Temporal Database Bibliography Update

Vassilis J. Tsotras **Anil Kumar**

Departments of Electrical Engineering & Computer Science
Polytechnic University, Brooklyn, NY 11201
E-Mail: {tsotras, akumar}@photon.poly.edu

1 Introduction

This is the sixth bibliography to appear concerning temporal databases and represents a supplement to the 1993 bibliography by Kline ("An Update of the Temporal Database Bibliography," *ACM SIGMOD Record*, 22, No. 4, Dec. 1993, pp. 66–80). Since these bibliographies are incremental, the earlier bibliographies should also be consulted to find previous entries. In addition, the reader should consult the references in the survey article by Ozsoyoglu & Snodgrass ("Temporal and Real-Time Databases: A Survey", *IEEE Trans. on Knowledge and Data Engineering*, Vol. 7, No. 4, Aug. 1995, pp. 513–532), since those references are not included here.

The four previous bibliographies are: Soo ("Bibliography on Temporal Databases," *ACM SIGMOD Record*, 20, No. 1, Mar. 1991, pp. 14–23.), Stam and Snodgrass ("A Bibliography on Temporal Databases," *IEEE Database Engineering*, 7, No. 4, Dec. 1988, pp. 231–239), McKenzie ("Bibliography: Temporal Databases," *ACM SIGMOD Record*, 15, No. 4, Dec. 1986, pp. 40–52), and Bolour, Anderson, Dekeyser, and Wong ("The Role of Time in Information Processing: A Survey," *ACM SIGMOD Record*, 12, No. 3, 1983, pp. 27-50).

Since Kline's bibliography, there have been several developments in temporal databases. The International Workshop on Temporal Databases was held in Zurich, Switzerland, Sept. 17-18, 1995 (its proceedings appear in *Recent Advances in Temporal Databases*, Clifford and Tuzhilin [eds.], Workshops in Computing Series, Springer). In addition, a consensus extension to SQL-92, the *Temporal Structured Query Language*, or TSQL2, was developed. The language specification and other material appear in a new book, *The TSQL2 Temporal Query Language*, edited by R. Snodgrass (Kluwer Academic Publishers, 1995).

The present bibliography lists 463 new temporal database papers. Most of the included papers were published in 1994-95, some before 1994 and some will appear in 1996. Based on our findings we have updated the graph representing the growth of temporal database papers (Figure 1). As the graph shows, the growth is superlinear, demonstrating that the field remains vibrant. Note that the growth is even larger if one includes papers on spatio-temporal issues.

This bibliography is divided into four sections based on the well-accepted valid/transaction model of time (see Jensen [ed.], "A Consensus Glossary of Temporal Database Concepts," *ACM SIGMOD Record*, 23, No. 1, Mar. 1994, pp. 52-64). Valid time of a fact is the time when the fact is true in the modeled reality. Transaction time is the time when a fact is stored in the database and can thus be queried. The four categories are: (1) papers dealing with *valid-time*, (2) papers dealing with *transaction-time*, (3) papers discussing concepts that apply to *both valid and transaction time*, and (4) papers related to other aspects of time, such as multimedia, temporal constraints, etc.

To save space, in the rest we have abbreviated references to standard database conferences (*SIGMOD, PODS, ICDE, EDBT, ER, DEXA, CIKM, DOOD, RIDE, BNCOD* etc.) and journals (*IEEE TKDE, ACM TODS, ACM TOIS, IS* etc.) Similarly, the above mentioned workshop and book are termed as "Workshop on TDBs" and "TSQL2 Book", respectively. The complete bibliography is available for anonymous ftp at `ftp.cs.arizona.edu` in the `bib` directory. We apologize in advance for any errors, misclassifications, or omissions and welcome any corrections. We would like to acknowledge R. Snodgrass and B. Aronov for comments on this paper and the many colleagues that supplied us with additional references. Any errors in the entries herein are entirely our own.

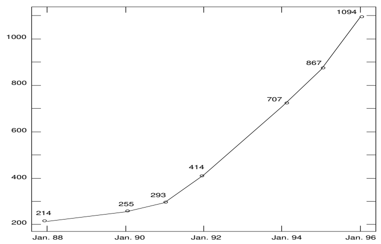

Figure 1: Temporal Database Papers

2 Valid Time

Abiteboul, S., Herr, L., and den Bussche, J. V. (1995). Temporal Connectives versus Explicit Timestamps in Temporal Query Languages. In *Proc. of Workshop on TDBs*, pages 43–57.

Abiteboul, S., Herr, L., and den Bussche, J. V. (1996). Temporal Versus First-Order Logic to Query Temporal Databases. In *Proc. of the ACM PODS*, Montreal, Canada.

Agrawal, R., Faloutsos, C., and Swami, A. N. (1993). Efficient Similarity Search In Sequence Databases. In *Proc. of the 4th Intl. Conf. of Foundations of Data Organization and Algorithms*, pages 69–84, Chicago, Illinois. LNCS, Vol. 730, Springer Verlag.

Agrawal, R., Lin, K., Sawhney, H., and Shim, K. (1995a). Fast Similarity Search in the Presence of Noise, Scaling, and Translation in Time-Series Databases. In *Proc. of the 21st VLDB Conf.*, pages 490–501, Zurich, Switzerland.

Agrawal, R., Psaila, G., Wimmers, E., and Zait, M. (1995b). Querying Shapes of Histories. In *Proc. of the 21st VLDB Conf.*, pages 502–514, Zurich, Switzerland.

Ang, C. and Tan, K. (1994). The Interval B-Tree: a New Time Indexing Technique. In *Proc. of the 5th Australasian Conf.*, pages 162–178, Christchurch, New Zealand.

Ang, C. and Tan, K. (1995). The Interval B-Tree. *Information Processing Letters*, 53:85–89.

Baekgaard, L. and Mark, L. (1995). Incremental Computation of Time-Varying Query Expressions. *IEEE TKDE*, 7(4):583–590.

Bassiouni, M., Mukherjee, A., and Llewellyn, M. (1994). Design and Implementation of Extended Boolean and Comparison Operators for Time-oriented Query Languages. *The Computer Journal*, 37(7):576–587.

Berndt, D. and Clifford, J. (1994). Using Dynamic Time Warping to Find Patterns in Time Series. In *Proc. of KDD-94: AAAI Workshop on Knowledge Discovery in Databases*, pages 359–370, Seattle, WA.

Bertino, E., Ferrari, E., and Guerrini, G. (1996). A Formal Temporal Object-Oriented Data Model. In *Proc. of 5th EDBT Conf.*, Avignon, France. To appear.

Bethem, J. V. (1991). *The Logic of Time (2nd Edition)*. Kluwer, Dordrecht, The Netherlands.

Bettini, C., Wang, X., Bertino, S., and Jajodia, S. (1995). Semantic Assumptions and Query Evaluation in Temporal Databases. In *Proc. of ACM SIGMOD*, pages 257–268, San Jose, CA.

Bettini, C., Wang, X., and Jajodia, S. (1996). Mining Event Sequences for Complex Temporal Relationships Involving Multiple Granularities. In *Proc. of the ACM PODS*, Montreal, Canada.

Blankenagel, G. and Gueting, R. (1994). External Segment Trees. *Algorithmica*, 12(6):498–532.

Böhlen, M. H., Chomicki, J., Snodgrass, R. T., and Toman, D. (1996). Querying TSQL2 Databases with Temporal Logic. In *Proc. of 5th EDBT Conf.*, Avignon, France. To appear.

Böhlen, M. H., Jensen, C. S., and Snodgrass, R. T. (1995). Evaluating the Completeness of TSQL2. In *Proc. of Workshop on TDBs*, pages 153–172.

Böhlen, M. H. and Marti, R. (1994). On the Completeness of Temporal Database Query Languages. In *Proc. of the 1st Intl. Conf. on Temporal Logic*, pages 283–300. LNCS, Vol. 827, Springer-Verlag.

Brusoni, V., Console, L., Pernici, B., and Terenziani, P. (1994a). LaTeR: a General Purpose Manager of Temporal Information. In *Proc. of the 8th Intl. Symp. on Methodologies for Intelligent Systems*, pages 255–264, Charlotte, NC. LNCS, Vol.869, Springer.

Brusoni, V., Console, L., Pernici, B., and Terenziani, P. (1995a). A Relational Model for Historical Databases Dealing with Absolute, Qualitative and Incomplete Information. Technical report, Dip. di Informatica, Universita di Torino.

Brusoni, V., Console, L., Pernici, B., and Terenziani, P. (1996). LaTeR: An Efficient, General Purpose Manager of Temporal Information. *IEEE Software*. To appear.

Brusoni, V., Console, L., and Terenziani, P. (1995b). Efficient Query Answering in LaTeR. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Brusoni, V., Console, L., and Terenziani, P. (1995c). On the Computational Complexity of Querying Bounds on Differences Constraints. *Artificial Intelligence*. To appear.

Brusoni, V., Console, L., Terenziani, P., and Pernici, B. (1995d). Extending Temporal Relational Databases to Deal with Imprecise and Qualitative Temporal Information. In *Proc. of Workshop on TDBs*, pages 3–22.

Brusoni, V., Console, P., Terenziani, P., and Pernici, B. (1994b). Answering Queries Efficiently in Heterogeneous Temporal Knowledge Bases. In *Workshop on Algorithms, Complexity and Common-sense reasoning; ECAI '94, the 11th European Conf. on Artificial Intelligence*, Amsterdam, the Netherlands.

Chandra, R. and Segev, A. (1994a). Active Databases for Financial Applications. In *Proc. of 4th RIDE Workshop: Active Database Systems*, pages 46–52, Houston, TX.

Chandra, R. and Segev, A. (1994b). Using Next Generation Databases to Develop Financial Applications. In *Proc. of the 1st Intl. Conf. on Applications of Databases*, pages 190–203, Sweden. LNCS, Vol. 819, Springer-Verlag.

Chandra, R., Segev, A., and Stonebraker, M. (1994). Implementing Calendars and Temporal Rules in Next Generation Databases. In *Proc. of 10th ICDE Conf.*, pages 264–273, Houston, TX.

Chomicki, J. (1994). Temporal Integrity Constraints in Relational Databases. *Data Engineering Bulletin*, 17(2):33–37.

Chomicki, J. (1995). Efficient Checking of Temporal Integrity Constraints Using Bounded History Encoding. *ACM TODS*, 20(2):148–186.

Chomiki, J. and Toman, D. (1995). Implementing Temporal Integrity Constraints Using an Active DBMS. *IEEE TKDE*, 7(4):566–582.

Clifford, J. and Crocker, A. (1994). On Completeness of Historical Relational Query Languages. *ACM TODS*, 19(1):64–116.

Clifford, J., Croker, A., Grandi, F., and Tuzhilin, A. (1995a). On Temporal Grouping. In *Proc. of Workshop on TDBs*, pages 194–213.

Clifford, J., Croker, A., and Tuzhilin, A. (1995b). On Data Representation and Use in a Temporal Relational DBMS. *Information Systems Research*. To appear.

Das, A. K., Tu, S. W., and Musen, M. (1993). The Representation and Manipulation of Temporal Data for Clinical Decision-Support Systems: A Database Challenge. Technical Report KSL-93-70, Knowledge Systems Laboratory, Stanford University.

Davies, C. and Lazell, B. (1995). How Helpful is Current Theory for the Representation of Time in Real Databases? In *Proc. of the 3rd European Conf. on Information Systems*, pages 1207–1219, Athens, Greece.

Davies, C., Lazell, B., Hughes, M., and Cooper, L. (1995). Time is Just Another Attribute - Or At Least, Just Another Dimension. In *Proc. of Workshop on TDBs*, pages 175–193.

Dean, T. (1989). Using Temporal Hierarchies to Efficiently Maintain Large Temporal Databases. *J. of the ACM*, 36(4):687–718.

Deng, M., Sistla, A. P., and Wolfson, O. (1995). Temporal Conditions with Retroactive and Proactive Updates. In *Intl. Workshop on Active and Real-Time Database Systems*, Sweden. University of Skovde, Sweden.

Dey, D., Barron, T., and Storey, V. (1995). A Conceptual Model for the Logical Design of Temporal Databases. *Dec. Suppt. Syst.*, 15(4).

