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Enumeration complexity of conjunctive queries with functional dependencies. (English)
Zbl 1446.68052

Summary: We study the complexity of enumerating the answers of Conjunctive Queries (CQs) in the presence of Functional Dependencies (FDs). Our focus is on the ability to list output tuples with a constant delay in between, following a linear-time preprocessing. A known dichotomy classifies the acyclic self-join-free CQs into those that admit such enumeration, and those that do not. However, this classification no longer holds in the common case where the database exhibits dependencies among attributes. That is, some queries that are classified as hard are in fact tractable if dependencies are accounted for. We establish a generalization of the dichotomy to accommodate FDs; hence, our classification determines which combination of a CQ and a set of FDs admits constant-delay enumeration with a linear-time preprocessing. In addition, we generalize a hardness result for cyclic CQs to accommodate unary FDs, and further conclusions of our development include a dichotomy for enumeration with linear delay. Finally, we show that all our results apply also for CQs with disequalities and in the presence of cardinality dependencies that generalize FDs.

MSC:
68P15 Database theory
68Q25 Analysis of algorithms and problem complexity

Keywords:
enumeration; complexity; conjunctive queries; functional dependencies

Full Text: DOI Link

References: