Rewriting Queries with Negated Atoms

Enrique Matos Alfonso and Giorgos Stamou

National Technical University of Athens (NTUA)
gardero@image.ntua.gr

Abstract. The current paper have been accepted at the International Joint Conference on Rules and Reasoning (RuleML+RR 2017). We focus on Query rewriting, a popular approach for ontology based data access and in general for first order rewritable knowledge bases. The algorithms defined in the field are based on conjunctive queries with no use of negation over the atoms that are part of them. Also, the constraints present in the knowledge base are ignored in the process of rewriting a query and they are only used to check the consistency of the data.

In this paper, we study the problem of answering queries that allow negated atoms. We developed a novel method to use classical rewriting techniques for answering conjunctive queries with negated atoms. For a given conjunctive query with some negated atoms, we propose an algorithm that finds a set of conjunctive queries with no negated atom that contain all the answers of the initial query with respect to the rules. The algorithm uses resolution with respect to the clauses corresponding to the query and the constraints of the system in order to produce rewritings of the initial query without negated atoms. Our approach uses a classical rewriting algorithm as a black box and the constraints in the system to find the set of conjunctive queries without negated atoms that is equivalent to the original query containing negated atoms.

A system (COMPLETO) was implemented with the proposed method and compared to another system (REBSIR) that is able to rewrite negated concepts. In the experimental evaluation COMPLETO performed better than REBSIR for most of the datasets in the benchmark and it portrayed a more scalable performance i.e. describing a faster relative performance with respect to REBSIR's performance with the increase of the size of assertions in the dataset.