METADATA VIEW GRAPHS

A Framework for Query Optimization and Metadata Management

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Query optimization is the process of mapping a logical query expression to a physical query execution plan. Several approaches to query optimization have proven to be successful independently, but no one has considered integrating these approaches within a single optimizer. The Metadata View Graph (MVG) Framework uses the semantics of the database to support the integration of various types of query optimization. Specifically, semantic query optimization is used to reformulate a query to satisfy the conditions required by the other types of query optimization. This allows the optimizer to use approaches that do not apply to the original query.

The transformation rules used by semantic query optimization have traditionally been derived from schema-based constraints. Recently, however, researchers have begun to explore methods for discovering dynamic rules which represent the current contents of the database. Although dynamic rules generally contain more information than schema-based constraints, they are only valid for certain instances of the database. Consequently, dynamic rules must be maintained when the content of the database changes. Therefore, when the database state evolves (i.e., data is inserted, deleted, or modified), the rules that are affected by the changes must be invalidated or rewritten. Although several researchers have acknowledged the need to maintain dynamic rules, no one has formally addressed the problem.

The Metadata View Graph is a metadatabase that maintains semantic, statistical, and structural metadata for views of a database. This research has produced a set of strategies, methods, and algorithms for efficiently maintaining dynamic rules in the Metadata View Graph. Although these maintenance algorithms are essential to the MVG Framework, they are an important contribution to query optimization in general.