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Computational Support for Discrete Mathematics
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DIMACS Series in Discrete Mathematics and Theoretical Computer Science

Volume 15

Computational Support for Discrete Mathematics

DIMACS Workshop
March 12–14, 1992

Nathaniel Dean
Gregory E. Shannon
Editors

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Foreword

This DIMACS volume on Computational Support for Discrete Mathematics contains papers from talks at a workshop held at DIMACS, March 12–14, 1992.

We would especially like to thank the workshop’s organizers, Nathaniel Dean and Gregory E. Shannon, for organizing this workshop that brought together many outstanding speakers in this field.

Diane Souvaine, Acting Director
Robert Tarjan, Co-Director
Preface

This volume contains papers based on talks given at the DIMACS Workshop on Computational Support for Discrete Mathematics, March 12-14, 1992 at Rutgers University in Piscataway, New Jersey. This workshop was designed to facilitate working relationships among a diverse group of researchers concerned with the development of software for various aspects of experimental discrete mathematics. Their goal is to provide effective computational tools for research, applications prototyping, and various levels of education. We are grateful to DIMACS and NSF for their generous support.

With the recent technological advances in workstations, graphics, graphical user interfaces, and object oriented programming languages, a significant number of researchers are developing general-purpose software and integrated software systems for domains in discrete mathematics, including graph theory, combinatorics, combinatorial optimization, and sets. The goal of such software is to provide effective computational tools for research, applications prototyping, and teaching in these domains. Developing such software leads to new problems that are significant in their own right. Such problems include: effectively managing large objects or sets internally and externally; designing reusable software, interfaces, and algorithm libraries; developing effective object models for interactive algorithm design and programming; and developing user interfaces that effectively display excessively large and complex combinatorial objects.

Unfortunately, there are no obvious conferences, journals, special interest groups, or newsletters for researchers, developers, and educators interested in such software to report results, announce new systems, exchange ideas, or outline important research directions and strategies. With this lack of communication, there is gross duplication of effort, ad hoc progress in research, and a lack of viability, acceptability, and application of this area’s work.

The primary goal of the workshop was to facilitate working relations between the researchers, developers, and educators, identify common research interests and applications, to demonstrate current systems, and to identify how and where workers in this area can regularly communicate and meet. A second and equally important goal was to document the current and past research in this area through a substantial proceedings.

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The program was exciting. There were three excellent, inspiring talks by the keynote speakers: Ronald Read "Computer-assisted graph theory: recollections and speculations", Jon Bentley "Computational support for discrete algorithms", and Marc Brown "Algorithm animation: techniques, a system, and a novel application". The breath and depth of the invited and contributed talks were enormous, the informal discussion sessions were informative, and the software demonstrations were outstanding. There were also papers related to education and to experimental discrete mathematics. These included descriptions of current software for discrete mathematics, experience with specific implementation issues, experimental techniques and results, and applications. All of the papers were refereed.

The editors hope and expect that the considerable interest and collaborative efforts generated by this workshop will lead to continued developments with significant impact on theoretical research, applications and education.

Nathaniel Dean
Gregory E. Shannon