Special Section

GUEST EDITOR'S INTRODUCTION:

Research Surveys on Building Systems with Knowledge and Data Engineering Techniques

David L. Spooner, *Member, IEEE*

1 Introduction

Experience using knowledge and data engineering techniques for building large and complex systems is becoming widespread. It is time to document this experience and organize it into useful forms for students, practitioners, and researchers. At the same time, this experience highlights areas where future research is needed and establishes new research directions in knowledge and data engineering. This special section of *IEEE Transactions on Knowledge and Data Engineering* focuses on experience to date and future research directions in applying knowledge and data engineering concepts. It contains a collection of *research survey* articles devoted to these topics.

A secondary goal of this special section is to stimulate the submission of research survey manuscripts to *TKDE*. A research survey presents new taxonomies, identifies research issues, and defines future research directions. In December 1994, then-Editor-in-Chief Benjamin W. Wah announced *TKDE*'s intention to publish quality research survey articles [1]. This decision was motivated by reader input indicating that research surveys are valuable for keeping up with rapidly changing technologies. In addition, research surveys complement the traditional research articles published in *TKDE*. To date, a number of research survey articles have been published in *TKDE*; however, the number of submitted manuscripts has been small. It is hoped that his special section will encourage others to prepare research survey manuscripts and submit them to *TKDE*.

2 Research Survey Articles

This special section contains three research survey articles from widely diverse areas within knowledge and data engineering. The first article, "Sequential Decision Models for Expert System Optimization," by Vijay S. Mookerjee and Michael V. Mannino, focuses on obtaining the maximum value from the operation of expert systems. Appropriate optimization models can reduce the cost to construct, maintain, and operate these systems. The authors discuss the role of sequential decision models in achieving these optimizations when the cost to collect inputs is significant and the inputs are not known until the system operates. Real cost savings and increased user satisfaction have resulted from applying these models in a variety of application areas. The article defines in detail the concepts of sequential decision models and the roles that they play in optimizing expert systems.

The second article, "Elicitation of Knowledge from Multiple Experts Using Network Inference," by Robert Rush and William A. Wallace, focuses on the use of influence diagrams to represent an expert's understanding of a decision situation. The influence diagrams from individual experts are then merged into a composite representation of the decision situation. This composite representation can be used as the basis for building a knowledge-based system that supports the decision situation. An advantage of this methodology is that the experts who provide the knowledge are not influenced by group interaction dynamics, which is common in many other techniques for knowledge elicitation. The article surveys relevant literature on elicitation of knowledge from multiple experts before defining the methodology based on influence diagrams. The new methodology is not meant as a replacement for other techniques, but as an additional tool for the knowledge engineer to elicit knowledge from experts.

The final article in the special section is "Transaction Processing in Multilevel Secure Databases with Kernelized Architecture: Challenges and Solutions," by Vijayalakshmi Atluri, Sushil Jajodia, and Elisa Bertino. This article addresses the conflicting requirements of confidentiality, integrity, and availability as they relate to transactions processing in multilevel secure database systems. Conventional concurrency

• *D.L. Spooner is with the Computer Science Department, Rensselaer Polytechnic Institute, 110 8th St., Troy, NY 12180.*
E-mail: spoonerd@cs.rpi.edu.

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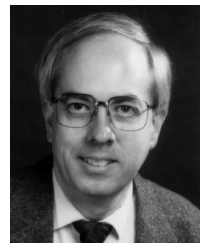
control techniques for transaction processing in database systems, such as two-phase locking and timestamps, do not meet the confidentiality requirements for such systems. They are prone to signaling channels, which can be used by malicious users to leak sensitive information. The article surveys new concurrency control techniques that have been developed to avoid signaling channels and meet the other requirements for both centralized and distributed multilevel secure database systems.

3 Numerous Specialists Surveyed

Each of these research survey articles addresses a different problem in building working systems. The first two articles focus on engineering knowledge systems and address the problems of optimizing the operation of expert systems and elicitation of knowledge for expert systems, respectively. The third article focuses on engineering data systems by addressing the relationships between security and concurrency control issues for these systems. All three articles survey the work of many researchers, who have addressed these problems; organize this prior work into useful taxonomies; and present directions for future research.

References

[1] B.W. Wah, "Editorial," *IEEE Trans. Knowledge and Data Eng.*, vol. 6, no. 6, pp. 853-856, Dec. 1994.



David L. Spooner received the BS degree from Pennsylvania State University, the MS degree from Cornell University, and the PhD degree from Pennsylvania State University, all in computer science. Since 1981, he has been at Rensselaer Polytechnic Institute in Troy, New York, where he is a professor in the Computer Science Department. His research interests include engineering database systems, object-oriented systems, and database security. He has served on the program committees of several conferences in these areas and has edited several collections of papers from these conferences. He is currently the surveys editor of *IEEE Transactions on Knowledge and Data Engineering* and chair of IFIP Working Group 11.3 on Database Security. He is a member of the ACM, IEEE, and IEEE Computer Society.