Abstract
Semantic annotations of XML-Schemas allow the interpretation of the schema elements with the help of a reference ontology. This can be a driver for the integration of heterogeneous applications, where the exchanged messages needs to be transformed to the required target format.

Since an ontology conceptualizes some real-world domain and the real world constantly evolves also the reference ontology needs to evolve over time. This has consequences for the semantic annotations that need to be maintained in order to comply with the new version of the reference ontology. In addition such an evolving reference ontology gets an additional function: It does not only express the domain at some specific point in time - it can also express the evolution of the domain. This information can be used to (semi-) automatically maintain the annotations and to detect changes that have consequences for the interpretation of instance data. This may require to change instance data in order to allow a correct interpretation with the latest ontology version.

In this thesis we will present a purely declarative annotation method for XML-Schemas, matching and mapping methods for schemas that are annotated with the proposed annotations, methods for the representation of ontology changes, methods for the maintenance of annotations with regard to structure and logics and finally the detection of schema elements, where the interpretation of the data has potentially changed.

1. Annotation-Based Transformation Approach [4]

2. Declarative Annotation Method [3]

3) Schema Matching and Mapping
Simple 1:1 matches based on semantic relations (equivalence, subclass, ...) of annotation concepts. Complex n:m matches based on annotated transformation templates (e.g. firstname, lastname -> fullname). Prototype implementation generates MapForce Files.

4) Performance Evaluation

5) Change Representation
Idea: Store changes as a set of instances of a change-ontology. Each instance relates elements of the new and old ontology version with some graph operation.

Problem:
Structural and logical changes are relevant. Metamodelling limitations of OWL. Need for tool support.

Solution:
Hybrid Meta-Ontology based approach. Can directly be queried with SPARQL.

6) Annotation Maintenance
Structural: E.g. Annotation paths reference non-existing URIs. Semi-automatic simple and complex repair strategies based on the change representation.

Logical [1]: Systematic investigation of all types of invalidations (unsatisfiability) of annotation concepts. Definition and detection of minimal invalid sub-paths.

Semantical [2]: Detection of ontology changes that potentially change the interpretation of the data. Based on the explicit definition of change-dependencies.

Declarative Semantic Annotations for XML Document Transformations and their Maintenance
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