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Computing
in Object-Oriented
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Preface

This volume contains the Proceedings of the International Symposium on Computing in Object-Oriented Parallel Environments (ISCOPE '98), held at Santa Fe, New Mexico, USA on December 8–11, 1998. ISCOPE is in its second year,[1] and continues to grow both in attendance and in the diversity of the subjects covered. ISCOPE'97 and its predecessor conferences focused more narrowly on scientific computing in the high-performance arena. ISCOPE '98 retains this emphasis, but has broadened to include discrete-event simulation, mobile computing, and web-based metacomputing.

The ISCOPE '98 Program Committee received 39 submissions, and accepted 10 (26%) as Regular Papers, based on their excellent content, maturity of development, and likelihood for widespread interest. These 10 are divided into three technical categories.

Applications: The first paper describes an approach to simulating advanced nuclear power reactor designs that incorporates multiple local solution methods and a natural extension to parallel execution. The second paper discusses a Time Warp simulation kernel that is highly configurable and portable. The third gives an account of the development of software for simulating high-intensity charged particle beams in linear particle accelerators, based on the POOMA framework, that shows performance considerably better than an HPF version, along with good parallel speedup.

Runtime and Libraries: The first paper in this category evaluates Java as a language and system for high-performance numerical computing, exposing some issues to face in language features and compilation strategies. The second describes using the Illinois Concert system to parallelize an adaptive mesh refinement code, showing that a combination of aggressive compiler optimizations and advanced run-time support can yield good parallel performance for dynamic applications. The third paper presents a unified framework for building a numerical linear algebra library for dense and sparse matrices, achieving high performance and minimizing architectural dependencies. In the fourth paper, a parallel run-time substrate is presented that supports a global addressing scheme, object mobility, and automatic message forwarding for implementing adaptive applications on distributed-memory machines.

Numerics and Algorithms: The first paper describes a software package for partitioning data on structured grids, supporting inherent and new partitioning algorithms, and describes its use in two applications. The second describes a family of multiple minimum degree algorithms to generate permutations of large, sparse, symmetric matrices to minimize time and space required in matrix factorization. The final regular paper discusses two optimizing transformations for numerical frameworks, one that reduces inter-processor communication and another that improves cache utilization.

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[1] The ISCOPE'97 Proceedings are available from Springer as LNCS, Vol. 1343.

In addition, the Program Committee selected 15 submissions as Short Papers. These papers were deemed to represent important work of a more specialized nature or to describe projects that are still in development. The Short Papers are divided into four technical categories.

Metacomputing: The first paper presents a Java-based infrastructure to combine web-based metacomputing with cluster-based parallel computing. The second describes an experimental metacomputing system that is dynamically reconfigurable in its use of systems and networks, and also in its own capabilities. The third paper outlines a distributed platform to ease the combination of heterogeneous networks, concentrating on the design of its kernel software. The fourth paper presents language constructs for the simultaneous creation of entire static object networks which have useful properties.

Frameworks and Run-time: The first paper describes a class library for FIFO queues that can be incorporated with Time Warp simulation mechanisms and retain the advantages of inlined data structures and efficient state saving. The second paper presents a thread profiling system that is cognizant of the underlying concurrent run-time environment. The third paper evaluates a high-level, portable, multithreaded run-time system for supporting concurrent object-oriented languages. The fourth describes a run-time library for data-parallel applications that covers a spectrum of parallel granularities, problem regularities and user-defined data structures. The last paper in this section describes the design and use of a component architecture for large-scale simulations of scientific problems, based in turn on the POOMA framework.

Numerics and Algorithms: The first paper discusses the parallelization and implementation of Monte Carlo simulations for physical problems. The second presents a parallel implementation of the dynamic recursion method for tridiagonalizing sparse matrices efficiently. The third discusses the design of software for solving sparse, symmetric systems of linear equations by direct methods. The fourth paper describes a template library of two-phase container classes and communication primitives for parallel dynamic mesh applications.

Arrays: The first of two papers in this category describes the Blitz++ library, meant to provide a base environment of vectors, arrays and matrices for scientific computing with C++. The second discusses the design of arrays and expression evaluation strategies in the new POOMA II framework development.

This collection of 25 papers represents the state of the art in applying object-oriented methods to parallel computing. ISCOPE '98 is truly international in scope, with its 72 contributing authors representing 24 research institutions in 9 countries. The ISCOPE '98 organizers are confident that the reader will share their excitement about this dynamic and important area of computer science and applications research.

At the end of this volume, the Author Contacts section details the affiliations, postal addresses, and email addresses of all the proceedings authors.

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