Conservative Extensions in Description Logics and Beyond
(Abstract of Invited Talk)

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In description logic (DL), deciding whether a logical theory is a conservative extension of another theory is a fundamental reasoning task with applications in ontology modularity and reuse, ontology versioning, and ontology summarization [1]. It is well-known that conservative extensions are decidable in many DLs and that they can often be characterized elegantly in term of model theoretic notions such as bisimulations, simulations, or homomorphisms. In this talk, we discuss two current topics in conservative extensions.

First, we consider versions of conservative extensions that are defined in terms of data and querying [2]. We show that when ontologies are formulated in the description logic $\mathcal{ALC}$ and queries are conjunctive queries (CQs), then the resulting decision problem is undecidable. Remarkably, decidability is regained when CQs are replaced with unions of conjunctive queries (UCQs). We also consider the unexpectedly dramatic effects of admitting inverse roles in ontologies [3], namely that, in model-theoretic characterizations, homomorphisms have to be replaced with bounded homomorphisms, resulting in considerable technical challenges in designing decision procedures.

And second, we study the decidability of conservative extensions in more expressive decidable fragments of first-order logic such as the two-variable fragment and the guarded fragment [4]. We show undecidability for these two fragments and decidability for the two-variable guarded fragment. The latter rests on a model-theoretic characterization that is considerably more complex than for many standard DLs. Again, boundedness of the relevant model-theoretic notion (which in this case is GF_2-bisimulation) plays an important role.

References

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