

The *MultiView* Project: Object-Oriented View Technology and Applications *

E. A. Rundensteiner, H. A. Kuno, Y.-G. Ra, V. Crestana-Taube, M. C. Jones, P. J. Marron
The University of Michigan, 1301 Beal Avenue, Ann Arbor, MI 48109-2122
<http://www.eecs.umich.edu/~rundenst/group/umdg.html>

The *MultiView Project* is an on-going 5-year NFS-funded effort at the University of Michigan to develop and apply object-oriented view technology to address the needs of recently emerging applications such as data warehousing and workflow management systems that require the sharing, virtual restructuring, and caching of data [5]. Through *MultiView*, users can dynamically create and modify virtual classes and schemata at any time (Figure 1). *MultiView*, which is fully implemented on top of the GemStone OODB, is one of the first systems to provide updatable and incrementally maintained materialized object-oriented views [1, 5].

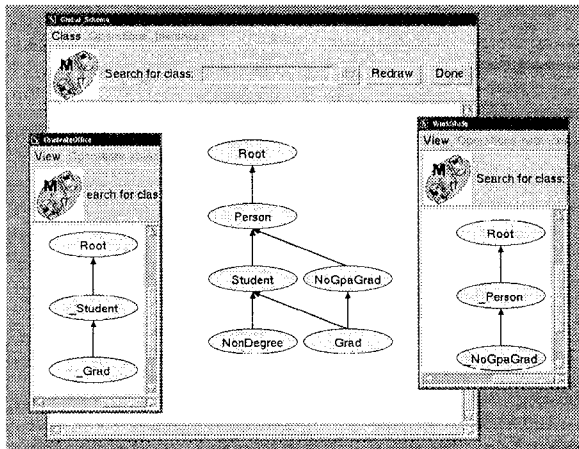


Figure 1: *MultiView*: Applications can dynamically create updatable materialized views of the database.

Unique features of the *MultiView* system include the incorporation of virtual classes into the global schema as first-class

This work supported in part by the NSF RIA grant #IRI-9309076, NSF NYI grant #IRI 94-57609, the University of Michigan Faculty Award Program, Intel, IBM, and AT&T. Harumi Kuno is supported by the NASA Graduate Student Researchers Program. Viviane Taube is supported by the IBM Toronto Student Fellowship Program.

Permission to make digital/hard copy of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage, the copyright notice, the title of the publication and its date appear, and notice is given that copying is by permission of ACM, Inc. To copy otherwise, to republish, to post on servers, or to redistribute to lists, requires prior specific permission and/or a fee.

SIGMOD '96 6/96 Montreal, Canada
© 1996 ACM 0-89791-794-4/96/0006...\$3.50

database citizens and the support for capacity-augmenting views (virtual classes that add new extrinsic properties or behavior). We have developed optimization strategies for the efficient incremental maintenance of materialized views, including distributed property registration and subsumption-based branch termination [2]. We have also designed a new index structure tailored for the efficient maintenance of materialized path query views. Our experimental studies confirm the performance benefit of our proposed optimizations.

In addition, *MultiView* applies and augments view technology to address important problems such as achieving transparent schema evolution, developing complex customized view types beyond simple SQL-type of set transformations, and dynamic query processing across heterogeneous collections in digital libraries. For example, we utilize OO view technology to solve the software legacy problem of dealing with continuously evolving database requirements. Our transparent schema evolution (TSE) system, which is built on top of *MultiView*, integrates schema evolution and view support functionalities into one system, thereby supporting the on-line modification of a shared object repository without disturbing existing applications [3, 4]. One unique contribution of TSE is its extensibility framework, which allows the dynamic addition of new change operations into our system (unlike the predetermined static sets of change operations provided by other OODB systems). To the best of our knowledge, ours is the very first effort to provide an open architecture that supports the dynamic addition of new schema change operations.

References

- [1] Kuno, H. A. and Rundensteiner, E. A., "The *MultiView* OODB View System: Design and Implementation," accepted for Journal of Theory and Practice of Object Systems, Special Issue on Subjectivity in OO Systems, 1996.
- [2] Kuno, H. A., and Rundensteiner, E. A., "Using Object-Oriented Principles to Optimize Update Propagation to Materialized Views," *IEEE ICDE-12*, 1996.
- [3] Ra, Y.G., and Rundensteiner, E. A., "A Transparent Object-Oriented Schema Change Approach Using View Evolution," *IEEE ICDE-11*, 1995.
- [4] Ra, Y. G., and Rundensteiner, E. A., "A Transparent Schema Evolution System Based on Object-Oriented View Technology", to appear in *IEEE TKDE* 1996.
- [5] Rundensteiner, E. A., "*MultiView*: A Methodology for Supporting Multiple View Schemata in Object-Oriented Databases," *VLDB'92*, Canada, pp. 187 - 198, Aug. 1992.