

# Using Deductive Databases Technology for Approximate Query Answering in Partially Complete Databases

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The *Closed-World Assumption* (CWA) on relational databases expresses that an atom not in the database is false. A more appropriate assumption for sound but partially incomplete databases, is the *Local Closed-World Assumption* (LCWA), a local form of the CWA, expressing that the database is complete in a certain area. A database for which local closed world assumptions are specified is called a locally complete database. By specifying these areas where the predicates of the database are complete –which we call windows of expertise of a database predicate–, users can retrieve more informative answers than using standard SQL queries, i.e. obtain answers for the so-called possible and certain queries. Unfortunately, it turns out that this query answering process is an expensive task (unless  $P=NP$ ): it amounts to co-NP and NP for checking whether a tuple is a possible or certain answer, respectively.

In this presentation we introduce a deductive databases approach for approximating query answers in locally complete databases. The idea is, given a relational database and a set of LCWAs expressions, reconstruct an approximation of the logic theory that the database conveys, by means of a deductive database under stable model semantics. The users can then directly query the deductive database and retrieve the answers. As we will show in the presentation, this approach allows to answer queries in polynomial time. Moreover, based on previous work of the authors [3, 1, 2], we also assert that for important classes of queries –conjunctive for certain answers and disjunctive for possible answers– and windows of expertise, this approach is optimal, i.e. it returns the *exact* answers to queries. Thus, we obtain a class of queries and locally closed databases for which certain and possible query answering is tractable after all.

We will then address the problem of domain independent and safe queries in locally closed databases. The specific question we pose here is for which type of queries and windows of expertise in a locally closed database, the set of answers do not depend on the underlying domain and is finite. To answer this question we turn to the literature on safe queries in relational databases and domain independence on query answering mechanisms of logic programming, which combined provide the basic machinery in which our results are founded.

## References

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