Chapter XIII

Model Transformations in Designing the ASSO Methodology

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Abstract

ASSO, an innovative conceptual methodology which combines features of database design with the formal method B, has been defined in order to ensure the flexibility of semantic data models, the efficiency of object models and design correctness. Starting from a directed acyclic graph of classes supported by semantic data models, a formal mapping generates classes supported by object models. The classes supported by semantic data models are then extended with aspects of behavioural modelling: a relationship with the B model is established and the consistency proofs of the whole schema are reduced to small obligations of B. This chapter evidences how ASSO is based on model transformations. These have been introduced with various purposes: to map semantic data models to object models, to integrate static and dynamic modelling, to link formal and informal notations and to relate the conceptual schema and the logical schema of the methodology.
Introduction

Methodologies used in designing database applications can be based on informal models that, although easy to understand, are unable to cover both static and dynamic aspects of modelling in an integrate way and may cause inconsistencies. Further, they can be inadequate to guarantee that the schema supported by the database system satisfies the requirements specified at conceptual level. Finally, they cannot ensure the coexistence of two quality requirements classically conflicting, i.e., flexibility in reflecting the changes occurring in real life on the schema and efficiency in accessing information.

B (Abrial, 1996), a formal method of software engineering, uses mathematical notations for modelling static and dynamics and for performing consistency proofs. The refinement of B, supported again by proofs, allows the derivation of correct implementations; however, the direct use of B for developing database applications presents some shortcomings since B lacks the high level abstraction mechanisms used for modelling database schemas and its refinement has not been specifically designed for obtaining efficient database implementations.

ASSO (Castelli & Locuratolo, 1995; Locuratolo, 1997; Locuratolo & Matthews, 1999) is an innovative methodology for the achievement of quality requirements, which combines features of database design with the B-Method in order to ensure easiness in schema specifications, flexibility in reflecting the changes occurring in real life on the schema, consistency between static and dynamic modelling, correctness of implementations and efficiency in accessing information. Formality in ASSO is completely transparent to the designer until he decides to make proofs.

Designing formal environments for the specification and the development of database applications is currently an interesting topic of research (Mammar & Laleau, 2003). This is because the growing use of databases in various application domains where economical interests require a certain degree of safety, e.g., e-business or financial systems, favours the call for the integration of databases and formal methods (Laleau, 2000, 2002).

ASSO results from the intuitions of researchers or students with backgrounds coming from different disciplinary areas. MetaASSO (Locuratolo, 2002), the approach employed to design ASSO, highlights these intuitions while providing a high-level description of interacting components, called methodological tools. The following methodological tools have been designed to achieve quality in ASSO:

* the Revisited Partitioning, a formal method working on static aspects of database conceptual schemas; the Structured Database Schema, a formal conceptual model which integrates consistently
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