Preface

This thesis investigates which index structures support query processing in typical data warehouse environments most efficiently. Data warehouse applications differ significantly from traditional transaction-oriented operational applications. Therefore, the techniques applied in transaction-oriented systems cannot be used in the context of data warehouses and new techniques must be developed.

The thesis shows that the time complexity for the computation of *optimal* tree-based index structures prohibits its use in real world applications. Therefore, we *improve* heuristic techniques (*e. g.* R^*-tree) to process range queries on aggregated data more efficiently. Experiments show the benefits of this approach for different kinds of typical data warehouse queries. Performance models *estimate* the behavior of standard index structures and the behavior of the extended index structures. We introduce a new model that considers the distribution of data. We show experimentally that the new model is more precise than other models known from literature. Two techniques *compare* two tree-based index structures with two bitmap indexing techniques. The performance of these index structures depends on a set of different parameters. Our results show which index structure performs most efficiently depending on the parameters.

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