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Direct Methods in the Calculus of Variations **Direct Methods in the Theory of Elliptic Equations** Direct Methods in Control Problems **Direct Methods in the Calculus of Variations The Direct Method in Modern Languages Theory and Practice of Direct Methods in Crystallography** *The Direct Method in Soliton Theory* **Direct Methods for Sparse Matrices** Direct Methods for Stability Analysis of Electric Power Systems **Direct Methods for Sparse Linear Systems** Direct Methods in Circuit Simulation Using Multiprocessors *Direct Methods in the Calculus of Variations* **Direct Methods for Solving Macromolecular Structures Direct Methods The Direct Method of Teaching English to Foreigners Direct Methods for Solving the Boltzmann Equation and Study of Nonequilibrium Flows Direct Methods for Sparse Matrices** Solitons *A First German Book* Stability Theory by Liapunov's Direct Method Direct Methods of Solving Multidimensional Inverse Hyperbolic Problems **Direct Methods in the Theory of Elliptic Equations The Direct Method in German Poetry Esperanto by direct method Direct Method of Determining Cyclical Fluctuations of Economic Data ... Direct Methods Stability by Liapunov's Direct Method with Applications by Joseph L Salle and Solomon Lefschetz Advances in Direct Methods for Materials and Structures Numerical Methods for Grid Equations** Speak Direct Method English *Direct Methods for Limit States in Structures and Materials* **Direct-method Physical Development** Hybrid Systems, Optimal Control and Hybrid Vehicles *Direct Methods for Solving Macromolecular Structures Advances in Optimization and Linear Programming* **Vision Algorithms: Theory and Practice** *Limit State of Materials and Structures* Crash Course in Accounting and Financial Statement Analysis **Input Design for Systems Under Identification Using Indirect and Direct Methods** A Comparison

between "Direct Method" and Grammar "Translation Method". Different Language Teaching Methods

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Seamlessly bridging academic accounting with real-life applications, Crash Course in Accounting and Financial Statement Analysis, Second Edition is the perfect guide to a complete understanding of accounting and financial statement analysis for those with no prior accounting background and those who seek a refresher. With contributions by numerous experts This book is developed for the study of vectorial problems in the calculus of variations. The subject is a very active one and almost half of the book consists of new material. This is a new edition of the earlier book published in 1989 and it is suitable for graduate students. The book has been updated with some new material and examples added. Applications are included. The bilinear, or Hirota's direct, method was invented in the early 1970s as an elementary means of constructing soliton solutions that avoided the use of the heavy machinery of the inverse scattering transform and was successfully used to construct the multisoliton solutions of many new equations. In the 1980s the deeper significance of the tools used in this method - Hirota derivatives and the bilinear form - came to be understood as a key ingredient in Sato's theory and the connections with affine Lie algebras. The main part of this book concerns the more modern version of the method in which solutions are expressed in the form of determinants and pfaffians. While maintaining the original philosophy of using relatively simple mathematics, it has, nevertheless, been influenced by the deeper understanding that came out of the work of the Kyoto school. The book will be essential for all those working in soliton theory. This book of the proceedings of the 1997 NATO

Advanced Study Institute (ASI) on Direct Methods for Solving Macromolecular Structures was assembled from the lecturers' contributions and represents a comprehensive and in-depth overview of crystallographic structure determination methods for macromolecules. While having a focus based on the direct methods, the Institute adopted an inclusive and broad perspective. Thus, both direct and experimental phasing techniques are presented in this book, highlighting their complementarities and synergies. As weil, methodologies spanning the full crystallographic image reconstruction process - from low resolution envelope definition to high resolution atomic refinement- are discussed. The first part of the book introduces the array of tools currently used in structure determination, whether originating from a mathematical, computational or experimental framework. This section of the book displays the variety and ingenuity of old and new phasing approaches developed to solve increasingly complex structures. Some of the contributions focus on recent developments and/or implementations that have given older approaches a new life. A case in point is the re-implementation of Buerger's superposition approach, which is now solving protein structures. Another beautiful example is found in the introduction to the traditional multiple isomorphous replacement approach where new techniques, such as site-directed mutagenesis and the use of inert gases in the preparation of heavy atom derivatives, are described. Equally impressive are the presentations of newer approaches, which take advantage of advances on the experimental front (e. g. In recent years there has been a considerable renewal of interest in the clas sical problems of the calculus of variations, both from the point of view of mathematics and of applications. Some of the most powerful tools for proving existence of minima for such problems are known as direct methods. They are often the only available ones, particularly for vectorial problems. It is the aim of this book to present them. These methods were introduced by Tonelli, following earlier work of Hilbert and Lebesgue. Although there are excellent books on calculus of variations and on direct methods, there are recent important developments which cannot be found in these books; in particular, those dealing with vector valued functions and relaxation of non convex problems. These two last ones are important in appli cations to nonlinear elasticity, optimal design . . . . In these fields the variational methods are particularly effective. Part of the mathematical developments and of the renewal of interest in these methods finds its motivations in nonlinear elasticity. Moreover, one of the recent important contributions to nonlinear analysis has been the study of the

