Reusing and Modifying Rulebases by Predicate Substitution

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Abstract

We propose a method for reusing and modifying a deductive database. The need for such techniques occurs when new rulebased applications differ only slightly from existing ones or when an application is to be incrementally updated. Such techniques are particularly important when reprogramming is expensive or unreliable. In order to facilitate reuse, we extend deductive database systems by the concept of *predicate substitution*. In this way, during query evaluation, not only variables, but also predicates can be substituted. We provide a proof theory and a model theory for this language, including a fixpoint semantics. In addition, we show that substitution increases the expressive power of Datalog: not only does its data complexity increase from PTIME to EXPTIME, but substitution also allows large sets of Datalog rules to be succinctly expressed. In fact, finite rulebases with substitution can express infinite rulebases without substitution.

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