Dreyer, W., Dittrich, A., and Schmidt, D. (1995). Using the CALANDA Time Series Management System. In *Proc. of the ACM SIGMOD*, page 489, San Jose, CA. Prototype demo.

Dreyer, W., Dittrich, A. K., and Schmidt, D. (1994). Research Perspectives for Time Series Management Systems. *SIGMOD Record*, 23(1):10–15.

Dyreson, C. E. and Snodgrass, R. T. (1994). Efficient Timestamp Input and Output. *Software Practice and Experience*, 24(1):89–109.

Dyreson, C. E. and Snodgrass, R. T. (1995a). Temporal Granularity. In *TSQL2 Book*, pages 347–383. Kluwer.

Dyreson, C. E. and Snodgrass, R. T. (1995b). Temporal Indeterminacy. In *TSQL2 Book*, pages 327–346. Kluwer.

Edelweiss, N., Oliveira, J., Castilho, J., Peressi, E., Montanari, A., and Pernici, B. (1994). T-ORM: Temporal aspects in objects and roles. In *Proc. of ORM-1 Intl. Conf. on Object-Role Modeling*, pages 18–27, Townsville, Australia.

Edelweiss, N., Oliveira, J., and Pernici, B. (1993). An Object-Oriented Temporal Model. In *Intl. Conf. on Advanced Information Systems Engineering*, volume 5, pages 397–415, Paris, France. Springer-Verlag (LNCS, 685).

Edelweiss, N., Pernici, B., Oliveira, J., and Castilho, J. M. V. (1992). Um Modelo Temporal Orientado a Objetos. In *Seminario Integrado da Sociedade Brasileira de Computacao*, volume 19, pages 166–177, Rio de Janeiro, RJ, Brazil. SBC. In Portuguese.

Etzion, O., Gal, A., and Segev, A. (1994). Retroactive and Proactive Database Processing. In *Proc. of 4th RIDE Workshop: Active Database Systems*, pages 126–131, Houston, TX.

Faloutsos, C., Jagadish, H., Mendelzon, A., and Milo, T. (1996). A Signature Technique for Similarity-Based Queries. Technical report, AT&T Bell Labs.

Gadia, S. K. and Yeung, C. S. (1989). A Tuple Calculus for Temporal Databases and Its Comparison with TQUEL. *Information Sciences*.

Gehani, N., Jagadish, H. V., Mumick, I. S., and Shmueli, O. (1993). Temporal Queries for Active Database Support. In *Proc. of the Intl. Workshop on an Infrastructure for Temporal Databases*, Arlington, TX.

Gertz, M. and Lipeck, U. W. (1995). Temporal Integrity Constraints in Temporal Databases. In *Proc. of Workshop on TDBs*, pages 77–92.

Goldin, D. Q. and Kanellakis, P. C. (1995). On Similarity Queries for Time-Series Data: Constraint Specification and Implementation. In *Proc. of the 1st Intl. Conf. on Principles and Practice of Constraint Programming*, Cassis, France. LNCS, Vol. 976, Springer Verlag.

Goralwalla, A., Özsu, M. T., and U.Tansel, A. (1995). Experimenting with Temporal Relational Databases I. In *Proc. of 4th CIKM Conf.*, pages 296–303, Baltimore, MD.

Goralwalla, I., Tansel, A., and Özsu, M. T. (1994). An Empirical Study of the Performance of Temporal Relational Databases. Technical Report TR 94-15, Univ. of Alberta, Canada.

Grandi, F., Scalas, M., and Tiberio, P. (1993). A History-oriented Data View and Operation Semantics for Temporal Relational Databases. In *Proc. of the Intl. Workshop on an Infrastructure for Temporal Databases*, Arlington, TX.

Grandi, F., Scalas, M., and Tiberio, P. (1995). A History-oriented Temporal SQL Extension. In *The 2nd Intl. Workshop on Next Generation Information Technologies and Systems*, Israel.

Hall, G. and Gupta, R. (1991). Modeling Transition. In *Proc. of 7th ICDE Conf.*, pages 540–549, Kobe, Japan.

Hall, G. and Gupta, R. (1992). An Abstraction Mechanism for Modeling Generation. In *Proc. of 8th ICDE Conf.*, Phoenix, AZ.

Harris, W. and Gray, W. A. (1994). Temporal Constructs Required to Represent Financial Instruments. In *Financial Information Systems Conf.*, Sheffield, U.K.

Harris, W. and Gray, W. A. (1995). Using Temporal Constructs in Temporal Databases. In *Proc. of Workshop on TDBs*, pages 133–152.

Hsu, S., Jensen, C. S., and Snodgrass, R. T. (1995). Valid-Time Selection and Projection. In *TSQL2 Book*, pages 251–298. Kluwer.

Illustra (1994). *Illustra TimeSeries DataBlade*. Illustra Information Technologies, Inc. DBMS, Vol. 7, No. 10.

Jagadish, H., Mendelzon, A. O., and Milo, T. (1995). Similarity-Based Queries. *Proc. of the ACM PODS*, pages 36–45.

Jajodia, S. and Wang, X. (1993). Temporal mediators: Supporting uniform access to heterogeneous temporal databases. In *Proc. of the Workshop on Interoperability of Database Systems and Database Applications*, pages 223–234, Fribourg, Switzerland.

Jensen (ed.), C. S. (1993). A Consensus Test Suite of Temporal Database Queries. Technical Report TR 93-2034, Dept. of Math. and Computer Science, Aalborg University, Denmark.

Kabanza, F., Stevenne, J., and Wolper, P. (1995). Handling Infinite Temporal Data. *J. of Computer and System Sciences*, 51(1):3–17.

Kanellakis, P., Ramaswamy, S., Vengroff, D., and Vitter, J. (1993). Indexing for Data Models with Constraints and Classes. In *Proc. of the ACM PODS*, pages 233–243, Washington, D.C. To appear at the J. of Comp. and Syst. Sciences.

Kline, N. and Snodgrass, R. T. (1995). Computing Temporal Aggregates. In *Proc. of 11th ICDE Conf.*, pages 222–231, Taipei, Taiwan.

Kline, N., Snodgrass, R. T., and Leung, T. Y. C. (1995). Aggregates. In *TSQL2 Book*, pages 395–425. Kluwer.

Kline, N. and So, L. (1993). The Timecard Calendar Specification. Technical Report 48, University of Arizona, Computer Science Department, Tucson, AZ.

Kline, N. and Soo, M. D. (1993). The SQL92 Calendar Specification. TempIS Technical Report 54, University of Arizona, Computer Science Department, Tucson, AZ.

Kokkotos, S., Ioannidis, E., Panayiotopoulos, T., and Spyropoulos, C. (1995). On the Issue of Valid Time(s) in Temporal Databases. *SIGMOD Record*, 24(3):40–43.

Koubarakis, M. (1992). Dense Time and Temporal Constraints with "not equals". In *Proc. of the 3rd Intl. Conf. on Principles of Knowledge Representation and Reasoning*, pages 24–35, Cambridge, MA. Morgan Kaufmann.

Koubarakis, M. (1994a). Complexity Results for First-Order Theories of Temporal Constraints. In *Proc. of the 4th Intl. Conf. on Principles of Knowledge Representation and Reasoning*, pages 379–390, Bonn, Germany. Morgan Kaufmann.

Koubarakis, M. (1994b). Database Models for Infinite and Indefinite Temporal Information. *IS*, 19(2):141–173.

Koubarakis, M. (1994c). Foundations of Indefinite Constraint Databases. In *Proc. of the 2nd Intl. Workshop on the Principles and Practice of Constraint Programming*, pages 266–280. LNCS, Springer Verlag, Vol. 874.

Koubarakis, M. (1994d). *Foundations of Temporal Constraint Databases*. PhD thesis, Computer Science Division, National Technical University of Athens, Greece.

Koubarakis, M. (1995a). Databases and Temporal Constraints: Semantics and Complexity. In *Proc. of Workshop on TDBs*, pages 93–109.

Koubarakis, M. (1995b). From Local to Global Consistency in Temporal Constraint Networks. In *Proc. of the 1st Intl. Conf. on Principles and Practice of Constraint Programming*, pages 53–69, France. LNCS, Vol. 976, Springer Verlag.

Kouramajian, V. and Elmasri, R. (1994). Uncertainty in Valid Time Databases. In *Proc. of the Workshop on Uncertainty in Databases and Deductive Systems*, Ithaca, NY.

Kucera, H., Friesen, P., and Sondheim, M. (1994). SQL/MM: The Open Systems Approach to Spatiotemporal Databases. In *Proc. GIS'94: 8th Annual Symp. on Geographic Information Systems*, Vancouver, Canada.

Kucera, H. and Sondheim, M. (1992). SAIF - Conquering Space and Time. In *Proc. of GIS'92: 6th Annual Symp. on Geographic Information Systems*, Vancouver, Canada.

Kucera, H., Sondheim, M., Varma, H., and Keighan, E. (1993). Spatial and Temporal Operators to Extend SQL3. In *ISO/IEC JTC1/SC21/WG3 DBL 142*, Yokohama, Japan.

Kurt, A. and Ozsoyoglu, Z. (1995a). Modeling and Querying Periodic Temporal Databases. In *Workshop of the 6th DEXA Conf.*, pages 124–133, London, U.K.

Kurt, A. and Ozsoyoglu, Z. (1995b). Modeling Periodic Time and Calendars. In *Proc. of Intl. Conf. on Appls. of Databases*, pages 221–234.

Lalioti, V. and Theodoulidis, C. (1995a). Use of Scenarios for Validation of Conceptual Specifications. In *Proc. of the 6th Intl. Workshop on the Next Generation of CASE Tools*, Finland.

Lalioti, V. and Theodoulidis, C. (1995b). Visual Scenarios for Validation of Requirements Specification. In *Proc. of the 7th Intl. Conf. on Soft. Engg. and Knowledge Engg.*, Rochville, MD.

Leung, T. Y. C. and Pirahesh, H. (1995). Querying Historical Data in IBM DB2 C/S DBMS Using Recursive SQL. In *Proc. of Workshop on TDBs*, pages 315–331.

Lorentzos, N. (1994). DBMS Support for Nonmetric Measurement Systems. *IEEE TKDE*, 6(6):945–953.

Lorentzos, N. and Mitsopoulos, Y. (1995). SQL Extension for Interval Data. *IEEE TKDE*. To appear.

Lorentzos, N. A. (1993). Semantics in Database with Interval Support. Technical report, Informatics Laboratory, Agricultural University Athens, Athens, Greece.

Lorentzos, N. A. and Manolopoulos, Y. (1994). Efficient Management of 2-d Interval Relations. In *Proc. of 5th DEXA Conf.*, pages 72–82, Athens, Greece. LNCS, Vol. 856, Springer.

Lorentzos, N. A. and Manolopoulos, Y. (1995). Functional Requirements for Historical and Interval Extensions to the Relational Model. *Data & Knowledge Engineering*, 17(1):59–86.

Lorentzos, N. A., Poulovassilis, A., and Small, C. (1994). Implementation of Update Operations for Interval Relations. *The Computer Journal*, 37(3):164–176.

Lorentzos, N. A., Poulovassilis, A., and Small, C. (1995). Manipulation Operations for an Interval-Extended Relational Model. *Data & Knowledge Engineering*, 17(1):1–29.

Mannila, H., Toivonen, H., and Verkamo, A. (1995). Discovering Frequent Episodes in Sequences. In *Proc. of the 1st Intl. Conf. on Knowledge Discovery and Data Mining*, Montreal, Canada. AAAI Press.

Motakis, I. and Zaniolo, C. (1995a). Composite Temporal Events in Active Database Rules: A Logic-Oriented Approach. In *Proc. of 4th DOOD Conf.*, Singapore.

Motakis, I. and Zaniolo, C. (1995b). Composite Temporal Events in Active Databases: A Formal Semantics. In *Proc. of Workshop on TDBs*, pages 332–351.

Muntz, R. R., Shek, E. C., and Zaniolo, C. (1993). Using LDL++ for Spatio-Temporal Reasoning in Atmospheric Science Databases. In *Proc. of Logic Databases Workshop*.

Niezette, M. and Stevenne, J. (1992). An Efficient Symbolic Representation of Periodic Time. In *Proc. of 1st CIKM Conf.*, Baltimore, MD.

