Report on T-Rex Exchange

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Summary

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Start date: June 19, 2005
End date: June 26, 2005
Topic: Elaborate categorical definition of alignments

Goal of the exchange

Antoine Zimmermann, Markus Krötzsch and Pascal Hitzler worked on categorical definition of alignments that could accomodate non-equivalence correspondences. This is partly reported in D2.2.5.

Topics/Achievements of the exchange

We have designed a theoretical framework to formally define ontology alignments and operations that can be done with them. This framework, based on category theory, considers ontologies and ontology alignments as first order objects independently of the representation language, as opposed to entity based definitions. Indeed, if ontologies are objects in a category, and morphisms correspond to ontology refinements, then an ontology alignment is a categorical relation between two ontologies, i.e. a pair of morphisms with the same domain. So, if f: $A \rightarrow O$ and f': $A \rightarrow O'$ are both ontology refinements, then $\langle A, f, f' \rangle$ is an alignment of O and O', A approximates ontologies O and O' and it describes a part of the knowledge that is common to them. We call this structure a V-alignment. With such a characterization, an algebra has been designed which describes what is ontology merging alignment comparison, composition, union and intersection using well known categorical constructions.

Concrete categories of ontologies exist in the literature, but fail to express complex alignments, e.g. alignments expressing subsumption relation between concepts of two ontologies. To solve this problem, we investigated two approaches: defining more complex categories or improving the structure of our categorical alignments. On the one hand, more complex categories enhance the

expressivity of the alignments, but the categories lose some interesting properties such as the existence of the merge for any V-alignment and pair of ontologies. On the other hand, simpler categories, such as the category of theories and theory morphisms in institution theory, can describe complex alignments if the alignment structure is more elaborate. In collaboration with the University of Karlsruhe, we introduced W-alignments: a structure having an additional ontology containing bridge axioms relating to O and O' by two V-alignments [deliverable 2.2.5]. This raises the expressivity of alignments while keeping desirable properties of the category. However, the resulting algebra is less natural (composition is not associative).