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Discriminants, Resultants, and Multidimensional Determinants Regular Sequences and Resultants Topics in Algebraic Geometry and Geometric Modeling Applications of Computational Algebraic Geometry Computer Mathematics Artificial Intelligence and Symbolic Computation An Introduction to Two-Dimensional Quantum Field Theory with (0,2) Supersymmetry Applications of Polynomial Systems Geometric and Algorithmic Aspects of Computer-aided Design and Manufacturing Calabi-Yau Varieties and Mirror Symmetry Computational Science and Its Applications - ICCSA 2003 SAGA – Advances in ShApes, Geometry, and Algebra Modern Mathematical Tools and Techniques in Capturing Complexity Foundations of Computational Mathematics Applications of Computational Algebraic Geometry Software for Algebraic Geometry Algebraic Topology Invariant Methods in Discrete and Computational Geometry Algorithms and Theory of Computation Handbook Using Algebraic Geometry Algebraic Geometry and Geometric Modeling Differential Equations with Symbolic Computation Computer Mathematics Advances in Informatics Algorithms in Algebraic Geometry and Applications Ideals, Varieties, and Algorithms The Unity of Mathematics Complex Analysis and Geometry Algorithmic Probability and Combinatorics Groups, Rings and Algebras Computational Methods in Mechanical Systems Symbolic Computation Mathematics in the 21st Century Future Vision and Trends on Shapes, Geometry and Algebra The Mathematica GuideBook for Symbolics Approximate Commutative Algebra Tensor Analysis Algebraic Combinatorics and Computer Science Computing in Algebraic Geometry Applied Parallel Computing

Mathematical algorithms are a fundamental component of Computer Aided Design and Manufacturing (CAD/CAM) systems. This book provides a bridge between algebraic geometry and geometric modelling algorithms, formulated within a computer science framework. Apart from the algebraic geometry topics covered, the entire book is based on the unifying concept of using algebraic techniques – properly specialized to solve geometric problems – to seriously improve accuracy, robustness and efficiency of CAD-systems. It provides new approaches as well as industrial applications to deform surfaces when animating virtual characters, to automatically compare images of handwritten signatures and to improve control of NC machines. This book further introduces a noteworthy representation based on 2D contours, which is essential to model the metal sheet in industrial processes. It additionally reviews applications of numerical algebraic geometry to differential equations systems with multiple solutions and bifurcations. Future Vision and Trends on Shapes, Geometry and Algebra is aimed specialists in the area of mathematics and computer science on the one hand and on the other hand at those who want to become familiar with the practical application of algebraic geometry and geometric modelling such as students, researchers and doctorates. This volume includes 28 chapters by authors who are leading researchers of the world describing many of the up-to-date aspects in the field of several complex variables (SCV). These contributions are based upon their presentations at the 10th Korean Conference on Several Complex Variables (KSCV10), held as a satellite conference to the International Congress of Mathematicians (ICM) 2014 in Seoul, Korea. SCV has been the term for multidimensional complex analysis, one of the central research areas in mathematics. Studies over time have revealed a variety of rich, intriguing, new knowledge in complex analysis and geometry of analytic spaces and holomorphic functions which were "hidden" in the case of complex dimension one. These new theories have significant intersections with algebraic geometry, differential geometry, partial differential equations, dynamics, functional analysis and operator theory, and sheaves and cohomology, as well as the traditional analysis of holomorphic functions in all dimensions. This book is suitable for a broad audience of mathematicians at and above the beginning graduate-student level. Many chapters pose open-ended problems for further research, and one in particular is devoted to problems for future investigations. Written at a level appropriate to undergraduates, this book covers such topics as the Hilbert Basis

Theorem, the Nullstellensatz, invariant theory, projective geometry, and dimension theory. The book bases its discussion of algorithms on a generalisation of the division algorithm for polynomials in one variable that was only discovered in the 1960's. Although the algorithmic roots of algebraic geometry are old, the computational aspects were neglected earlier in this century. This has changed in recent years, and new algorithms, coupled with the power of fast computers, have let to some interesting applications, for example in robotics and in geometric theorem proving. In preparing this new edition, the authors present an improved proof of the Buchberger Criterion as well as a proof of Bezout's Theorem. This book spans the distance between algebraic descriptions of geometric objects and the rendering of digital geometric shapes based on algebraic models. These contrasting points of view inspire a thorough analysis of the key challenges and how they are met. The articles focus on important classes of problems: implicitization, classification, and intersection. Combining illustrative graphics, computations and review articles this book helps the reader gain a firm practical grasp of these subjects. The chapters of this book summarize the lectures delivered du ring the NATO Advanced Study Institute (ASI) on Computational Methods in Mechanisms, that took place in the Sts. Constantin and Elena Resort, near Varna, on the Bulgarian Coast of the Black Sea, June 16-28, 1997. The purpose of the ASI was to bring together leading researchers in the area of mechanical systems at large, with special emphasis in the computational issues around their analysis, synthesis, and optimization, during two weeks of lectures and discussion. A total of 89 participants from 23 count ries played an active role during the lectures and sessions of contributed papers. Many of the latter are being currently reviewed for publication in specialized journals. The subject of the book is mechanical systems, Le. , systems composed of rigid and flexible bodies, coupled by mechanical means so as to constrain their various bodies in a goal-oriented manner, usually driven under computer con trol. Applications of the discipline are thus of the most varied nature, ranging from transportation systems to biomedical devices. U nder normal operation conditions, the constitutive bodies of a mechanical system can be consid ered to be rigid, the rigidity property then easing dramatically the analysis of the kinematics and dynamics of the system at hand. Examples of these systems are the suspension of a terrestrial vehicle negotiating a curve at speeds within the allowed or recommended limits and the links of multiaxis industrial robots performing conventional pick-and-place operations. Approximate Commutative Algebra is an emerging field of research which endeavours to bridge the gap between traditional exact Computational Commutative Algebra and approximate numerical computation. The last 50 years have seen enormous progress in the realm of exact Computational Commutative Algebra, and given the importance of polynomials in scientific modelling, it is very natural to want to extend these ideas to handle approximate, empirical data deriving from physical measurements of phenomena in the real world. In this volume nine contributions from established researchers describe various approaches to tackling a variety of problems arising in Approximate Commutative Algebra. This volume contains papers related to the research conference, 'Symbolic Computation: Solving Equations in Algebra, Analysis, and Engineering', held at Mount Holyoke College (MA). It provides a broad range of active research areas in symbolic computation as it applies to the solution of polynomial systems. The conference brought together pure and applied mathematicians, computer scientists, and engineers, who use symbolic computation to solve systems of equations or who develop the theoretical background and tools needed for this purpose. Within this general framework, the conference focused on several themes: systems of polynomials, systems of differential equations, non commutative systems, and applications. Tensors, or hypermatrices, are multi-arrays with more than two indices. In the last decade or so, many concepts and results in matrix theory?some of which are nontrivial?have been extended to tensors and have a wide range of applications (for example, spectral hypergraph theory, higher order Markov chains, polynomial optimization, magnetic resonance imaging, automatic control, and quantum entanglement problems). The authors provide a comprehensive discussion of this new theory of tensors. Tensor Analysis: Spectral Theory and Special Tensors is unique in that it is the first book on these three subject areas: spectral theory of tensors; the theory of special tensors, including nonnegative tensors, positive semidefinite tensors, completely positive tensors, and copositive tensors; and the spectral hypergraph theory via tensors. This book introduces

two-dimensional supersymmetric field theories with emphasis on both linear and non-linear sigma models. Complex differential geometry, in connection with supersymmetry, has played a key role in most developments of the last thirty years in quantum field theory and string theory. Both structures introduce a great deal of rigidity compared to the more general categories of non-supersymmetric theories and real differential geometry, allowing for many general conceptual results and detailed quantitative predictions. Two-dimensional (0,2) supersymmetric quantum field theories provide a natural arena for the fruitful interplay between geometry and quantum field theory. These theories play an important role in string theory and provide generalizations, still to be explored fully, of rich structures such as mirror symmetry. They also have applications to non-perturbative four-dimensional physics, for instance as descriptions of surface defects or low energy dynamics of solitonic strings in four-dimensional supersymmetric theories. The purpose of these lecture notes is to acquaint the reader with these fascinating theories, assuming a background in conformal theory, quantum field theory and differential geometry at the beginning graduate level. In order to investigate the profound relations between structures from complex geometry and field theory the text begins with a thorough examination of the basic structures of (0,2) quantum field theory and conformal field theory. Next, a simple class of Lagrangian theories, the (0,2) Landau-Ginzburg models, are discussed, together with the resulting renormalization group flows, dynamics, and symmetries. After a thorough introduction and examination of (0,2) non-linear sigma models, the text introduces linear sigma models that, in particular, provide a unified treatment of non-linear sigma models and Landau-Ginzburg theories. Many exercises, along with discussions of relevant mathematical notions and important open problems in the field, are included in the text. This book covers original research and the latest advances in symbolic, algebraic and geometric computation; computational methods for differential and difference equations, symbolic-numerical computation; mathematics software design and implementation; and scientific and engineering applications based on features, invited talks, special sessions and contributed papers presented at the 9th (in Fukuoka, Japan in 2009) and 10th (in Beijing China in 2012) Asian Symposium on Computer Mathematics (ASCM). Thirty selected and refereed articles in the book present the conference participants' ideas and views on researching mathematics using computers. This book introduces readers to key ideas and applications of computational algebraic geometry. Beginning with the discovery of Gröbner bases and fueled by the advent of modern computers and the rediscovery of resultants, computational algebraic geometry has grown rapidly in importance. The fact that "crunching equations" is now as easy as "crunching numbers" has had a profound impact in recent years. At the same time, the mathematics used in computational algebraic geometry is unusually elegant and accessible, which makes the subject easy to learn and easy to apply. This book begins with an introduction to Gröbner bases and resultants, then discusses some of the more recent methods for solving systems of polynomial equations. A sampler of possible applications follows, including computer-aided geometric design, complex information systems, integer programming, and algebraic coding theory. The lectures in this book assume no previous acquaintance with the material. This book constitutes the refereed proceedings of the 8th International Conference on Artificial Intelligence and Symbolic Computation, AISC 2006, held in Beijing, China in September 2006. The 18 revised full papers presented together with 4 invited papers were carefully reviewed and selected from 39 submissions. Based on heuristics and mathematical algorithmics, artificial intelligence and symbolic computation are two views and approaches for automating (mathematical) problem solving. The papers address all current aspects in the area of symbolic computing and AI: mathematical foundations, implementations, and applications in industry and academia. The papers are organized in topical sections on artificial intelligence and theorem proving, symbolic computation, constraint satisfaction/solving, and mathematical knowledge management. This book provides a quick access to computational tools for algebraic geometry, the mathematical discipline which handles solution sets of polynomial equations. Originating from a number of intense one week schools taught by the authors, the text is designed so as to provide a step by step introduction which enables the reader to get started with his own computational experiments right away. The authors present the basic concepts and ideas in a compact way. This book contains a collection of articles corresponding to some of the talks delivered at the Foundations of

Computational Mathematics conference held at IMPA in Rio de Janeiro in January 1997. Some ofthe others are published in the December 1996 issue of the Journal of Complexity. Both of these publications were available and distributed at the meeting. Even in this aspect we hope to have achieved a synthesis of the mathematics and computer science cultures as well as of the disciplines. The reaction to the Park City meeting on Mathematics of Numerical Analy sis: Real Number Algorithms which was chaired by Steve Smale and had around 275 participants, was very enthusiastic. At the suggestion of Narendra Karmar mar a lunch time meeting of Felipe Cucker, Arieh Iserles, Narendra Karmarkar, Jim Renegar, Mike Shub and Steve Smale decided to try to hold a periodic meeting entitled "Foundations of Computational Mathematics" and to form an organization with the same name whose primary purpose will be to hold the meeting. This is then the first edition of FoCM as such. It has been organized around a small collection of workshops, namely - Systems of algebraic equations and computational algebraic geometry - Homotopy methods and real machines - Information-based complexity - Numerical linear algebra - Approximation and PDEs - Optimization - Differential equations and dynamical systems - Relations to computer science - Vision and related computational tools There were also twelve plenary speakers. Real-life problems are often quite complicated in form and nature and, for centuries, many different mathematical concepts, ideas and tools have been developed to formulate these problems