Peressi, E., Montanari, A., and Pernici, B. (1994). T-ORM: Evolving Objects and Roles. In *Proc. of the 4th Intl. Working Conf. on Dynamic Modeling and Information Systems*, pages 101–119, Noordwijkerhout, the Netherlands.

Peuquet, D. (1994). It's About Time: A Conceptual Framework for the Representation of Temporal Dynamics in Geographic Information Systems. *Annals of the Association of the American Geographers*, 84(3):441–461.

Plexousakis, D. and Mylopoulos, J. (1996). Accomodating Integrity Constraints During Database Design. In *Proc. of 5th EDBT Conf.*, Avignon, France. To appear.

Portinale, L. (1993). Selecting Observation Time in the Monitoring and Interpretation of Time-varying Data. In *Proc. of the 3rd Congress of the Italian Association for Artificial Intelligence*, pages 314–325, Torino, Italy. LNCS, Vol. 728, Springer.

Ramaswamy, S. and Subramanian, S. (1994). Path Caching: A Technique for Optimal External Searching. In *Proc. of the ACM PODS*, pages 25–35, Minneapolis, MN.

Roth, W. G., Ramakrishnan, R., and Seshadri, P. (1993). MIMSY: A System for Stock Market Analysis. In *Proc. of Logic Databases Workshop*, pages 121–142.

Roth, W. G., Ramakrishnan, R., and Seshadri, P. (1995). MIMSY: A System for Analyzing Time Series in the Stock Market Domain. In *Proc. of Logic Databases Works.*, pages 33–43.

Saraee, M. H. and Theodoulidis, B. (1995a). Knowledge Discovery in Temporal Databases: The Initial Step. In *Knowledge Discovery Workshop of the 4th DOOD Conf.*, Singapore.

Saraee, M. H. and Theodoulidis, C. (1995b). Knowledge Discovery in Temporal Databases. In *IEE Colloquium on Knowledge Discovery in Databases*, London, U.K.

Schmidt, D., Dittrich, A. K., Dreyer, W., and Marti, R. (1995). Time Series, A Neglected Issue in Temporal Database Research? In *Proc. of Workshop on TDBs*, pages 214–232.

Schwiderski, S. and Saake, G. (1994). Expressing Temporal Behaviour with Extended ECA Rules. In *Proc. of 12th BNCOD Conf.*, pages 23–37, Guildford, U.K. LNCS, Vol. 826, Springer.

Seshadri, P., Livny, M., and Ramakrishnan, R. (1995a). SEQ: A Model for Sequence Databases. In *Proc. of 11th ICDE Conf.*, pages 232–239, Taipei, Taiwan.

Seshadri, P., Livny, M., and Ramakrishnan, R. (1995b). The Design and Implementation of a Sequence Database System. Technical report, University of Wisconsin. Submitted for publication, available upon request.

Shrufi, A. and Topaloglou, T. (1995). Query Processing for Knowledge Bases Using Join Indices. In *Proc. of 4th CIKM Conf.*, Baltimore.

Snodgrass, R. T. (1995). Event Tables. In *TSQL2 Book*, pages 311–318. Kluwer.

Snodgrass, R. T., Ahn, I., Ariav, G., Bayer, P., Clifford, J., Dyreson, C. E., Grandi, F., Hermosilla, L., Jensen, C. S., Kafer, W., Kline, N., Kulkarni, K., Leung, T. Y. C., Lorentzos, N., Mitsopoulos, Y., Roddick, J. F., Soo, M. D., and Sripada, S. M. (1994a). An Evaluation of TSQL2. Commentary, University of Arizona, Department of Computer Science. In: The TSQL2 Language Specification.

Snodgrass, R. T., Böhlen, M., Jensen, C. S., and Steiner, A. (1995a). Change Proposal to SQL/Temporal: Adding Valid Time — Part A. *Intl. Organization for Standardization*, page 40. ANSI Expert's Contribution.

Snodgrass, R. T., Jensen, C. S., and Grandi, F. (1995b). The From Clause. In *TSQL2 Book*, pages 245–249. Kluwer.

Snodgrass, R. T., Kulkarni, K., Kucera, H., and Mattos, N. (1994b). Proposal for a new SQL Part—Temporal. ISO/IEC JTC1/SC21 WG3 DBL RIO-75, X3H2-94-481.

Snodgrass, R. T. and Soo, M. D. (1995). Supporting Multiple Calendars. In *TSQL2 Book*, pages 103–121. Kluwer.

So, L. (1993). The Academic Calendar Specification. TempIS TR 49, University of Arizona, Computer Science Department, Tucson, AZ.

Soo, M. D., Kline, N., and Snodgrass, R. T. (1995). SQL-92 Compatibility Issues. In *TSQL2 Book*, pages 501–504. Kluwer.

Soo, M. D., Snodgrass, R. T., and Jensen, C. S. (1994). Efficient Evaluation of the Valid-Time Natural Join. In *Proc. of 10th ICDE Conf.*, pages 282–292.

Soukeras, S. and King, P. J. H. (1994a). Temporal Databases: an Event Oriented Approach. In *Proc. of 12th BNCOD Conf.*, pages 38–54, Guildford, U.K. LNCS, Vol. 826, Springer.

Soukeras, S. and King, P. J. H. (1994b). A Temporal Functional Language for the Management Historical Databases. In *Proc. of 5th DEXA Conf.*, pages 259–269, Athens, Greece. LNCS, No. 856, Springer-Verlag.

Sripada, S. and Wuthrich, B. (1994). Cumulative Updates. In *Proc. of 20th VLDB Conf.*, pages 534–545, Santiago, Chile.

Sripada, S. M. (1993). A Temporal Approach to Belief Revision in Knowledge Bases. In *Proc. of the 9th Conf. on Artificial Intelligence for Applications*, pages 56–62, Orlando, FL. IEEE Computer Society Press.

Stolorz, P. (1995). Fast Spatio-Temporal Data Mining of Large Geophysical Datasets. In *Proc. of the 1st Intl. Conf. on Knowledge Discovery and Data Mining*, Montreal, Canada.

Subramanian, S. and Ramaswamy, S. (1995). The P-range tree: A new data structure for range searching in secondary memory. In *Proc. of the 6th Annual ACM SIAM Symp. on Discrete Algorithms*, San Fransisco, CA.

Tansel, A. and Garnett, L. (1989). Nested Historical Relations. In *Proc. of ACM SIGMOD Conf.*, pages 284–293.

Tansel, A. U. (1995). Temporal Relational Data Model. *IEEE TKDE.* To appear.

Tansel, A. U. and Tin, E. (1993). The Expressive Power of Temporal Relational Query Languages. Technical report, Baruch College, NY.

Teisseira, M., Poncelet, P., and Ciechetti, R. (1994). Towards Event Modelling for Database Design. In *Proc. of the 20th VLDB Conf.*, Santiago, Chile.

Terenziani, P. (1994). Dealing with Qualitative and Quantitative Temporal Information Concerning Periodic Events. In *Proc. of the 8th Intl. Symp. on Methodologies for Intelligent Systems*, pages 275–284, Charlotte, NC. LNCS, Vol.869, Springer Verlag.

Terenziani, P. (1995). Reasoning About Periodic Events. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Theodoulidis, C. and Lalioti, V. (1995). Conceptual Visualisation Techniques and Tools, Industrial and Poster Session. In *Proc. of the 14th Intl. Conf. on Object-Oriented and Entity-Relationship Modelling*, Queensland, Australia. LNCS, Vol. 1021, Springer-Verlag.

Theodoulidis, C. and Loucopoulos, P. (1991). A Conceptual Modelling Formalism for Temporal Database Applications. *IS*, 16(4).

Tian, D. (1995). An Extension of SQL for Relations of History Expressions. In *Proc. of 4th Intl. Symp. on Database Systems for Advanced Applications*, Singapore.

Tin, E. and Tansel, A. U. (1994). Comparison of Historical Relational Query Languages. In *Proc. of the 2nd Biennial European Joint Conf. on Engineering Systems Design and Analysis*, pages 275–282, London, U.K.

Toman, D. (1996). Point vs. Interval-based Query Languages for Temporal Databases. In *Proc. of the ACM PODS*, Montreal, Canada.

Toman, D. and Chomicki, J. (1994). Implementing Temporal Integrity Constraints Using an Active DBMS. In *Proc. of 4th RIDE Workshop: Active Database Systems*, pages 87–95, Houston.

Tuma, P. A. (1992). Implementing Historical Aggregates in TempIS. Master's thesis, Wayne State University, Detroit, Michigan.

Tuzhilin, A. (1993). Querying Datalog Programs with Temporal Logic. *Acta Informatica*, pages 679 – 700.

Tuzhilin, A. (1995). Templar: A Knowledge-Based Language for Software Specifications Using Temporal Logic. *ACM TOIS*, 13(3).

Tuzhilin, A. and Clifford, J. (1995). On Periodicity in Temporal Databases. *IS*, 20(8):619–639.

Valet, L. C. and Roberts, S. A. (1994). Identifying the Requirement for History of Time-Varying Objects During an Object-Oriented Analysis. In *Intl. Conf. on Object-Oriented Information Systems*, London, U.K.

Van Belleghem, K., Denecker, M., and De Schreye, D. (1994). The Abductive Event Calculus as a General Framework for Temporal Databases. In *Proc. of the 1st Intl. Conf. on Temporal Logic*, pages 301–316, Bonn, Germany. LNCS, Vol.827, Springer.

Wang, X. (1995). Algebraic Query Languages on Temporal Databases with Multiple Granularities. In *Proc. of 4th CIKM Conf.*, Baltimore.

Wang, X., Bettini, C., Brodsky, A., and Jajodia, S. (1994a). Logical Design for Temporal Databases with Multiple Granularities. ISSE-TR 94-111, ISSE Dept., George Mason Univ.

Wang, X., Bettini, C., Brodsky, A., and Jajodia, S. (1994b). On the Relevance of Time Granularity in the Design of Temporal Databases. In *AI*IA Workshop on Temporal Reasoning*, Parma, Italy.

Wang, X. S., Jajodia, S., and Subrahmanian, V. S. (1995). Temporal Modules: An Approach Toward Federated Temporal Databases. *Information Sciences*, 82(1/2):103–128.

Whelan, J. and Kline, N. (1993). The Magnitude Calendar Specification. TempIS Technical Report 51, University of Arizona, Computer Science Department, Tucson, AZ.

Wijsen, J. (1995a). Design of Temporal Relational Databases Based on Dynamic and Temporal Functional Dependencies. In *Proc. of Workshop on TDBs*, pages 61–76.

Wijsen, J. (1995b). *Extending Dependency Theory for Temporal Databases*. PhD thesis, K.U. Leuven, Belgium.

Wijsen, J., Vandenbulcke, J., and Olivie, H. (1993a). Functional Dependencies Generalized for Temporal Databases that Include Object-

Identity. In *Proc. of 12th ER Conf.*, pages 100–114, Arlington, TX. LNCS, Vol. 823, Springer.

Wijsen, J., Vandenbulcke, J., and Olivie, H. (1993b). A Theory of Keys for Temporal Databases. In *Actes 9emes Journees Bases de Donnees*, pages 35–54.

Wijsen, J., Vandenbulcke, J., and Olivie, H. (1994a). On Time-invariance and Synchronism in Valid-time Relational Databases. *J. of Computing and Information*, 1(1).

Wijsen, J., Vandenbulcke, J., and Olivié, H. (1994b). Temporal Dependencies in Relational Database Design. In *Actes 10èmes Journées Bases de Données*, pages 157–169, Clermont-Ferrand, France.

Wuthrich, B., Tong, W. C., and Sankaran, K. (1995). A Temporal and Probabilistic, Deductive and Object-Oriented Query Language. In *Temporal Reasoning Workshop of the 4th DOOD Conf.*, Singapore.

3 Transaction Time

ADB (1993). MATISSE Versioning. Technical report, ADB/Intellitic.

Ariav, G. (1991). Temporally Oriented Data Definitions: Managing Schema Evolution in Temporally Oriented Databases. *IEEE TKDE*, 6(6):451–467.

Arlein, R., Gava, J., Gehani, N., and Lieuwen, D. (1995). Ode 4.0 User Manual. Technical report, AT&T Bell Labs. Distributed via ftp.

Becker, B., Geschwind, S., Ohler, T., Seeger, B., and Widmayer, P. (1995). An Asymptotically Optimal Multiversion B-Tree. *The VLDB Journal*. To appear.