behaviour of nonlinear functionals un der various types of convergence, particularly the weak convergence. Two well studied theories have now been developed, namely f-convergence and compen sated compactness. They both include as a particular case the direct methods of the calculus of variations, but they are also, both, inspired and have as main examples these direct methods. This book provides a comprehensive discussion on the existence and regularity of minima of regular integrals in the calculus of variations and of solutions to elliptic partial differential equations and systems of the second order. While direct methods for the existence of solutions are well known and have been widely used in the last century, the regularity of the minima was always obtained by means of the Euler equation as a part of the general theory of partial differential equations. In this book, using the notion of the quasi-minimum introduced by Giaquinta and the author, the direct methods are extended to the regularity of the minima of functionals in the calculus of variations, and of solutions to partial differential equations. This unified treatment offers a substantial economy in the assumptions, and permits a deeper understanding of the nature of the regularity and singularities of the solutions. The book is essentially self-contained, and requires only a general knowledge of the elements of Lebesgue integration theory. Contents: Semi-Classical Theory; Measurable Functions; Sobolev Spaces; Convexity and Semicontinuity; Quasi-Convex Functionals; Quasi-Minima; HAlder Continuity; First Derivatives; Partial Regularity; Higher Derivatives. Readership: Graduate students, academics and researchers in the field of analysis and differential equations." Learn english 4x faster than the other methods with SPEAK DIRECT METHOD The finite-difference solution of mathematical-physics differential equations is carried out in two stages: 1) the writing of the difference scheme (a differ ence approximation to the differential equation on a grid), 2) the computer solution of the difference equations, which are written in the form of a high order system of linear algebraic equations of special form (ill-conditioned, band-structured). Application of general linear algebra methods is not always appropriate for such systems because of the need to store a large volume of information, as well as because of the large amount of work required by these methods. For the solution of difference equations, special methods have been developed which, in one way or another, take into account special features of the problem, and which allow the solution to be found using less work than via the general methods. This work is an extension of the book Difference M ethod3 for the Solution of Elliptic Equation3 by A. A. Samarskii and V. B.

Andreev which considered a whole set of questions connected with difference approximations, the con struction of difference operators, and estimation of the ~onvergence rate of difference schemes for typical elliptic boundary-value problems. Here we consider only solution methods for difference equations. The book in fact consists of two volumes. In this book, we study theoretical and practical aspects of computing methods for mathematical modelling of nonlinear systems. A number of computing techniques are considered, such as methods of operator approximation with any given accuracy; operator interpolation techniques including a non-Lagrange interpolation; methods of system representation subject to constraints associated with concepts of causality, memory and stationarity; methods of system representation with an accuracy that is the best within a given class of models; methods of covariance matrix estimation; methods for low-rank matrix approximations; hybrid methods based on a combination of iterative procedures and best operator approximation; and methods for information compression and filtering under condition that a filter model should satisfy restrictions associated with causality and different types of memory. As a result, the book represents a blend of new methods in general computational analysis, and specific, but also generic, techniques for study of systems theory ant its particular branches, such as optimal filtering and information compression. Best operator approximation, Non-Lagrange interpolation, Generic Karhunen-Loeve transform Generalised low-rank matrix approximation Optimal data compression Optimal nonlinear filtering This book provides an overview of direct methods such as limit and shakedown analysis, which are intended to do away with the need for cumbersome step-by-step calculations and determine the loading limits of mechanical structures under monotone, cyclic or variable loading with unknown loading history. The respective contributions demonstrate how tremendous advances in numerical methods, especially in optimization, have contributed to the success of direct methods and their practical applicability to engineering problems in structural mechanics, pavement and general soil mechanics, as well as the design of composite materials. The content reflects the outcomes of the workshop “Direct Methods: Methodological Progress and Engineering Applications,” which was offered as a mini-symposium of PCM-CMM 2019, held in Cracow, Poland in September 2019. This new volume provides the information needed to understand the simplex method, the revised simplex method, dual simplex method, and more for solving linear programming problems. Following a logical order, the book first gives a mathematical