theoretically and then to solve them either exactly or approximately. This book aims to gather a collection of papers dealing with several different problems arising from many disciplines and some modern mathematical approaches to handle them. In this respect, the book offers a wide overview on many of the current trends in Mathematics as valuable formal techniques in capturing and exploiting the complexity involved in real-world situations. Several researchers, colleagues, friends and students of Professor María Luisa Menéndez have contributed to this volume to pay tribute to her and to recognize the diverse contributions she had made to the fields of Mathematics and Statistics and to the profession in general. She had a sweet and strong personality, and instilled great values and work ethics in her students through her dedication to teaching and research. Even though the academic community lost her prematurely, she would continue to provide inspiration to many students and researchers worldwide through her published work. This carefully prepared manuscript presents elimination theory in weighted projective spaces over arbitrary noetherian commutative base rings. Elimination theory is a classical topic in commutative algebra and algebraic geometry, and it has become of renewed importance recently in the context of applied and computational algebra. This monograph pro Read Write Inc. Fresh Start is a specially adapted literacy programme for all pupils in Years 5, 6 and 7 who are working below National Curriculum level 3. Like Read Write Inc. Phonics for pupils in the early years, the scheme starts by introducing pupils to all the letter sounds through use of the Speed Sounds cards and the green and red flashcards.Pupils progress through these sets of workbooks at their own pace, after they have completed the Introductory module. Modules 1-10 include both fiction and non-fiction texts and cover a range of cross-curricular topics. Practise in writing, spelling, editing and comprehension is provided at every level. This book presents the state-of-the-art in tackling differential equations using advanced methods and software tools of symbolic computation. It focuses on the symbolic-computational aspects of three kinds of fundamental problems in differential equations: transforming the equations, solving the equations, and studying the structure and properties of their solutions. Algorithms in algebraic geometry go hand in hand with software packages that implement them. Together they have established the modern field of computational algebraic geometry which has come to play a major role in both theoretical advances and applications. Over the past fifteen years, several excellent general purpose packages for computations in algebraic geometry have been developed, such as, CoCoA, Singular and Macaulay 2. While these packages evolve continuously, incorporating new mathematical advances, they both motivate and demand the creation of new mathematics and smarter algorithms. This volume reflects the workshop “Software for Algebraic Geometry” held in the week from 23 to 27 October 2006, as the second workshop in the thematic year on Applications of Algebraic Geometry at the IMA. The papers in this volume describe the software packages Bertini, PHClab, Gfan, DEMiCs, SYNAPS, TrIm, Gambit, ApaTools, and the application of Risa/Asir to a conjecture on multiple zeta values. They offer the reader

a broad view of current trends in computational algebraic geometry through software development and applications. This book, dedicated to the memory of Gian-Carlo Rota, is the result of a collaborative effort by his friends, students and admirers. Rota was one of the great thinkers of our times, innovator in both mathematics and phenomenology. I feel moved, yet touched by a sense of sadness, in presenting this volume of work, despite the fear that I may be unworthy of the task that befalls me. Rota, both the scientist and the man, was marked by a generosity that knew no bounds. His ideas opened wide the horizons of fields of research, permitting an astonishing number of students from all over the globe to become enthusiastically involved. The contagious energy with which he demonstrated his tremendous mental capacity always proved fresh and inspiring. Beyond his renown as gifted scientist, what was particularly striking in Gian-Carlo Rota was his ability to appreciate the diverse intellectual capacities of those before him and to adapt his communications accordingly. This human sense, complemented by his acute appreciation of the importance of the individual, acted as a catalyst in bringing forth the very best in each one of his students. Whosoever was fortunate enough to enjoy Gian-Carlo Rota's longstanding friendship was most enriched by the experience, both mathematically and philosophically, and had occasion to appreciate son cote de bon vivant. The book opens with a heartfelt piece by Henry Crapo in which he meticulously pieces together what Gian-Carlo Rota's untimely demise has bequeathed to science. "This book revives and vastly expands the classical theory of resultants and discriminants. Most of the main new results of the book have been published earlier in more than a dozen joint papers of the authors. The book nicely complements these original papers with many examples illustrating both old and new results of the theory."