Becker, B., Gschwind, S., Ohler, T., Seeger, B., and Widmayer, P. (1993). On Optimal Multiversion Access Structures. In *Proc. of the 3rd Symp. on Large Spatial Databases*, pages 123–141, Singapore. LNCS, Vol.692, Springer-Verlag.

Bernstein, R., Kruskal, V., and Sarnak, N. (1990). Creation and Maintenance of Multiple Versions. Technical report, RC-15650, IBM Research Division, T. J, Watson Research Center, Yorktown Heights, NY.

Bozkaya, T. and Ozsoyoglu, Z. (1995). Indexing Transaction-Time Databases. Technical Report CES-95-19, Computer Engg. and Science, Case Western Reserve Univ., Cleveland, OH.

Chen, I., Markowitz, V., Fasman, K., Letovsky, S., and Li, P. (1996). Version Management for Scientific Databases. In *Proc. of 5th EDBT Conf.*, Avignon, France. To appear.

Chen, J., McLeod, D., and D.O'Leary (1994). Schema Evolution for Object-Based Accounting Database Systems. In *Intl. Conf. on Object-Oriented Systems, Methodologies, and Applications*, Palermo, Italy.

DEC (1992). *DECmcc-Historical Data Services Use.* Digital Equipment Corporation. Technical information; order No. AA-PJWPA-TE.

DeCastro, C. and Scalas, M. (1995). Inferred Validity of Transaction-Time Data. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Eaglestone, B., Davis, G., Ridley, M., and Hulley, N. (1993). Implementation of a Version Model for Artists using Extended Relational Technology. In *Proc. of 11th BNCOD Conf.*, pages 258–276, Keele, U.K. LNCS, Vol. 696, Springer Verlag.

Edelweiss, N., Castilho, J., and Oliveira, J. (1995a). Temporal Aspects of Conceptual Schema Evolution. In *Intl. Conf. of the Chilean Computer Science Society*, volume 15, pages 187–197, Arica, Chile.

Edelweiss, N., Oliveira, J., and Castilho, J. (1995b). Evolucao de Esquemas em Bancos de Dados Temporais. In *XXII Simposio Brasileiro de Software e Hardware - XXII SEMISH, XXI Conferencia Latino-Americana de Informatica - PANEL95*, pages 375–386, Canela, Brazil. Instituto de Informatica - UFRGS. In Portuguese.

Gancarski, S., Jomier, G., and Zamfiroiu, M. (1995). A Framework for the Manipulation of a Multiversion Database. In *Workshop of the 6th DEXA Conf.*, London, U.K.

Ginsburg, S., Simovici, D., and Wang, X. (1993). Content Related Interval Queries on Object Histories. *Information and Computation*, 103(1):30–67.

Gukal, S., Omiecinski, E., and Ramachandran, U. (1995). An Efficient Transient Versioning Method. In *Proc. of 13th BNCOD Conf.*, pages 155–171, Manchester, U.K. LNCS, Vol. 940, Springer-Verlag.

Haritsa, J., Ball, M., Roussopoulos, N., Datta, A., and Baras, J. (1993). MANDATE: Managing Networks Using Database Technology. *IEEE Trans. on Selected Areas in Communications*, 11(9):1360–1372.

Jang, Y. P. and Johnson, R. G. (1994). Evolutions of Object States in Temporal Object-Oriented Databases. In *Proc. of the 22st Annual Conf. on Computer Science*, pages 304–311, Phoenix, AZ. ACM Press.

Jensen, C. S. (1995). Vacuuming. In *TSQL2 Book*, pages 451–462. Kluwer.

Jeon, D., Urban, S., Shah, J., Liu, H., Bliznakov, P., and Rogers, M. (1995). Metadata Extensions to an Object-Oriented Data Model for the Dynamic Capture of Engineering Design Histories. In *Proc. of the 6th IFIP TC-2 Working Conf. on Data Semantics*, Stone Mountain, Atlanta. Chapman & Hall, London.

Kesim, F. N. and Sergot, M. J. (1993). Versioning of Objects in Deductive Databases. In *3rd DOOD Conf.*, pages 459–472, Phoenix, AZ.

Kesim, N. and Sergot, M. (1995). Schema Evolution in a Deductive Framework. In *Temporal Reasoning Workshop of the 4th DOOD Conf.*, Singapore.

Landau, G. M., Schmidt, J. P., and Tsotras, V. J. (1995). On Historical Queries along Multiple Lines of Time Evolution. *The VLDB Journal*, 5(5).

Lanka, S. and Mays, E. (1991). Fully Persistent B+-Trees. In *Proc. of the ACM SIGMOD*, pages 426–435, San Jose, CA.

Li, C. and Wang, S. (1994). Efficient Storage Structures for Temporal Object-Oriented Databases. In *Proc. of 5th DEXA Conf.*, pages 246–258, Athens, Greece. LNCS, No. 856, Springer-Verlag.

Liu, C., Chrysanthis, P., and Chang, S. (1994). Database Schema Evolution through the Specification and Maintenance of Changes on Entities and Relationships. In *Proc. of 13th ER Conf.*, pages 132–151, Manchester, U.K. LNCS, Vol. 881, Springer-Verlag.

Liu, L. (1995). Maintaining Database consistency in the Presence of Schema Evolution. In *Proc. of the 6th IFIP TC-2 Working Conf. on Data Semantics*, Stone Mountain, Atlanta. Chapman & Hall, London.

Lomet, D. and Salzberg, B. (1993). Exploiting a History Database for Backup. In *Proc. of the 19th VLDB Conf.*, pages 380–390, Dublin.

Monk, S. R. and Sommerville, I. (1992). A Model for Versioning of Classes in Object-Oriented Databases. In *Proc. of 10th BNCOD Conf.*, pages 42–58. LNCS, Vol. 618, Springer.

Muth, P., Kraiss, A., and Weikum, G. (1996). LoT: Dynamic Declustering of TSB-Tree Nodes for Parallel Access to Temporal Data. In *Proc. of 5th EDBT Conf.*, Avignon, France. To appear.

Nascimento, M. and Dunham, M. (1996). Indexing a Transaction-Decision Time Database. In *Proc. of the 11th Annual Symp. on Applied Computing*, Philadelphia, PA. To appear.

Novikov, B. A. (1995). Indexing in Temporal Databases. *Programming and Computer Software*, 21(2).

O'Neil, P. and Weikum, G. (1993). A Log-Structured History Data Access Method (LHAM). In *Proc. of HPTS*.

Patrick, J. and Roddick, J. F. (1994). Temporal Support for a Behavioural Data Model. In *Proc. of the 5th Australasian Conf. on Information Systems*, pages 249–258, Monash University, Victoria.

Pu, C., Tsang, M. K., Wu, K., and Yu, P. S. (1994). Multiversion Divergence Control of Time Fuzziness. In *Proc. of 3rd CIKM Conf.*, Gaithersburg, MD.

Roddick, J. F. (1991). Dynamically Changing Schemas Within Database Models. *Australian Computer J.*, 23(3):105–109.

Roddick, J. F. (1992). SQL/SE - A Query Language Extension for Databases Supporting Schema Evolution. *SIGMOD Record*, 21(3).

Roddick, J. F. (1993). Implementing Schema Evolution in Relational Database Systems: An Approach Based on Historical Schemata. 10/93, Dept. of Computer Science and Computer Engineering, La Trobe University.

Roddick, J. F. (1994a). *A Model for Temporal Inductive Inference and Schema Evolution in Relational Database Systems.* PhD thesis, Department of Computer Science and Computer

Engineering, La Trobe University.

Roddick, J. F. (1994b). Schema Evolution in Database Systems - an Updated Bibliography. Technical Report Technical Report CIS-94-012, School of Computer and Information Science, University of South Australia. Update to the earlier version of SIGMOD Record, 21(4), 1992.

Roddick, J. F. (1995). A Survey of Schema Versioning Issues for Database Systems. *Information and Software Technology*, 37(7):383–393.

Roddick, J. F. (1996). A Model for Schema Versioning in Temporal Database Systems. *Australian Computer Science Communications*, 18(1). To appear.

Roddick, J. F., Craske, N. G., and Richards, T. J. (1993). A Taxonomy for Schema Versioning Based on the Relational and Entity Relationship Models. In *Proc. of the 12th Intl. Conf. on Entity-Relationship Approach*, pages 139–150, Arlington, TX. LNCS, Vol. 823, Springer.

Roddick, J. F. and Snodgrass, R. T. (1995a). Schema Versioning. In *TSQL2 Book*, pages 427–449. Kluwer.

Roddick, J. F. and Snodgrass, R. T. (1995b). Transaction Time Support. In *TSQL2 Book*, pages 319–325. Kluwer.

Salzberg, B. (1994a). On Indexing Spatial and Temporal Data. *IS*, 19(6):447–465.

Salzberg, B. (1994b). Timestamping After Commit. In *Proc. of the Parallel and Distributed Information Systems*, pages 160–167, Austin, TX.

Salzberg, B. (1995). Access Methods. *CRC Handbook on Computer Science*. Invited chapter, (to appear).

Salzberg, B. and Lomet, D. (1995). Branched and Temporal Index Structures. Technical Report NU-CCS-95-17, Northeastern University, Boston, MA. Submitted for publication.

Shvartsman, A. (1993a). A Historical Object Base in an Enterprise Management Director. In *Proc. of the 3rd IFIP Integrated Network Management Symp.*, pages 123–134.

Shvartsman, A. (1993b). Dealing with History and Time in a Distributed Enterprise Manager. *IEEE Network*, pages 32–42.

Sjoberg, D. (1993). Quantifying Schema Evolution. *Inf. Softw. Tech.*, 35(1):35–44.

Snodgrass, R. T., Jensen, C. S., and Grandi, F. (1995). Schema Specification. In *TSQL2 Book*, pages 241–243. Kluwer.

Suzuki, T. and Kitagawa, H. (1994). Design and Analysis of a File Manager with Page-level History Management Function. In *Proc. of the 47th Conf. of the Intl. Federation for Information and Documentation*, pages 307–313, Omiya, Japan.

Suzuki, T. and Kitagawa, H. (1996). Development and Performance Analysis of a Temporal Persistent Object Store POST/C++. In *Proc. of the 7th Australasian Database Conf.*, Melbourne, Australia. To appear.

Torp, K., Mark, L., and Jensen, C. S. (1994). Efficient Differential Timeslice Computation. Technical Report R-94–2055, Aalborg University, Department of Mathematics and Computer Science, Aalborg, Denmark.

Tsotras, V., Phalke, V., Kumar, A., and Gopinath, B. (1995a). Supporting Temporal Views in a Management Information Base. Technical Report CATT-TR-95-87, Polytechnic University, Brooklyn, NY. Accepted at the J. of Network and Systems Management.

Tsotras, V. J., Gopinath, B., and Hart, G. (1995b). Efficient Management of Time-Evolving Databases. *IEEE TKDE*, 7(4):591–608.

Tsotras, V. J. and Kangelaris, N. (1995). The Snapshot Index: An I/O-Optimal Access Method for Timeslice Queries. *IS*, 20(3):237–260.

van de Bercken, J. and Seeger, B. (1995). Temporal Query Processing with Duplicate Avoidance: Efficient Approaches to Multiversion Access Methods. Technical report, University of Marburg, Germany.

Varman, P. and Verma, R. (1995). An Efficient Multiversion Access Structure. Technical Report TR-9518, Department of Electrical and Computer Engineering, Rice University, Houston, TX. To appear at the IEEE TKDE.

Verma, R. and Varman, P. (1994). Efficient Archivable Time Index: A Dynamic Indexing Scheme for Temporal Data. In *Proc. of the Intl. Conf. on Computer Systems and Education*, pages 59–72, Bangalore, India. Computer Systems and Education, Tata McGraw-Hill.

Weikum, G. (1995). Workflow Monitoring: Queries on Logs or Temporal Databases? In *High Performance Transaction Systems Workshop 1995*, Pacific Grove, CA.

Yang, Y. (1993). Change Management in Object-Oriented Databases. In *Proc. of the 12th Annual Intl. Phoenix Conf. on Computers and Communications*, pages 238–244, Tempe, AZ. IEEE Computer Society Press.

4 Valid & Transaction Time

Androutsopoulos, I., Ritchie, G. D., and Thanisch, P. (1995a). A Framework for Natural Language Interfaces to Temporal Databases. Technical Report RP-734, University of Edinburgh, Scotland, U.K.

