Charting the Borderland – Decidability in Description Logics and Beyond

DL Invited Talk Abstract

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Decidability of inferencing is commonly considered a very important property of logic-based knowledge representation formalisms, required for the algorithmization and automation of reasoning. Yet, oftentimes, the corresponding (un)decidability arguments are idiosyncratic and do not shed much light on the underlying principles governing the divide.

In my talk, I will review generic model- and proof-theoretic criteria for decidability of querying in fragments of first-order logic. Description logics play a central role in these considerations: They can serve as a simplified "testbed" inspiring decidability criteria which can then be generalized to higher arities.

On the model-theoretic side, I will describe a general framework by means of which decidability of query entailment can be established based on the existence of countermodels with certain structural properties. These properties depend on the ontology and query language used and range from finite domain over forest-like shape to width-finiteness employing width notions like treewidth and cliquewidth.

On the proof-theoretic side, I will report on a recent result according to which decidable homomorphism-closed queries can be captured by a rather restricted ontology-mediated querying framework based on existential rules with certain chase termination guarantees.