—Mathematical Reviews Algorithms and Theory of Computation Handbook is a comprehensive collection of algorithms and data structures that also covers many theoretical issues. It offers a balanced perspective that reflects the needs of practitioners, including emphasis on applications within discussions on theoretical issues. Chapters include information on finite precision issues as well as discussion of specific algorithms where algorithmic techniques are of special importance, including graph drawing, robotics, forming a VLSI chip, vision and image processing, data compression, and cryptography. The book also presents some advanced topics in combinatorial optimization and parallel/distributed computing. • applications areas where algorithms and data structuring techniques are of special importance • graph drawing • robot algorithms • VLSI layout • vision and image processing algorithms • scheduling • electronic cash • data compression • dynamic graph algorithms • on-line algorithms • multidimensional data structures • cryptography • advanced topics in combinatorial optimization and parallel/distributed computing Provides reader with working knowledge of Mathematica and key aspects of Mathematica symbolic capabilities, the real heart of Mathematica and the ingredient of the Mathematica software system that makes it so unique and powerful Clear organization, complete topic coverage, and an accessible writing style for both novices and experts Website for book with additional materials: http://www/MathematicaGuideBooks.org Accompanying DVD containing all materials as an electronic book with complete, executable Mathematica 5.1 compatible code and programs, rendered color graphics, and animations Numerous well-presented and important papers from the conference are gathered in the proceedings for the purpose of pointing directions for useful future research in diverse areas of mathematics including algebraic geometry, analysis, commutative algebra, complex analysis, discrete mathematics, dynamical systems, number theory and topology. Several papers on computational and applied mathematics such as wavelet analysis, quantum mechanics, piecewise linear modeling, cosmological models of super symmetry, fluid dynamics, interpolation theory, optimization, ergodic theory and games theory are also presented. The idea of mirror symmetry originated in physics, but in recent years, the field of mirror symmetry has exploded onto the mathematical scene. It has inspired many new developments in algebraic and arithmetic geometry, toric geometry, the theory of Riemann surfaces, and infinite-dimensional Lie algebras among others. The developments in physics stimulated the interest of mathematicians in Calabi-Yau varieties. This led to the realization that the time is ripe for mathematicians, armed with many concrete examples and alerted by the mirror symmetry phenomenon, to focus on Calabi-Yau varieties and to test for these special varieties some of the great

outstanding conjectures, e.g., the modularity conjecture for Calabi-Yau threefolds defined over the rationals, the Bloch-Beilinson conjectures, regulator maps of higher algebraic cycles, Picard-Fuchs differential equations, GKZ hypergeometric systems, and others. The articles in this volume report on current developments. The papers are divided roughly into two categories: geometric methods and arithmetic methods. One of the significant outcomes of the workshop is that we are finally beginning to understand the mirror symmetry phenomenon from the arithmetic point of view, namely, in terms of zeta-functions and L-series of mirror pairs of Calabi-Yau threefolds. The book is suitable for researchers interested in mirror symmetry and string theory. This book constitutes the refereed proceedings of the 7th International Conference on Applied Parallel Computing, PARA 2004, held in June 2004. The 118 revised full papers presented together with five invited lectures and 15 contributed talks were carefully reviewed and selected for inclusion in the proceedings. The papers are organized in topical sections. Invariant, or coordinate-free methods provide a natural framework for many geometric questions. Invariant Methods in Discrete and Computational Geometry provides a basic introduction to several aspects of invariant theory, including the supersymmetric algebra, the Grassmann-Cayler algebra, and Chow forms. It also presents a number of current research papers on invariant theory and its applications to problems in geometry, such as automated theorem proving and computer vision. Audience: Researchers studying mathematics, computers and robotics. Algebraic geometry and geometric modeling both deal with curves and surfaces generated by polynomial equations. Algebraic geometry investigates the theoretical properties of polynomial curves and surfaces; geometric modeling uses polynomial, piecewise polynomial, and rational curves and surfaces to build computer models of mechanical components and assemblies for industrial design and manufacture. The NSF sponsored the four-day "Vilnius Workshop on Algebraic Geometry and Geometric Modeling", which brought together some of the top experts in the two research communities to examine a wide range of topics of interest to both fields. This volume is an outgrowth of that