Androutsopoulos, I., Ritchie, G. D., and Thanisch, P. (1995b). Experience Using TSQL2 in a Natural Language Interface. In *Proc. of Workshop on TDBs*, pages 133–152.

Baudinet, M. (1995). On the Expressiveness of Temporal Logic Programming. *Information and Computation*, 117(2):157–180.

Böhlen, M. (1995). Temporal Database System Implementations. *SIGMOD Record*, 24(4).

Böhlen, M. H. (1994a). *The Temporal Deductive Database System Chronolog*. PhD thesis, Department Informatik, ETH Zurich.

Böhlen, M. H. (1994b). Valid Time Integrity Constraints. Technical Report 94-30, University of Arizona, Computer Science.

Chen, C. Y., Chang, C. C., and Lee, R. C. T. (1994). A Line Segment Intersection Based Temporal Join. In *Intl. Symp. on Advanced Database Technologies and Their Integration*, Japan.

Clifford, J., Dyreson, C., Isakowitz, T., Jensen, C. S., and Snodgrass, R. T. (1994). On the Semantics of "Now" in Temporal Databases. Technical Report R-94–2047, Aalborg University, Department of Mathematics and Computer Science, Aalborg, Denmark.

Clifford, J., Dyreson, C. E., Snodgrass, R. T., Isakowitz, T., and Jensen, C. S. (1995a). Now. In *TSQL2 Book*, pages 385–394. Kluwer.

Clifford, J. and Isakowitz, T. (1994). On the Semantics of (Bi)Temporal Variable Databases. In *Proc. of 4th EDBT Conf.*, pages 215–230, Cambridge, U.K. LNCS, Vol. 779, Springer-Verlag.

Clifford, J., Jensen, C. S., Snodgrass, R. T., Böhlen, M. H., Dewan, H., and Schmidt, D. (1995b). Panel: The State-of-the-Art in Temporal Data Management: Perspectives from the Research and Financial Applications Communities. In *Proc. of Workshop on TDBs*, page 356.

DeCastro, C., Grandi, F., and Scalas, M. R. (1994). Management of Schema Versions in Multitemporal Relational Databases. In *Proc. of the 2th Italian Conf. on Advanced Database Systems*, Rimini, Italy. In Italian.

DeCastro, C., Grandi, F., and Scalas, M. R. (1995a). Extensional Data Management in Multitemporal Relational Databases Supporting Schema Versioning. In *Proc. of the 3rd Italian Conf. on Advanced Database Systems*, Ravello, Italy. In Italian.

DeCastro, C., Grandi, F., and Scalas, M. R. (1995b). On Schema Versioning in Temporal Databases. In *Proc. of Workshop on TDBs*, pages 272–291.

Dyreson, C. E. and Snodgrass, R. T. (1995a). The Baseline Clock. In *TSQL2 Book*, pages 77–96. Kluwer.

Dyreson, C. E. and Snodgrass, R. T. (1995b). A Timestamp Representation. In *TSQL2 Book*, pages 475–499. Kluwer.

Dyreson, C. E., Snodgrass, R. T., and Freiman, M. (1995a). Efficiently Supporting Temporal Granularities in a DBMS. Technical Report TR 95/07, Department of Computer Science, James Cook University of North Queensland.

Dyreson, C. E., Soo, M., and Snodgrass, R. T. (1995b). The Data Model for Time. In *TSQL2 Book*, pages 97–101. Kluwer.

Edelweiss, N., Castilho, J., and Oliveira, J. (1993). A Temporal Logic Language for Temporal Conditions Definition. In *Intl. Conf. of the Chilean Computer Science Society*, volume 23, pages 163–178, La Serena, Chile. Santiago: University of Chile.

Edelweiss, N. and Oliveira, J. (1993). Definicao e Manipulacao de Objetos atraves de um

Modelo de Dados Temporal. In *Seminario Integrado de Software e Hardware*, volume 20, pages 226–240, Florianopolis, SC, Brazil. SBC. In Portuguese.

Edelweiss, N., Oliveira, J., Castilho, J., and Pernici, B. (1992). Especificacao de Requisitos: Utilizando um Modelo Temporal Orientado a Objetos. In *Simposio Brasileiro de Engenharia de Software*, volume 6, pages 213–228, Gramado, RS Brazil. Porto Alegre: Instituto de Informatica/UFRGS. In Portuguese.

Edelweiss, N., Oliveira, J., and Pernici, B. (1994). An Object-Oriented Approach to a Temporal Query Language. In *Proc. of 5th DEXA Conf.*, pages 225–235, Athens, Greece. LNCS, No. 856, Springer-Verlag.

Elmasri, R., Kouramajian, V., and Fernando, S. (1993). Temporal Database Modeling : An Object-Oriented Approach. In *Proc. of 2nd CIKM Conf.*, pages 574 – 585, Washington, DC.

Gadia, S. K. (1993). Seamless Integration of Spatial, Temporal, Belief and Ordinary Data. *SIGMOD Record*, 22(1):15–20.

Gal, A. and Etzion, O. (1995). Handling Change Management using Temporal Active Repositories. In *Proc. of 14th Object-Oriented and Entity-Relationship Modelling Conf. (OO-ER)*, Gold Coast, Australia. LNCS, Vol. 1021, Springer-Verlag.

Gatziu, S. and Dittrich, K. R. (1993). Events in an Active Object-Oriented Database System. In *Proc. of the 1st Intl. Workshop on Rules in Database Systems*, pages 23–39, Edinburgh, U.K. Workshops in Computing, Springer.

Goralwalla, I. A., Leontiev, Y., Özsu, M. T., and Szafron, D. (1995). A Uniform Behavioral Temporal Object Model. Technical Report TR 95-13, University of Alberta, Canada.

Jensen, C. S., Clifford, J., Elmasri, R., Gadia, S. K., Hayes, P., and Jajodia, S. e. (1994). A Consensus Glossary of Temporal Database Concepts. *SIGMOD Record*, 23(1):52–64.

Jensen, C. S. and Snodgrass, R. T. (1995a). Semantics of Time-Varying Attributes and Their Use for Temporal Database Design. In *Proc. of the 14th Intl. Conf. on Object-Oriented and Entity Relationship Approach (OO-ER)*, pages 366–377, Gold Coast, Australia. LNCS, Vol. 1021, Springer-Verlag.

Jensen, C. S. and Snodgrass, R. T. (1995b). Temporal Databases (Tutorial). In *21st VLDB Conf.*, Zurich, Switzerland.

Jensen, C. S., Snodgrass, R. T., and Leung, T. Y. C. (1995a). Cursors. In *TSQL2 Book*, pages 305–309. Kluwer.

Jensen, C. S., Snodgrass, R. T., and Soo, M. D. (1995b). Extending Existing Dependency Theory to Temporal Databases. *IEEE TKDE*, to appear.

Jensen, C. S., Snodgrass, R. T., and Soo, M. D. (1995c). The TSQL2 Data Model. In *TSQL2 Book*, pages 157–240. Kluwer.

Kim, D. H., Jeon, K. W., Jeong, K. J., Kim, K. J., and Ryu, K. H. (1994). A Temporal Database Management Main Memory Prototype. In *Proc. of 1994 IEEE Region 10 Annual Intl. Conf.*, volume 1, pages 391–396, Singapore.

Kim, S.-K. and Chakravarthy, S. (1993). Modeling Time: Adequacy of Three Distinct Time Concepts for Temporal Databases. In *Proc. of 12th ER Conf.*, Arlington, TX. LNCS, Vol. 823, Springer-Verlag.

Knight, B. and Ma, J. (1994). A Temporal Database Model Supporting Relative and Absolute Time. *The Computer J.*, 37(7):588–597.

Kokkotos, S. and Spyropoulos, C. D. (1994). A Framework for Developing Temporal Databases. In *Proc. of 5th DEXA Conf.*, pages 236–245, Athens, Greece. LNCS, No. 856, Springer.

Kouramajian, V. (1994). Incorporating Time in Databases (Tutorial). In *1st Intl. Conf. on Temporal Logic*, Bonn, Germany.

Kouramajian, V. and Elmasri, R. (1995a). Archiving Techniques for Temporal Databases. In *Proc. of 4th Intl. Symp. on Database Systems for Advanced Applications*, Singapore.

Kouramajian, V. and Elmasri, R. (1995b). The TI/R Tree : A Temporal-Spatial Access Structure. In *Proc. of the 33rd ACM Annual Southeast Conf.*, Clemson University, SC.

Kouramajian, V., Elmasri, R., and Chaudhry, A. (1994a). Declustering Techniques for Parallelizing Temporal Access Structures. In *Proc. of 10th ICDE Conf.*, pages 232–242, Houston, TX.

Kouramajian, V., Kamel, I., Elmasri, R., and Waheed, S. (1994b). The Time Index+: An Incremental Access Structure for Temporal Databases. In *Proc. of 3rd CIKM Conf.*, Gaithersburg, MD.

Kramer, B., Chaudhri, V., Koubarakis, M., Topaloglou, T., Wang, H., and Mylopoulos, J. (1991). Implementing Telos. *SIGART Bulletin, Special Issue on Implemented Knowledge Representation and Reasoning Systems*, 2(3):77–83.

Kumar, A., Tsotras, V. J., and Faloutsos, C. (1995a). Access Methods for Bi-Temporal Databases. In *Proc. of Workshop on TDBs*, pages 235–254.

Kumar, A., Tsotras, V. J., and Faloutsos, C. (1995b). Designing Access Methods for Bitemporal Databases. Technical Report 112530–950926-11-TM, AT&T Bell Labs, Murray Hill, NJ. Submitted for publication.

Leung, T. Y. C., Jensen, C. S., and Snodgrass, R. T. (1995). Modification. In *TSQL2 Book*, pages 299–303. Kluwer.

Lu, H., Ooi, B.-C., and Tan, K.-L. (1994). On Spatially Partitioned Temporal Join. In *Proc. of the 20th VLDB Conf.*, pages 546–557, Santiago.

Lue, J., Brown, K., and Samson, W. (1995). Indexing Techniques for Temporal Data. In *Workshop of the 6th DEXA Conf.*, London, U.K.

Ma, J. and Knight, B. (1994). Management of Both Absolute Time and Relative Time in Process Control. In *Proc. of 9th Intl. Conf. on Applications of Artificial Intelligence in Engineering*, pages 313–320, University Park, PA.

Ma, J., Knight, B., and Petridis, M. (1994). A Revised Theory of Action and Time Based on Intervals and Points. *The Computer J.*, 37(10).

MacLean, D. and Orci, T. (1994). A Data Model for Multi-Temporal, Dynamically Verifiable Information Systems. In *Proc. of the Baltic Workshop on National Infrastructure Databases*.

Makki, K. and Pissinou, N. (1994). A New Storage Organization for Temporal Databases. *The Intl. J. of Systems and Software*, 27(3):159–169.

Moller, P. and Sripada, S. (1995). The ChronoBase Temporal Deductive Database System. In *Temporal Reasoning Workshop of the 4th DOOD Conf.*, Singapore.

Mylopoulos, J., Chaudhri, V., Plexousakis, D., Shrufi, A., and Topaloglou, T. (1995). Implementing Knowledge Management Systems . *The VLDB Journal*. To appear.

Nascimento, M., Dunham, M., and Kouramajian, V. (1995a). A Mapping-Based Approach for Range Indexing. Technical Report 95-CSE-14, Southern Methodist University, Dallas, TX.

Nascimento, M. and Eich, M. (1995). On Decision Time for Temporal Databases. In *Proc. of the 2nd Intl. Workshop on Temporal Representation and Reasoning*, pages 157–162, Melbourne Beach, FL.

Nascimento, M., Elmasri, R., and Dunham, M. (1995b). Using Incremental Trees For Space Efficient Indexing of Bitemporal Databases. In *Proc. of the 2nd Intl. Conf. on Applications of Databases*, San Jose, CA. (To appear).

Nascimento, M. A., Dunham, M. H., and Elmasri, R. (1995c). Analytical Performance Studies of the IVTT Bitemporal Access Structure. Technical Report 95-CSE-19, Southern Methodist University, Dallas, TX.

