Research Summary

Rada Chirkova and Michael R. Genesereth
Department of Computer Science
School of Engineering
Stanford University
Stanford CA 94305-9020

E-mail: rada@cs.stanford.edu
Address: Gates Bldg. 2A, Rm 205 Stanford CA 94305-9020
Phone: (650) 725-2602
Fax: (650) 725-7411

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We are interested in investigating the application of abstraction and reformulation methods in the database domain. In this context, we look into the problem of selecting relations to materialize in databases. This problem is one of the aspects of the general research on improving query response time in databases.

We propose to solve the relation selection problem by doing off-line relational reformulation of database rules which we view as axioms of a theory in first-order logic. A direct representation of axioms is provided by a query language Datalog.

We consider reformulations whose results satisfy the following conditions. First, the sets of answers to any of the queries in a given set of queries may not change. Second, as a result of the reformulation, the query processing complexity has to be reduced for at least one query in the set. Finally, the order of magnitude of the storage space required for the database may not increase after the materialization of the selected relations.

Under the constraints defined by the class of reformulations described above, we approach the solution of the relation selection problem by doing relational reformulation of database rules expressed as axioms. The goal of the reformulation is to focus on the data which is necessary for answering the given queries, and to consider all other data in the database irrelevant. We work on developing methods for creating and materializing new relations, so that they reflect only the information which is needed to answer the given queries. We don't materialize queries themselves or any relations which are defined in the input but not stored in the database.

We are investigating to what extent additional knowledge about the given problem can help extract the information relevant for answering the queries. To that end, we currently explore the role of functional dependencies in database relations.

Our research began in summer 1997 and is likely to become the topic of Rada Chirkova's Ph.D. dissertation under Dr. Genesereth.