The Use of Reformation to Repair Faulty Analogical Blends

Alan Bundy & Ewen Maclean
University of Edinburgh

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An analogical blend is the formation of a new concept from two old ones, e.g., houseboat or boathouse from house and boat, depending on whether you align the boat with the house or its occupant. This process can be automated via the colimit algorithm from Category Theory, applied to two ontologies, plus an initial alignment between their terms. Analogical blends are often faulty, e.g. inconsistent or incomplete, so need to be repaired.

Reformation is an algorithm we have developed for the diagnosis and repair of faulty ontologies. It is an adaption of the unification algorithm. Unification steps are paired. Paired steps both apply to input in the same syntactic form, but with inverse pre-conditions: one step leading to success and one to failure. Faulty ontologies can be repaired by analysis of either the derivation of false conjectures or the failed proofs of true conjectures. A key unification step is inverted by changing a failed step into a successful one, or vice versa. This is realised by changing the ontology so that its partner step in the pair is triggered instead of it. We are investigating the application of reformation to the diagnosis and repair of faulty analogical blends.

Both colimit and reformation are generic algorithms that have widespread applications. One such application is the alignment and merging of ontologies. Given an initial alignment, a merger can be generated as an analogical blend using the colimit algorithm. Inference may then show this blend to be faulty. Reformation can suggest a realignment that produces a different blend which repairs the fault. Several iterations of this repair process may be required.