merging of documents;**
- **Methodology for change management;**
- **Techniques to propagate and patch effects of changes**

Methodology for Change Management.

Collaborative maintenance of documents needs an integrated *management of change* that supports a user in creating, updating or deleting documents. In general, management of change comprises two parts: the maintenance of the various dependencies in and between documents and the propagation of changes along these dependencies. Dependencies are typically externalized either by parsing formal documents or document structures or by manually annotating meta data to informal documents. OMoC develops a general methodology and techniques to combine different approaches of maintaining changes in a general process model to seamlessly support the development or adoption of informally given documents.

While in most current approaches document parts are only marked or recalculated if they affected by a change, OMoC utilises semantics of document structures, encoded into a so-called system ontology, to minimize human effort in adapting documents to changes.

Semantic Changes: Difference and Merge

In order to support an efficient management of change, OMoC provides means to specify and utilize semantic aspects of information units (IUs) in documents. They will be used:

- to identify syntactically different IUs to be semantically equal and thus to minimize the number of IUs affected when changing IUs *Equality Theory* and
- to frame the syntactical representation of IUs and thus to help to locate changes of IUs relative to the internal structure (*Syntactical Structure*).

Propagating and Patching Effects

The OmoC methodology allows one to compute where and in what sense a document has been changed. These local changes are propagated to their environment, e.g. those document fragments in the collection that are affected by a change, so that the system can give authors feedback of the impact of their modifications.

Changes are propagated along dependencies between IUs. In order to adapt document considered as a graph (with IUs being the nodes and the dependencies being the links) to a local change two tasks have to be solved:

- **Locality:** Which IUs and which parts of these IUs are affected by a change?
- **Consistency:** How can the affected parts be changed so that the overall document is consistent again?

View Centered Modifications of NarCons.

OMoC builds on a view of documents as narrative/content structures (NarCons), where the *narrative structure of a document* (e.g. Paragraphs,

sections, lists, structured by rhetorical relations) is made explicit as in a tree structure whose leaves are links to a database of *content elements* (e.g. assertions, definitions, comments; structured by semantic relations). NarCons form the basic data structure for the proposed management of change, we have to build up an infrastructure for their management. In particular, traditional document formats and workflows only support one of the layers of NarCons: formal developments bthe content side (but they are serialized to files for persistence), and documents the narrative side (but the document structure underlies constraints imposed by the content). As a consequence, we have to build tools that allow one to manipulate both aspects, without (excessively) burdening the users. We envision that the user is presented a *view* of a document (i.e. a narrative document, where all the narrative links are retracted), which can then be manipulated. Using the methodology developed in OMoC, the changes are propagated back into the content commons.

Case Studies

The management of change approach will be implemented in a prototype system. It will progress in parallel with theory development and serves as a continual reality check to evaluate the concepts. The developed methodologies and techniques will be evaluated in various case studies concerning the maintenance and development of:

- lecture documents for university teachers,
- scholar material in the area of e-learning,
- semantic Wiki for collaboratively building, editing and browsing a mathematical knowledge base,
- composition of legal contracts from individual contract snippets guided by syntactical and semantic constraints encoded as meta data, document for a certified software process.

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