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Preface

This book presents a collection of coordinated scientific papers describing the research activities and the scientific and technical results achieved within the TASSO research initiative. TASSO has been promoted and funded by the Italian National Research Council (Consiglio Nazionale delle Ricerche), within the national research project "Sistemi Informatici e Calcolo Parallelo." Part of the project has been conducted in cooperation with the Research Institute for Symbolic Computation (RISC) of the Johannes-Kepler-University, Linz, Austria. New methodological aspects related to design and implementation of symbolic computation systems are considered in TASSO. The aim of this research project is to integrate such aspects into a homogeneous software environment for scientific computation. The proposed methodology is based on a combination of different techniques: algebraic specification through a modular approach and completion algorithms, approximated and exact algebraic computing methods, object-oriented programming paradigm, automated theorem proving through methods à la Hilbert and methods of natural deduction. In order to experiment with the proposed methodology and to show its effectiveness, the design of a prototypal implementation of a computing environment represents a specific goal of the project. In this environment, several modules for specification of mathematical structures and treatment of their logic properties are integrated and managed by a suitable interface.

While the focus is on the theoretical activity developed in the project, some papers present also practical achievements: the TASSO programming language, implementations of deductive mechanisms, and algebraic computing tools. Some papers not directly connected to the practical achievements have been included, to provide a better comprehension of general arguments related to the topics of the project.

The contents are arranged in four parts, each one collecting and sequencing related subjects.

The first describes the state of the art in symbolic mathematical computation and the requirements for advanced software systems; it motivates and founds the general approach followed by TASSO for the integration of specification and computing paradigms.

The proposed treatment of mathematical objects, via techniques for method abstraction, structures classification, and exact representation is presented in the second part.

The programming methodology that supports the design and implementation issues is described in the third part.

The reasoning capabilities supported by the environment are presented in the fourth part.

Academic partners active in TASSO have been:
Università di Roma "La Sapienza": Dipartimento di Informatica e Sistemistica, Roma, Italy
Università di Roma Tre: Dipartimento di Informatica e Automazione
Università di L'Aquila: Dipartimento di Matematica Pura ed Applicata, L'Aquila, Italy
Consiglio Nazionale delle Ricerche (CNR): Istituto di Analisi dei Sistemi ed Informatica, Roma, Italy
Consiglio Nazionale delle Ricerche (CNR): Istituto per la Matematica Applicata, Genova, Italy
Johannes-Kepler-University: Research Institute for Symbolic Computation (RISC), Linz, Austria
University of Warszaw: Department of Informatics, Warszaw, Poland

Cooperating industrial partners have been:
Olivetti Systems and Networks, Ivrea, Italy
STET: Scuola Speciale G. Reiss Romoli, L'Aquila, Italy

The work for the TASSO project, and the interest in related subjects arisen within the international scientific community, gave great impulse to the organization of the DISCO conferences on "Design and Implementation of Symbolic Computation Systems," held in Capri (Italy, 1990), Bath (United Kingdom, 1992), Gmunden (Austria, 1993), and Karlsruhe (Federal Republic of Germany).

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