workshop. Included are surveys, tutorials, and research papers. In addition, the editors have included a translation of Minding's 1841 paper, "On the determination of the degree of an equations obtained by elimination", which foreshadows the modern application of mixed volumes in algebraic geometry. The volume is suitable for mathematicians, computer scientists, and engineers interested in applications of algebraic geometry to geometric modeling. Systems of polynomial equations can be used to model an astonishing variety of phenomena. This book explores the geometry and algebra of such systems and includes numerous applications. The book begins with elimination theory from Newton to the twenty-first century and then discusses the interaction between algebraic geometry and numerical computations, a subject now called numerical algebraic geometry. The final three chapters discuss applications to geometric modeling, rigidity theory, and chemical reaction networks in detail. Each chapter ends with a section written by a leading expert. Examples in the book include oil wells, HIV infection, phylogenetic models, four-bar mechanisms, border rank, font design, Stewart-Gough platforms, rigidity of edge graphs, Gaussian graphical models, geometric constraint systems, and enzymatic cascades. The reader will encounter geometric objects such as Bézier patches, Cayley-Menger varieties, and toric varieties; and algebraic objects such as resultants, Rees algebras, approximation complexes, matroids, and toric ideals. Two important subthemes that appear in multiple chapters are toric varieties and algebraic statistics. The book also discusses the history of elimination theory, including its near elimination in the middle of the twentieth century. The main goal is to inspire the reader to learn about the topics covered in the book. With this in mind, the book has an extensive bibliography containing over 350 books and papers. Tribute to the vision and legacy of Israel Moiseevich Gel'fand Written by leading mathematicians, these invited papers reflect the unity of mathematics as a whole, with particular emphasis on the many connections among the fields of geometry, physics, and representation theory Topics include conformal field theory, K-theory, noncommutative geometry, gauge theory, representations of infinite-dimensional Lie algebras, and various aspects of the Langlands program This book introduces readers to key ideas and applications of computational algebraic geometry. Beginning with the discovery of Gröbner bases and fueled by the advent of modern computers and the rediscovery of resultants, computational algebraic

geometry has grown rapidly in importance. The fact that "crunching equations" is now as easy as "crunching numbers" has had a profound impact in recent years. At the same time, the mathematics used in computational algebraic geometry is unusually elegant and accessible, which makes the subject easy to learn and easy to apply. This book begins with an introduction to Gröbner bases and resultants, then discusses some of the more recent methods for solving systems of polynomial equations. A sampler of possible applications follows, including computer-aided geometric design, complex information systems, integer programming, and algebraic coding theory. The lectures in this book assume no previous acquaintance with the material. The present volume contains a selection of refereed papers from the MEGA-94 symposium held in Santander, Spain, in April 1994. They cover recent developments in the theory and practice of computation in algebraic geometry and present new applications in science and engineering, particularly computer vision and theory of robotics. The volume will be of interest to researchers working in the areas of computer algebra and symbolic computation as well as to mathematicians and computer scientists interested in gaining access to these topics. This volume contains selected papers presented at the Fourth Asian Symposium on Computer Mathematics. 39 peer-reviewed original contributions together with full papers and extended abstracts by the four invited speakers, G H Gonnet, D Lazard, W McCune, and W-T Wu, cover some of the most recent and significant advances in computer mathematics, including algebraic, symbolic, numeric, and geometric computation, automated mathematical reasoning, mathematical software, and computer-aided geometric design. Researchers, teachers, students, and engineers interested in doing mathematics using computers will find this volume good reading and a valuable reference. This volume contains the proceedings of the AMS Special Sessions on Algorithmic Probability and Combinatories held at DePaul University on October 5-6, 2007 and at the University of British Columbia on October 4-5, 2008. This volume collects cutting-edge research and expository on algorithmic probability and combinatories. It includes contributions by well-established experts and younger researchers who use generating functions, algebraic and probabilistic methods as well as asymptotic analysis on a daily basis. Walks in the quarter-plane and random walks (quantum, rotor and self-avoiding), permutation tableaux, and random permutations are considered. In addition, articles in the volume present a variety of saddle-point and geometric methods for the asymptotic analysis of the