Different ways of expressing boolean queries

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Abstract

Three natural modalities are commonly used to express boolean queries: testing for nonemptiness of a query; testing for emptiness; and testing for the containment of the result of one query in the result of another query. For the class of first-order queries, these three modalities have exactly the same expressive power. For other classes of queries, e.g., expressed in weaker query languages, the modalities may differ in expressiveness. The expressive powers of the three modalities are compared for a wide range of classes of queries. Specific results are obtained for the class of conjunctive queries, as well as for the full range of possible fragments of navigational queries over graph databases (modeled as fragments of the algebra of binary relations).

Comparing nonemptiness with emptiness corresponds to the closure under negation question. Obviously, one can generalize this question for other boolean connectives. Several results for other boolean connectives are obtained.