Oliveira, J., Edelweiss, N., Arruda, E., Laender, A., and Cavalcanti, J. (1995). On the Implementation of an Object-Oriented Temporal Model using Object-Oriented and Relational DBMSs. In *Workshop of the 6th DEXA Conf.*, pages 35–44, London, U.K.

Orci, T. (1994). A Data Model for Multi-Temporal, Dynamically Verifiable Information Systems. In *Baltic Workshop on National Infrastructure Databases: - Problems, Methods, and Experiences*, Vilnius, Lithuania.

Orci, T. (1995a). Adding a Temporal Dimension to a Deductive Database. In *Temporal Reasoning Works. of 4th DOOD Conf.*, Singapore.

Orci, T. (1995b). Framework for Temporal Deductive Databases. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Orgun, M. (1993). On Temporal Deductive Databases. Technical Report 93-140, Department of Computing, Macquarie University, Australia. Revised version to appear in Computational Intelligence, Vol.12.

Orgun, M. (1995). A Temporal Algebra with Recursive Equations. Technical Report No.C/TR95-05, Macquarie University.

Orgun, M. A. and Muller, H. A. (1993). A temporal algebra based on an abstract model. In *Proc. of the 4th Australian Database Conf.*, Advances in Database Research, Singapore.

Ozsoyoglu, G. and Snodgrass, R. T. (1995). Temporal and Real-Time Databases: A Survey. *IEEE TKDE*, 7(4):513–532.

Pissinou, N. (1995). MUTOM: A Multi-User Temporal Object Model. *Intl. J. of Computer & Software Engineering*, 4(3).

Pissinou, N. and Makki, K. (1993). A Unified Model and Methodology for Temporal Object Databases. *The Intl. J. on Intelligent and Cooperative Information Systems*, 2(2):201–223.

Pissinou, N. and Makki, K. (1994a). A Coherent Architecture for a Temporal Object Database Management System. *The Intl. J. of Systems and Software*, 27(3):195–205.

Pissinou, N. and Makki, K. (1994b). On The Representation of Temporal Object Roles in Object Oriented Databases. In *Proc. of 1st Intl. Workshop on Temporal Representation and Reasoning*, pages 165–168, Pensacola, FL.

Pissinou, N. and Makki, K. (1994c). Separating Semantics from Representation in a Temporal Object Database Domain. *The J. of Computer Information Systems*, 34(3):41–46.

Pissinou, N., Makki, K., and Park, E. K. (1994a). Towards a Framework for Integrating Multilevel Secure Models and Temporal Data Models. In *Proc. of 3rd CIKM Conf.*, Gaithersburg, MD.

Pissinou, N., Makki, K., and Yesha, Y. (1993). On Temporal Modeling in the Context of Object Databases. *SIGMOD Record*, 22(3):8–15.

Pissinou, N., Snodgrass, R. T., Elmasri, R., Mumick, I. S., Özsu, M. T., Pernici, B., Segev, A., Theodoulidis, B., and Dayal, U. (1994b). Towards an Infrastructure for Temporal Databases: Report of an Invitational ARPA/NSF Workshop. *SIGMOD Record*, 23(1):35–51.

Plexousakis, D. (1993). Integrity Constraint and Rule Maintenance in Temporal Deductive Knowledge Bases. In *Proc. of the 19th VLDB Conf.*, pages 146–157, Dublin, Ireland.

Plexousakis, D. (1995). Compilation and Simplification of Temporal Integrity Constraints. In *Proc. of the 2nd Intl. Workshop on Rules in Database Systems*, pages 260–276, Athens, Greece. LNCS, Vol. 985, Springer-Verlag.

Plexousakis, D. (1996). *On the Efficient Maintenance of Temporal Integrity in Knowledge Bases*. PhD thesis, University of Toronto.

Price, G. and Grey, A. (1994). Object Oriented Databases and their Application to Historical Data. *History and Computing*, 6(1).

Proper, H. (1994). *A Theory of Conceptual Modelling of Evolving Application Domains*. PhD thesis, Univ. of Nijmegen, Nijmegen, The Netherlands.

Proper, H. and van der Weide, T. (1995). A General Theory for Evolving Application Models. *IEEE TKDE*, 7(6).

Proper, H. A. and van der Weide, T. P. (1993). Towards a General Theory for the Evolution of Application Domains. In *Proc. of the 4th Australian Database Conf.*, Brisbane.

Proper, H. A. and van der Weide, T. P. (1994). EVORM: A Conceptual Modelling Technique for Evolving Application Domains. *Data & Knowledge Engineering*, 12(3):313–359.

Robertson, C. (1993). *The Temporal Transformational Data Model*. PhD thesis, Department of Computer Science, University of Otago, Dunedin, New Zealand.

Rose, E. and Segev, A. (1994). Schema Versioning in a Temporal Object-Oriented Data Model. Technical report, Lawrence Berkely Laboratory, Berkeley, CA.

Sarda, N. (1995). Temporal Databases: Recent Developments and Applications (Tutorial). In *4th DOOD Conf.*, Singapore.

Schleifer, P., Sun, Y., and Patel, D. (1995). Modelling Temporal Semantics in an Object-Oriented Database. In *Proc. of the 2nd Intl. Conf. on Object-Oriented Information Systems*. Springer-Verlag.

Schleifer, P., Sun, Y., and Patel, D. (1996). The Implementation of a Chronicle Collection Class in Smalltalk/DB. In *Proc. of the 11th Annual Symp. on Applied Computing (Special Track on Database Techn.)*, Philadelphia, PA. To appear.

Segev, A., Jensen, C. S., and Snodgrass, R. T. (1995). Report on the 1995 Intl. Workshop on Temporal Databases. *SIGMOD Record*, 24(4):46–52.

Shen, H., Ooi, B. C., and Lu, H. (1994). The TP-Index: A Dynamic and Efficient Indexing Mechanism for Temporal Databases. In *Proc. of 10th ICDE Conf.*, pages 274–281, Houston, TX.

Snodgrass, R. T. (1994). Overview of the Special Section on Temporal Database Infrastructure. *SIGMOD Record*, 23(1):34.

Snodgrass, R. T. (1995a). Introduction to TSQL2. In *TSQL2 Book*, pages 19–31. Kluwer.

Snodgrass, R. T. (1995b). TSQL2 Tutorial. In *TSQL2 Book*, pages 33–47. Kluwer.

Snodgrass, R. T., Ahn, I., Ariav, G., Batory, D. S., Clifford, J., Dyreson, C. E., Elmasri, R., Grandi, F., Jensen, C. S., Kafer, W., Kline, N., Kulkarni, K. G., Leung, T. Y. C., Lorentzos, N. A., Roddick, J. F., Segev, A., Soo, M. D., and Sripada, S. M. (1994). A TSQL2 Tutorial. *SIGMOD Record*, 23(3):27–33.

Snodgrass, R. T., Ahn, I., Ariav, G., Batory, D. S., Clifford, J., Dyreson, C. E., Elmasri, R., Grandi, F., Jensen, C. S., Kafer, W., Kline, N., Kulkarni, K., Leung, T. Y. C., Lorentzos, N., Roddick, J. F., Segev, A., Soo, M. D., , and Sripada, S. . M. (1995a). *Language Syntax*, pages 549–631. Kluwer. R. T. Snodgrass.

Snodgrass, R. T., Clifford, J., Dayal, U., and Segev, A. (1995b). Panel: Whither TSQL3? In *Proc. of Workshop on TDBs*, page 335.

Snodgrass, R. T., Jensen, C. S., Dyreson, C. E., Kafer, W., Kline, N., and Roddick, J. F. (1995c). A Second Example. In *TSQL2 Book*, pages 49–73. Kluwer.

Snodgrass, R. T. and Kucera, H. (1994). Rationale for Temporal Support in SQL3. ISO/IEC JTC1/SC21/WG3 DBL SOU-177, SQL/MM SOU-02, Southampton, U.K.

Snodgrass, R. T. and Kucera, H. (1995). Rationale for a Temporal Extension to SQL. In *TSQL2 Book*, pages 3–18. Kluwer.

Soo, M. D., Dyreson, C. E., and Snodgrass, R. (1995a). Temporal Data Types. In *TSQL2 Book*, pages 123–152. Kluwer.

Soo, M. D., Jensen, C. S., and Snodgrass, R. T. (1995b). An Algebra for TSQL2. In *TSQL2 Book*, pages 505–546. Kluwer.

Soo, M. D., Jensen, C. S., and Snodgrass, R. T. (1995c). An Architectural Framework. In *TSQL2 Book*, pages 465–473. Kluwer.

Sun, Y. (1994). Extending RDBMS to Support Temporal Data. In *Proc. of the Basque Intl. Workshop on Information Technology*, pages 335–345, Toulouse, France.

Sun, Y. (1995). The Modelling of Temporal Data in the Relational Database Environment. *J. of Computer Science and Technology*, 10(2):163–174.

Sun, Y., Stockman, A. G., and Deen, S. M. (1992). Processing Temporal Data in the Relational Database. In *Proc. of the 3rd Intl. Conf. on Data and Knowledge Syst. for Manufact. and Engg.*, pages 237–246, Lyon, France.

Theodoulidis, B., Ait-Braham, A., Andrianopoulos, G., Chaudhary, J., Karvelis, G., and Sou, S. (1994a). The ORES Temporal Database Management System. In *Proc. of ACM SIGMOD*, page 511, Minneapolis, MN.

Theodoulidis, B., Ait-Braham, A., and Karvelis, G. (1994b). The ORES Temporal DBMS and the ERT-SQL Query Language. In *Proc. of 5th DEXA Conf.*, pages 270–279, Athens, Greece. LNCS, No. 856, Springer-Verlag.

Theodoulidis, B., Papapanagiotou, P., and Pappas-Katsiafas, V. (1995). Interactive Querying and Visualisation in Temporal Databases. In *Temporal Reasoning Workshop of the 4th DOOD Conf.*, Singapore.

Theodoulidis, C. (1994). Temporal Information Bases for CASE. In *Proc. of the 5th Intl. Workshop on the Next Generation of CASE Tools*, Utrecht, The Netherlands.

Theodoulidis, C. and Petrounias, I. (1993). A Multiparadigm Environment for the Development of Information Systems. In *Proc. of the 4th Greek Informatics Conf.*, Patras, Greece.

Topaloglou, T. (1993). Storage Management for Knowledge Bases. In *Proc. of 2nd CIKM Conf.*, Washington, DC.

Vassilakis, C., Lorentzos, N. A., and Georgiadis, P. (1995). Transaction Support in a Temporal DBMS. In *Proc. of Workshop on*

TDBs, pages 255–271.

Won, J. and Elmasri, R. (1996). Representing Retroactive and Proactive Versions in Bi-Temporal Databases (2TDBs). In *Proc. of 12th ICDE Conf.*, New Orleans, LA. To appear.

Zurek, T. (1996). Parallel Temporal Nested-Loop Joins. Technical Report ECS-CSG-20-96, Dept. of Computer Science, Edinburgh Univ.

5 Other Papers

Aberer, K. and Klas, W. (1994). Supporting Temporal Multimedia Operations in Object-oriented Database Management Systems. In *Proc. of the IEEE Intl. Conf. on Multimedia Computing and Systems*, Boston, MA.

Adelberg, B., Garcia-Molina, H., and Kao, B. (1995). Applying Update Streams in a Soft Real-Time Database System. In *Proc. of the ACM SIGMOD*, pages 245–256, San Jose, CA.

Adiba, M. (1995). STORM:A Structural and Temporal Object-Oriented Multimedia Database System. In *Intl. Workshop on Multi-Media Database Management Systems*, Blue Mountain Lake, NY.

Arapis, C. (1993). A Temporal Logic Based Approach for the Description of Object Behavior Revolution. In *Mathematical Fundamentals of Database and Knowledge Systems*, volume 7. Annals of Math. and Artif. Intelligence.

Arapis, C. (1995). A Temporal Perspective of Composite Objects. In *Object-Oriented Software Composition*, pages 123–152. Prentice Hall.

Arruda, E., Edelweiss, N., and Oliveira, J. (1994). Implementacao de um modelo orientado a objetos com papeis. In *PANEL 94 - XX Conferencia Latinoamericana de Informatica*, volume 20, pages 977–988, Cidade do Mexico, Mexico. In Portuguese.

Becker, P. (1995). A Temporal Logic Based Approach for Querying Lists, Trees, and DAGs in Databases. In *Proc. of 6th DEXA Conf.*, pages 293–302, London, U.K. LNCS, Vol. 978, Springer-Verlag.