coefficients of single-and multivariable generating functions associated with combinatorial objects and discrete random structures. The volume should appeal to pure and applied mathematicians, as well as mathematical physicists; in particular, anyone interested in computational aspects of probability, combinatories and enumeration. Furthermore, the expository or partly expository papers included in this volume should serve as an entry point to this literature not only to experts in other areas, but also to graduate students. Central to this collection of papers are new developments in the general theory of localization of spaces. This field has undergone tremendous change of late and is yielding new insight into the mysteries of classical homotopy theory. The present volume comprises the refereed articles submitted at the Conference on Algebraic Topology held in Sant Feliu de Guíxols, Spain, in June 1994. Several comprehensive articles on general localization clarify the basic tools and give a report on the state of the art in the subject matter. The text is therefore accessible not only to the professional mathematician but also to the advanced student. Computer-Aided Design and Manufacturing (CAD/CAM) is concerned with all aspects of the process of designing, prototyping, manufacturing, inspecting, and maintaining complex geometric objects under computer control. As such, there is a natural synergy between this field and Computational Geometry (CG), which involves the design, analysis, implementation, and testing of efficient algorithms and data representation techniques for geometric entities such as points, polygons, polyhedra, curves, and surfaces. The DIMACS Center (Piscataway, NJ) sponsored a workshop to further promote the interaction between these two fields. Attendees from academia, research laboratories, and industry took part in the invited talks, contributed presentations, and informal discussions. This volume is an outgrowth of that meeting. Topics covered in this volume include geometric modeling, computational topology, computational metrology, geometric constraint solving, part immobilization, geometric aspects of machining, layered manufacturing, and algebraic methods. The book is suitable for graduate students

and researchers interested in geometric and algorithmic aspects of computer-aided design and manufacturing. The three-volume set, LNCS 2667, LNCS 2668, and LNCS 2669, constitutes the refereed proceedings of the International Conference on Computational Science and Its Applications, ICCSA 2003, held in Montreal, Canada, in May 2003. The three volumes present more than 300 papers and span the whole range of computational science from foundational issues in computer science and mathematics to advanced applications in virtually all sciences making use of computational techniques. The proceedings give a unique account of recent results in computational science. An illustration of the many uses of algebraic geometry, highlighting the more recent applications of Groebner bases and resultants. Along the way, the authors provide an introduction to some algebraic objects and techniques more advanced than typically encountered in a first course. The book is accessible to non-specialists and to readers with a diverse range of backgrounds, assuming readers know the material covered in standard undergraduate courses, including abstract algebra. But because the text is intended for beginning graduate students, it does not require graduate algebra, and in particular, does not assume that the reader is familiar with modules. This book summarizes research carried out in workshops of the SAGA project, an Initial Training Network exploring the interplay of Shapes, Algebra, Geometry and Algorithms. Written by a combination of young and experienced researchers, the book introduces new ideas in an established context. Among the central topics are approximate and sparse implicitization and surface parametrization; algebraic tools for geometric computing; algebraic geometry for computer aided design applications and problems with industrial applications. Readers will encounter new methods for the (approximate) transition between the implicit and parametric representation; new algebraic tools for geometric computing; new applications of isogeometric analysis and will gain insight into the emerging research field situated between algebraic geometry and computer aided geometric design. This book constitutes the refereed proceedings of the 10th Panhellenic Conference on Informatics, PCI 2005, held in Volas, Greece, in November 2005. The 83 revised full papers presented were carefully reviewed and selected from 252 submissions. The papers are organized in topical sections on data bases and data mining, algorithms and theoretical foundations, cultural and museum information systems, internet-scale software/information systems, wearable and mobile computing, computer graphics, virtual reality and visualization, AI, machine learning and knowledge bases, languages, text and speech processing, bioinformatics, software engineering, educational technologies, e-business, computer and sensor hardware and architecture, computer security, image and video processing, signal processing and telecommunications, computer and sensor networks.

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