IDEA GROUP PUBLISHING
701 E. Chocolate Avenue, Suite 200, Hershey PA 17033-1240, USA
Tel: 717/533-8845; Fax 717/533-8661; URL-http://www.idea-group.com
ITB10622

Chapter VIII

Introducing Fuzziness in Existing Orthogonal Persistence Interfaces and Systems

Miguel Ángel Sicilia
University of Alcalá, Spain

Elena García-Barriocanal
University of Alcalá, Spain

José A. Gutiérrez
University of Alcalá, Spain

Abstract

Previous research has resulted in generalizations of the capabilities of OODB models and query languages to cope with imprecise and uncertain information in several ways, informed by previous research in fuzzy relational databases. As a result, a number of models and techniques to integrate fuzziness in its various facets in object data stores are available for researchers and practitioners, and even extensions to commercial systems have been implemented. Nonetheless, for those models and techniques to become widespread in industrial contexts, more attention should be paid to their integration with current database design and programming practices, so that the benefits of fuzzy extensions could be easily adopted and seamlessly integrated in current applications. This chapter attempts to provide some criteria to select the fuzzy extensions that

more seamlessly integrate in the current object storage paradigm known as orthogonal persistence, in which programming-language object models are directly stored, so that database design becomes mainly a matter of object design. Concrete examples and case studies are provided as practical illustrations of the introduction of fuzziness both at the conceptual and the physical levels of this kind of persistent system.

Introduction

A number of research groups has investigated the problem of modeling fuzziness in the context of object-oriented databases (OODBs), e.g., De Caluwe (1998), Ma, Zang, and Ma (2003), and some of their results include research implementations on top of commercial systems, e.g., those reported in Yazici, George, and Aksoy (1998) and in Schenker, Last, and Kandel (2001). Despite the considerable amount of significant research in the field, no commercial system is available today that supports fuzziness explicitly in its core physical or logical model, and existing database standards regarding object persistence sources — like those of the Object Data Management Group (ODMG) (Cattell, 2000) and Java™Data Objects (JDO) (Russell et al., 2001) — do not support vagueness or any other kind of generalized uncertainty information representation (Klir & Wierman, 1998) in their data models.

One possible reason for this lack of integration of fuzziness in industrial practices may be found in the relative complexity of modeling with fuzzy mechanisms, which makes it difficult for average practitioners to fully understand and exploit the potential of fuzzy techniques. Studies coming from the field of psychology of programming, like those by Green and Petre (1996) and Kao and Archer (1997), may serve as points of departure to investigate how fuzziness affects the mental models of programmers and designers. In any case, further research is needed in how to extend existing (crisp) database programming technology to its fuzzy generalization in an acceptable and "usable" way for the average developer. In addition, some of these generalizations may eventually lead to reduced performance and other inefficiencies, precluding *a priori* their acceptability. This chapter aims at providing an overview of some of the issues regarding the just described situation, and at serving as a point of departure for further research in the area.

The rest of this chapter is structured as follows. The second section provides a brief review of existing research on extending OODB models, and the motivation for research on usability and acceptability of fuzzy constructs in orthogonal persistence systems and programming interfaces. The third section deals with the introduction of specific fuzzy constructs in orthogonal persistence systems,