Discovering database applications from the conceptual, relational, and physical database schemas

Motivations
It is well known that design and implementation of relational database schemas is less time consuming than implementation of database applications. This is because design of relational databases is a well understood, and well defined process with some of its stages, like for instance translation of conceptual schemas into relational schemas, performed completely automatically. A situation is different when it comes to implementation of the database applications. At this stage many of the database related projects enter the stages of hidden dormancy and long delays frequently lead to a premature termination of a project. One of the reasons why the implementations of database applications take more time even with the help of so called application generators (which are not really generators!), is that entire process is not very well formalized. A solution to this problem would be to discover the patterns of typical database applications, generate all possible instances of these patterns and let the users pick the appropriate applications. A research question is whether it is possible to completely automatically discover the patterns of database applications from a typical design of a relational database?

Specification
A data dictionary (also called as a repository) of a typical relational database management system contains a lot of information that contributes to identification of the typical patterns of database applications. Analysis of the relational schemas before implementation of the applications allows for a quite precise anticipation of user needs and for automatic generation of many applications whose existence is indicated by the structures of a relational database. For example, information related to the logical database schemas such as a number, types, and domain constraints imposed on the individual columns contribute to the discovery of different types of search conditions and data manipulation applications. The referential integrity constraints and the elements of physical design such as indexes and clusters can be used to find the navigation patterns in a database. The analysis of procedural components of relational design like for instance stored procedures, stored functions, and database triggers contributes to identification of different categories of database applications. It is expected that the components of data dictionaries will be used in this project to automatically discover the patterns of database applications and to propose the algorithms for automatic generation of all applications consistent with the given patterns.

Outcomes
The expected outcomes include: (1) identification of the elements in a data dictionary (repository) of a typical relational DBMS that can be used to discover the various database application patterns, (2) specification of how the identified components can be used to generate the application patterns, and (3) the algorithms for generation of all applications consistent with the given patterns and given structures of a relational database. The project needs no implementation work. It is expected that its outcomes will be used for the detailed specifications of one or more undergraduate software projects.

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