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Complexity of some fragments of description logics.
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An important application of modal logic in computer science is the theoretical foundation of *description logic*, which was born out of need to represent knowledge. The important questions of the complexity of a logic, such as the complexity of deciding whether a formula is valid or satisfiable, or the validity of a logical inference, are typically formulated in terms of description logics as the complexity of answering queries. Ontologies, i.e. formalized databases in description logic, are naturally represented by graphs; concepts, i.e. formalized classes of objects correspond to vertices in this context, and roles, i.e. formalized relationships between objects, correspond to edges. Queries can be expressed over concepts or over roles, and as such they correspond to two classes of formulas in the corresponding descriptive logic. In graphs they correspond to searching for vertices or paths with certain properties.

One example, which we intend to present, is the logic $\mathrm{CPDL}^{(\neg)}$, in which it is possible (apart from the usual operators from propositional dynamic logic, like negation, conjunction and disjunction of concepts, and tests, unions, compositions and iterations of programs) to consider the converses of programs (interpreted as inverses of binary relations) and the negations of atomic programs. We know [2] that $\mathrm{PDL}^{(\neg)}$ (i.e. PDL with negations of atomic programs, but with no converses) is EXPTIME-complete, and we believe that an analogous result can be proved for $\mathrm{CPDL}^{(\neg)}$.

[1] Diego Calvanese, G. de Giacomo, D. Lembo, M. Lenzerini and R. Rosati, *DL-Lite: Tractable Description Logics for Ontologies*, ***Association for the Advancement of Artificial Intelligence*** (Pittsburgh, Pennsylvania, USA), vol. 5, 2005, pp. 602–607.

[2] Carsten Lutz, Dirk Walther, *PDL with Negation of Atomic Programs*, ***Journal of Applied Non-Classical Logics*** (2005), no. 15(2), pp. 189–213.