Bimbo, A. D., Vicario, E., and Zingoni, D. (1995). Symbolic Description and Visual Querying of Image Sequences Using Spatio-Temporal Logic. *IEEE TKDE*, 7(4):609–622.

Botti, V., Barber, F., Crespo, A., Gallardo, D., Ripoll, I., Onaindia, E., and Hernandez, L. (1993). Sharing Temporal Knowledge by Multiple Agents. In *Proc. of 4th DEXA Conf.*, pages 470–473, Prague, Czech Republic. LNCS, No. 720, Springer-Verlag.

Botti, V., Barber, F., Crespo, A., Onaindia, E., Garcia-Fornes, A., Ripoll, I., Gallardo, D., and Hernandez, L. (1995). A Temporal Blackboard for a Multi-Agent Environment. *Data & Knowledge Engineering*, 15(3):189–21.

Bouzid, M. and Ladkin, P. (1995). Rules for Simple Temporal Reasoning. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Bozkaya, T. and Ozsoyoglu, Z. (1995). Indexing the Temporal Data in Multimedia Databases. Technical Report CES-95-23, Computer Engineering and Science, Case Western Reserve University, Cleveland, OH.

Cabodi, G., Camurati, P., Printetto, P., and Reorda, M. S. (1991). TPDL: Extended Temporal Profile Description Language. *Software-Practice and Experience*, 21(4):355–374.

Cavalcanti, J., Laender, A., Oliveira, J., and Edelweiss, N. (1995). Uma abordagem para implementacao de um modelo temporal orientado a objetos usando SGBDs relacionais. In *Simposio Brasileiro de Banco de Dados*, volume 10, pages 393–408, Recife, PE, Brazil. UFPE/DI. In Portuguese.

Cervesato, I., Chittaro, L., and Montanari, A. (1995). A Modal Calculus of Partially Ordered Events in a Logic Programming Framework. In *Proc. of 12th Intl. Conf. on Logic Programming*, pages 299–313, Tokyo, Japan. MIT Press.

Cervesato, I., Montanari, A., and Provetti, A. (1993). On the Non-monotonic Behavior of Event Calculus for Deriving Maximal Time-Intervals. In *Interval Computations*, volume 2, pages 83–119, St. Petersburg - Moscow. Institute for New Technologies.

Chakravarthy, S., Anwar, E., Mangis, L., and Mishra, D. (1994a). Design of Sentinel: An Object-oriented DBMS with Event-based Rules. *Information and Software Technology*, 36(9):555–568.

Chakravarthy, S., Krishnaprasad, V., Anwar, E., and Kim, S.-K. (1994b). Composite Events for Active Databases: Semantics, Contexts and Detection. In *Proc. of the 20th VLDB Conf.*, pages 606–617, Santiago, Chile.

Chakravarthy, S. and Misra, D. (1994). Snoop: An Expressive Event Specification Language for Active Databases. *Data & Knowledge Engineering*, 14(1):1–26.

Cheng, T. S. and Gadia, S. K. (1994). Pattern Matching Language for Spatio-Temporal Databases. In *Proc. of 3rd CIKM Conf.*, Gaithersburg, MD.

Chittaro, L. and Montanari, A. (1994). Efficient Handling of Context-dependency in the Cached Event Calculus. In *Proc. of 1st Intl. Workshop on Temporal Representation and Reasoning*, pages 103–112, Pensacola, FL.

Chittaro, L. and Montanari, A. (1996). Efficient Temporal Reasoning in the Cached Event Calculus. *Comput. Intellig.*, 12(2). To appear.

Chittaro, L., Montanari, A., and Cervesato, I. (1995a). Speeding up Temporal Reasoning by Exploiting the Notion of Kernel of an Ordering Relation. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Chittaro, L., Montanari, A., Dojat, M., and Gasparini, C. (1994a). The Event Calculus at Work: a Case Study in the Medical Domain. In *Proc. of the 2nd IEE Intl. Conf. on Intelligent Systems Engineering*, pages 195–200, Hamburg, Germany. IEE Press.

Chittaro, L., Montanari, A., and Peressi, E. (1995b). An Integrated Framework for Temporal Aggregation and Omission in the Event Calculus. In *Computational Mechanics*, Applications of Artificial Intelligence in Engineering X, pages 47–54, Boston, MA.

Chittaro, L., Montanari, A., and Provetti, A. (1994b). Skeptical and Credulous Event Calculi for Supporting Modal Queries. In *Proc. of ECAI '94: 11th European Conf. on Artificial Intelligence*, pages 361–365, Amsterdam, the Netherlands. John Wiley & Sons Publishers.

Chu, W., Ieong, I., Taira, R., and Breant, C. (1992). A Temporal Evolutionary Object-oriented Data Model for Medical Image Management. In *Proc. of 5th Annual IEEE Symp. on Computer-Based Medical Systems*, pages 84–91, Durham, NC.

Chung, J. (1995). Scalable Parallel Query Server for Decision Support. In *Proc. of 11th ICDE Conf.*, pages 186–187, Taipei, Taiwan.

Claramunt, C. and Thiriault, M. (1995). Managing Time in GIS: An Event-Oriented Approach. In *Proc. of Workshop on TDBs*, pages 23–42.

Cukierman, D. and Delgrande, J. (1994). Time Units and Calendars. In *Proc. of the 12th National Conf. on Artificial Intelligence*, volume 1, Seattle, WA. AAAI Press.

Cukierman, D. and Delgrande, J. (1995). A language to Express Time Intervals and Repetition. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Damodaran-Kamal, S. and Pissinou, N. (1995). Addressing Shared Access and Communication in Distributed Databases Using an Object Environment. *Intl. J. of Computer Systems*, 10(4):214–222.

Day, Y., Dagtas, S., Iino, M., Khokhar, A., and Ghafoor, A. (1995). Object-Oriented Conceptual Modeling of Video Data. In *Proc. of 11th ICDE Conf.*, pages 401–408, Taipei, Taiwan.

DeCastro, C. (1995). Temporal Aspects in Distributed Relational Databases. In *Workshop of the 6th DEXA Conf.*, London, U.K.

DeCastro, C., Grandi, F., and Scalas, M. R. (1993). Interoperability of Heterogeneous Temporal Relational Databases. In *Proc. of 12th ER Conf.*, pages 463–474, Arlington, TX. LNCS, Vol. 823, Springer-Verlag.

Edelweiss, N. (1994). *Sistemas de Informacao de Escritorios: um Modelo para Especificacoes Formais*. PhD thesis, Universidade Federal do Rio Grande do Sul, Porto Algre, Brazil.

Edelweiss, N. and Oliveira, J. (1993). Representacao Interna de um Banco de Dados para Suportar o Modelo Temporal F-ORM. In *Simposio Brasileiro de Banco de Dados*, volume 8, pages 297–311, Campina Grande, PA, Brazil. SBC. In Portuguese.

Edelweiss, N. and Oliveira, J. (1994). *Modelagem de Aspectos Temporais de Sistemas de Informacao*. UFPE-DI, Recife, PE, Brazil. Presented in the IX Escola de Computacao, Recife, PE, Brazil (in Portuguese).

Euzenat, J. (1995). An algebraic approach to granularity in time representation. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Faloutsos, C. (1995). Indexing Multimedia Databases (Tutorial). In *Proc. of the ACM SIGMOD*, page 467, San Jose, CA.

Fotouhi, F., Ahmad, I., Grosky, W. I., and Shah, A. A. (1994). Temporal Object System (TOS). *J. of Database Management*, 5(4):3–14.

Frazier, G. F. (1993). An Incremental Algorithm for Building Temporal Quadtrees. In *Proc. of the 21st Annual Conf. on Computer Science*, pages 446–452, Indianapolis, IN. ACM Press.

Fuller, D. A., Mujica, S. T., and Pino, J. A. (1993). The Design of an Object-Oriented Collaborative Spreadsheet with Version Control and History Management. In *Proc. of the ACM/SIGAPP Symp. on Applied Computing*, pages 416–423, Indianapolis, IN. ACM Press.

Gal, A. and Etzion, O. (1994a). A Parallel Execution Model for Updating Temporal Databases. In *Proc. of the 7th Intl. Conf. on Parallel and Distributed Computing Systems*, Las Vegas, NV.

Gal, A. and Etzion, O. (1994b). A Multi-Agent Update Process in a Database with Temporal Dependencies and Schema Versioning. Technical report, Technion—Israel Institute of Technology, Haifa, Israel.

Georgakopoulos, D., Rusinkiewicz, M., and Litwin, W. (1994). Chronological Scheduling of Transactions with Temporal Dependencies. *The VLDB Journal*, 3(1):1–28.

Geverini, A., Schubert, L., and Schaeffer, S. (1994). The Temporal Reasoning Tools TimeGraph I-II. In *Proc. of the 6th IEEE Intl. Conf. on Tools with Artificial Intelligence*, pages 513–520, New Orleans, LA.

Gibbs, S. J., Breiteneder, C., and Tsichritzis, D. (1993). Audio/Video databases: an object-oriented approach. In *Proc. of 9th ICDE Conf.*, pages 381–390, Vienna, Austria.

Gibbs, S. J., Breiteneder, C., and Tsichritzis, D. (1994). Data Modeling of Time-Based Media. In *Proc. of ACM SIGMOD*, pages 91–102, Minneapolis, MN.

Goble, C. and Crowther, P. (1994). Schemas for Telling Stories in Medical Records. In *Proc. of 4th EDBT Conf.*, pages 393–406, Cambridge, U.K. LNCS, Vol. 779, Springer-Verlag.

Golshani, F. and Dimitrova, N. (1994). Retrieval and Delivery of Information in Multimedia Database Systems. *Information and Software Technology*, 36(4):235–242.

Gross, R. and Marti, R. (1995a). A Constraint Database System for Temporal Knowledge. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Gross, R. and Marti, R. (1995b). Managing Temporal Knowledge Using a Deductive Constraint Database System. In *Datenbanksysteme in Buro, Technik und Wissenschaft*, pages 423–440, Dresden, Germany. Informatik Aktuell, Springer. In German.

Guynes, J. L., Lai, V. S., and Kuilboer, J. (1994). Temporal Databases: Model Design and Commercialization Prospects. *Database*, 25(3).

Hawkes, L., Derry, S., and Rundenesteiner, E. (1990). Individualized Tutoring Using an Intelligent, Fuzzy, Temporal Relational Database. *Intl. J. of Man and Machine*, 33:409–429.

Hermosilla, L. H. (1993). A Requirement Analysis for Supporting Temporal Reasoning in Geographic Information Systems. Technical Report ECRC-93-15, European Computer-Industry Research Centre.

Hjelsvold, R., Midtstraum, R., and Sandste, O. (1995). A Temporal Foundation of Video Databases. In *Proc. of Workshop on TDBs*, pages 295–314.

Hrycej, T. (1993). A temporal extension of Prolog. *J. of Logic Programming*, 15(1/2):113–145.

Huang and Luk (1994). Query Processing with Spatio-temporal Index on Object Oriented Databases. In *Proc. of the 2nd ACM Workshop on Advances in Geographic Information Systems*, Gaithersburg, MD.

Iino, M., Day, Y., and Ghafoor, A. (1994). An Object-oriented model for spatio-temporal synchronization of multimedia information. In *Proc. of the Intl. Conf. on Multimedia Computing and Systems*, pages 110–119, Boston, MA.

Jagadish, H. V., Mumick, I., and Silberschatz, A. (1995). View Maintenance Issues for the Chronicle Data Model. In *Proc. of the ACM PODS*, pages 113–124, San Jose, CA.

Kalua, P. P. and Robertson, E. L. (1993). Date Arithmetic. Technical report, Computer Science Department, Indiana University, Bloomington.

Keller, A. M. and Ullman, J. D. (1995). A Version Numbering Scheme with a Useful Lexicographical Order. In *Proc. of 11th ICDE Conf.*, pages 240–248, Taipei, Taiwan.

Kim, W. S., Chang, D. C., Lim, T. Y., and Shin, Y. H. (1995). Temporal Object-Oriented Data Model for the Modification. In *Proc. of 4th Intl. Symp. on Database Systems for Advanced Applications*, Singapore.

