Adapting Materialized Views after Redefinitions: Techniques and a Performance Study*

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Abstract

We consider a variant of the view maintenance problem: How does one keep a materialized view up-to-date when the view definition itself changes? Can one do better than recomputing the view from the base relations? Traditional view maintenance tries to maintain the materialized view in response to modifications to the base relations; we try to "adapt" the view in response to changes in the view definition.

Such techniques are needed for applications where the user can change queries dynamically and see the changes in the results fast. Data archaeology, data visualization, and dynamic queries are examples of such applications.

We consider all possible redefinitions of SQL `SELECT-FROM-WHERE-GROUPBY-HAVING`, `UNION`, and `EXCEPT` views, and show how these views can be adapted using the old materialization for the cases where it is possible to do so. We identify extra information that can be kept with a materialization to facilitate redefinition. Multiple simultaneous changes to a view can be handled without necessarily materializing intermediate results. We identify guidelines for users and database administrators that can be used to facilitate efficient view adaptation.

We perform a systematic experimental evaluation of our proposed techniques. Our evaluation indicates that adaptation is more efficient than rematerialization in most cases. Certain adaptation techniques can be up to 1,000 times better. We also point out the physical layouts that can benefit adaptation.

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