Knight, B. and Ma, J. (1993-1994). Time Representation: a Taxonomy of Temporal Models. *Artificial Intelligence Review*, 7(6):401–409.

Kouramajian, V. and Gertz, M. (1995). A Visual Query Editor for Temporal Databases. In *Proc. of the 14th Intl. Conf. on Object-Oriented and Entity Relationship Modelling*, Gold Coast, Australia. LNCS, Vol. 1021, Springer-Verlag.

Kucera, H., Graves, R., and Flaherty, M. (1995). Building a Spatiotemporal Framework for Statistical Information. *Bull. of the Intl. Statistical Inst. - Proc. - 50th Session*, LVI(2):671–688.

Kurutach, W. (1994). FITMod: a Fuzzy Interval-based Temporal Model for Temporal Databases. In *Proc. of the 2nd IEEE Australian and New Zealand Conf. on Intell. Information Syst.*, pages 442–446, Brisbane, Australia.

Kurutach, W. (1995). Modelling Fuzzy Interval-based Temporal Information: a Temporal Database Perspective. In *Proc. of the 1995 IEEE Intl. Conf. on Fuzzy Systems*, volume 2, pages 741–748, Yokohama, Japan.

Kurutach, W. and Franklin, J. (1993). On Temporal-fuzziness in Temporal Fuzzy Databases. In *Proc. of 4th DEXA Conf.*, pages 259–269, Prague, Czech Republic. LNCS, No. 720, Springer-Verlag.

Lee, E. B. and Ryu, K. H. (1993). TempIS: Interfacing System for Graphical Display of Temporal Databases. In *Proc. of TENCON'93, IEEE Region 10 Conf. on Computer, Communication, Control and Power Engineering*, volume 1, pages 319–322, Beijing, China.

Lin, J., Kung, D., and Hsia, P. (1994). Toward an object-oriented modeling approach with representation of temporal knowledge. In *Proc. of the 18th Annual IEEE Intl. Computer Soft. and Appl. Conf.*, pages 58–63, Taipei, Taiwan.

Lin, S.-H. and Dean, T. (1994). Localized Temporal Reasoning: A State-Based Approach. In *Proc. of 1st Intl. Workshop on Temporal Representation and Reasoning*, Pensacola, FL.

Ma, J. and Knight, B. (1994). A General Temporal Theory. *The Computer J.*, 37(2):114–123.

Ma, J. and Knight, B. (1995). Building Temporal Constraints into Knowledge Bases for Process Control - an Examination. *Engineering Applications of Artificial Intelligence*, 8(1):97–99.

Martin, C. and Sistac, J. (1994). Integrity Constraints Checking in Historical Deductive Databases. In *5th Intl. Workshop on the Deductive Approach to Information Systems and Databases*, Costa Brava, Spain.

Masunaga, Y. (1994). Temporal Multimedia Data Modeling in OMEGA. In *Intl. Symp. on Advanced Database Technologies and Their Integration*, Japan.

Masunaga, Y. (1995). A Temporal Expansion to the Multimedia Object Model in OMEGA. In *Proc. of 4th Intl. Symp. on Database Systems for Advanced Applications*, Singapore.

Maurel, D. and Mohri, M. (1995). Computation of French Temporal Expressions to Query Databases. In *Proc. of 1st Intl. Workshop on Applications of Natural Language to Data Bases*.

McBrien, P. (1993). Principles of Implementing Historical Databases in RDBMS. In *Proc. of 11th BNCOD Conf.*, pages 220–237, Keele, U.K. LNCS, Vol. 696, Springer Verlag.

Mengshoel, O. J. and Solvberg, I. (1993). Acquisition and Modelling of Uncertain, Incomplete and Time-Varying Knowledge. In *Proc. of the 7th Europ. Works. on Knowledge Acquisition for Knowledge-Based Syst.*, pages 300–319, Toulouse, France. LNCS, Vol. 723, Springer.

Mitra, D. (1995). Theoretical and Practical Implications of an Algorithm for Finding all Consistent Temporal Models. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Montanari, A., Peressi, E., and Pernici, B. (1994). Object Migration in Temporal Object-oriented Databases. *INFORMATICA - Intl. J. of Computing and Informatics*, 18(4):467–484.

Montanari, A. and Pernici, B. (1992). Modeling and Reasoning about Time in Temporal Databases. Technical Report Research Report 16/92, Dipartimento di Matematica ed Informatica, Universita' di Udine.

Morris, R., Ligozat, G., and Khatib, L. (1995). Generating Scenarios from Specifications of Repeating Events. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Morris, R. and Tamir, D. (1995). Time and Uncertainty in Reasoning about Order. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Morris, R. A., Shoaff, W. D., and Khatib, L. (1994). An Algebraic Formulation of Temporal Knowledge for Reasoning about Recurring Events. In *Proc. of 1st Intl. Works. on Temp. Representation and Reasoning*, Pensacola, FL.

Navrat, P. and Bielikova, M. (1995). Representing Calendrical Algorithms and Data in Prolog and Prolog III Languages. *ACM SIGPLAN Notices*, 30(7):45–51.

Nerson, J. (1992). O-O Development of a Date and Time Management Cluster. *J. of Object-Oriented Programming*.

Oberweis, A. and Sanger, V. (1994). GTL - A Graphical Language for Temporal Data. In *Proc. of the 7th Intl. Working Conf. on Scientific and Statistical Database Management*, pages 22–31, Charlottesville, VA. IEEE Computer Society Press.

Oei, J., Proper, H. A., and Falkenberg, E. (1994). Evolving Information Systems: Meeting the Ever Changing Environment. *Information Systems J.*, 4(3):213–233.

Oeuvray, P., Hope, G., and Miniato, P. (1995). Temporal Data Manager. In *High Performance Transaction Systems Workshop 1995*, Pacific Grove, CA.

Ozkarahan, E. (1995). Multimedia Document Retrieval. *Information Processing and Management*, 31(1):113–131.

Ozsoyoglu, G. and Wang, H. (1993). Example-Based graphical database query languages. *IEEE Computer*, 26(5):25–38.

Panayiotopoulos, T. and Gergatsoulis, M. (1995). Intelligent Information Processing using TRLi. In *Workshop of the 6th DEXA Conf.*, pages 494–501, London, U.K.

Pang, H., Carey, M. J., and Livny, M. (1995). Multiclass Query Scheduling in Real-Time Database Systems. *IEEE TKDE*, 7(4):533–551.

Pissinou, N., Raghavan, V., and Vanapipat, K. (1995). RIMM: A Reactive Integration Multidatabase Model. *Informatica: The Intl. J. of Computing and Informatics*, 19(2):177–193.

Pissinou, N. and Vanapipat, K. (1996). Active Database Rules in Distributed Database Systems: A Dynamic Approach to Solving Structural and Semantic Conflicts in Distributed Database Systems. *Intl. J. of Computer Systems, Science and Engineering*, 11(1):35–44.

Proper, H. A. and van der Weide, T. P. (1995). Information Disclosure in Evolving Information Systems: Taking as Shot at a Moving Target. *Data & Knowledge Engineering*, 15(2):135–168.

Ramparany, F., Zigman, R., and Yap, R. (1994). Integrating Causal and Coarse Grain Temporal Reasoning in a Model Based Control System. In *Proc. of the 10th Conf. on Artif. Intelligence for Applications*, pages 389–395, San Antonio, TX.

Reich, A. J. (1994). Intervals, Points, and Branching Time. In *Proc. of 1st Intl. Workshop on Temporal Representation and Reasoning*, Pensacola, FL.

Roddick, J. F. and Patrick, J. (1995). Perspectives on the Accommodation of Temporal Semantics in Information Systems: the Artificial Intelligence and Data Modelling Approaches. In *Encyclopedia of Microcomputers*, volume 17, pages 251–277. Marcel Dekker, New York, NY.

Schwiderski, S., Hartmann, T., and Saake, G. (1994). Monitoring Temporal Preconditions in a Behaviour Oriented Object Model. *Data & Knowledge Engineering*, 14(2):143–186.

Shah, A. A., Fotouhi, F., and Grosky, W. (1993a). Renovation of Complex Objects in the Temporal Object System. In *Proc. of the 12th Annual Intl. Phoenix Conf. on Computers and Communications*, pages 203–209, Tempe, AZ. IEEE Computer Society Press.

Shah, A. A., Fotouhi, F., Grosky, W., Rana, S. P., and Vashishta, A. (1993b). Offstage Objects and their Renovations in the Temporal Object System TOS. In *The 3rd Intl. Symp. on Database Systems for Advanced Applications*, Taejon, Korea.

Shimizu, T., Nakamura, O., and Kiyoki, Y. (1995). Multimedia Document System for Temporal and Spatial Structuring. In *Intl. Workshop on Hypermedia Design*, Montpellier, France.

Singh, M. (1995). Formalizing Actions in Branching Time: Model-Theoretic Consideration. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Sistla, A. P. and Wolfson, O. (1995a). Temporal Conditions and Integrity Constraints in Active Database Systems. In *Proc. of ACM SIGMOD*, pages 269–280, San Jose, CA.

Sistla, A. P. and Wolfson, O. (1995b). Temporal Triggers in Active Databases. *IEEE TKDE*, 7(3):471–486.

Song, F. (1994). Extending Temporal Reasoning with Hierarchical Constraint. In *Proc. of 1st Intl. Workshop on Temporal Representation and Reasoning*, Pensacola, FL.

Song, X. and Liu, J. W. S. (1995). Maintaining Temporal Consistency: Pessimistic vs. Optimistic Concurrency Control. *IEEE TKDE*, 7(5):786–796.

Soparkar, N., Korth, H. F., and Silbershatz, A. (1995). Databases with Deadline and Contingency Constraints. *IEEE TKDE*, 7(4):552–565.

Sripada, S. M., Rosser, B. L., Bedford, J. M., and Kowalski, R. A. (1994). Temporal Database Technology for Air Traffic Flow Management. In *Proc. of the 1st Intl. Conf. on Applications of Databases*, pages 28–41, Vadstena, Sweden. LNCS, Vol. 819, Springer-Verlag.

Sturm, R., Mulle, J. A., and Lockemann, P. C. (1995). Temporized and Localized Rule Sets. In *Proc. of the 2nd Intl. Workshop on Rules in Database Systems*, pages 131–146, Athens, Greece. LNCS, Vol. 985, Springer Verlag.

ter Hofstede, A. H. M., Proper, H. A., and van der Weide, T. P. (1994). Supporting Information Disclosure in an Evolving Environment. In *Proc. of 5th DEXA Conf.*, pages 433–444, Athens, Greece. LNCS, Vol. 856, Springer.

Toman, D. and Niwinski, D. (1996). First-Order Queries over Temporal Databases Inexpressible in Temporal Logic. In *Proc. of 5th EDBT Conf.*, Avignon, France. To appear.

Tuzhilin, A. (1995). Extending Temporal Logic to Support High-Level Simulations. *ACM Trans. on Modeling and Computer Simulation*, 5(2):129–155.

Vanapipat, K., Pissinou, N., and Raghavan, V. (1995). A Dynamic Framework to Actively Support Interoperability in Multidatabase Systems. In *Proc. of 5th RIDE Workshop: Distr. Object Management*, pages 148–153, Taipei, Taiwan.

Vaughan, J. (1995). Oracle Speaks of Space and Time. *Software Magazine*, 15(6).

Vidal, T. and Ghallab, M. (1995). Efficient Temporal Management through an Application-Dependent Graph Decomposition. In *Proc. of 2nd Intl. Workshop on Temporal Representation and Reasoning*, Melbourne Beach, FL.

Worboys, M. (1994). A Unified Model for Spatial and Temporal Information. *The Computer Journal*, 37(1):26–34.

Yeh, T. and de Cambray, B. (1993). Time as a Geometric Dimension for Modeling the Evolution of Entities : a 3D approach. In *Proc. of the 2nd Intl. Conf. on Integrating GIS and Environmental Modeling*. NCGIA.

Yeh, T. and de Cambray, B. (1994). How to Model Highly Variable Data in a Complex Object Data Model. In *Proc. of the COMAD'94: 6th Intl. Conf. on Management of Data*, pages 169–186. Tata Mc Graw-Hill Company.

Yeh, T. and de Cambray, B. (1995). Managing Highly Variable Spatio-Temporal Data. In *Proc. of the 6th Australasian Database Conf.*, pages 221–230.