model of the linear problem programming and describes the usual assumptions under which the problem is solved. It gives a brief description of classic algorithms for solving linear programming problems as well as some theoretical results. It goes on to explain the definitions and solutions of linear programming problems, outlining the simplest geometric methods and showing how they can be implemented. Practical examples are included along the way. The book concludes with a discussion of multi-criteria decision-making methods. Advances in Optimization and Linear Programming is a highly useful guide to linear programming for professors and students in optimization and linear programming. Direct methods of crystal structure determination are usually associated with techniques in which phases for a set of structure factors are determined from the corresponding experimental amplitudes by probabilistic calcula tions. It is thus implied that such ab initio phase calculations do not require a knowledge of atomic positions, and this basis distinguishes direct methods from other techniques for structure determination. An acceptably wider interpretation of the term direct methods leads to other important applica tions involving, inter alia, the use of heavy atoms, resolution-limited phase data for large molecules, rotation functions, and Fourier series. These topics are discussed in the later chapters of this book. Although some earlier theoretical investigations were made by Harker and Kaspar, direct methods may be considered to have begun around the year 1950. Important landmarks in the development of the subject include the book by Hauptmann and Karle, The Centrosymmetric Crystal (1953), the definitive paper by Karle and Karle in Acta Crystallographica (1966), and the recent (1978) sophisticated program package MULTAN 78 produced mainly by Germain, Main, and Woolfson. Woolfson's book, Direct Methods in Crystallography, was published in 1961, but because of the rapid progress in direct methods, much of it soon became outmoded. It is interesting to note that direct methods nearly came into being many years earlier. Certainly the E2 relationship was used implicitly by Lonsdale in 1928 in determining the crystal structure of hexamethylbenzene. The subject of sparse matrices has its root in such diverse fields as management science, power systems analysis, surveying, circuit theory, and structural analysis. Efficient use of sparsity is a key to solving large problems in many fields. This second edition is a complete rewrite of the first edition published 30 years ago. Much has changed since that time. Problems have grown greatly in size and complexity; nearly all examples in the first edition were of order less than 5,000 in the first edition, and are often more than a

million in the second edition. Computer architectures are now much more complex, requiring new ways of adapting algorithms to parallel environments with memory hierarchies. Because the area is such an important one to all of computational science and engineering, a huge amount of research has been done in the last 30 years, some of it by the authors themselves. This new research is integrated into the text with a clear explanation of the underlying mathematics and algorithms. New research that is described includes new techniques for scaling and error control, new orderings, new combinatorial techniques for partitioning both symmetric and unsymmetric problems, and a detailed description of the multifrontal approach to solving systems that was pioneered by the research of the authors and colleagues. This includes a discussion of techniques for exploiting parallel architectures and new work for indefinite and unsymmetric systems. Various general techniques have been developed for control and systems problems, many of which involve indirect methods. Because these indirect methods are not always effective, alternative approaches using direct methods are of particular interest and relevance given the advances of computing in recent years. The focus of this book, unique in the literature, is on direct methods, which are concerned with finding actual solutions to problems in control and systems, often algorithmic in nature. Throughout the work, deterministic and stochastic problems are examined from a unified perspective and with considerable rigor. Emphasis is placed on the theoretical basis of the methods and their potential utility in a broad range of control and systems problems. The book is an excellent reference for graduate students, researchers, applied mathematicians, and control engineers and may be used as a textbook for a graduate course or seminar on direct methods in control. The first part of the book introduces the array of tools currently in use in structure determination, originating from mathematical, computational and experimental approaches. It displays the variety and ingenuity of old and new phasing approaches developed to solve increasingly complex structures. Some of the papers focus on recent developments that have given older methods a new lease of life. Equally impressive are the presentations of newer approaches which take advantage of recent experimental, mathematical and computational advances. The second part of the book focuses on applications to macromolecular structures, displaying the incredible progress that has been achieved in recent years. The book concludes with a series of presentations on the latest developments, providing a view of the newest phasing methodologies. It offers the promise of many more achievements yet to come. Knowing the safety factor for limit

states such as plastic collapse, low cycle fatigue or ratcheting is always a major design consideration for civil and mechanical engineering structures that are subjected to loads. Direct methods of limit or shakedown analysis that proceed to directly find the limit states offer a better alternative than exact time-stepping calculations as, on one hand, an exact loading history is scarcely known, and on the other they are much less time-consuming. This book presents the state of the art on various topics concerning these methods, such as theoretical advances in limit and shakedown analysis, the development of relevant algorithms and computational procedures, sophisticated modeling of inelastic material behavior like hardening, non-associated flow rules, material damage and fatigue, contact and friction, homogenization and composites. This book constitutes the thoroughly refereed post-workshop proceedings of the International Workshop on Vision Algorithms held in Corfu, Greece in September 1999 in conjunction with ICCV'99. The 15 revised full papers presented were carefully reviewed and selected from 65 submissions; each paper is complemented by a brief transcription of the discussion that followed its presentation. Also included are two invited contributions and two expert reviews as well as a panel discussion. The volume spans the whole range of algorithms for geometric vision. The authors and volume editors succeeded in providing added value beyond a mere collection of papers and made the volume a state-of-the-art survey of their field. The sparse backslash book. Everything you wanted to know but never dared to ask about modern direct linear solvers. Chen Greif, Assistant Professor, Department of Computer Science, University of British Columbia.Overall, the book is magnificent. It fills a long-felt need for an accessible textbook on modern sparse direct methods. Its choice of scope is excellent John Gilbert, Professor, Department of Computer Science, University of California, Santa Barbara.Computational scientists often encounter problems requiring the solution of sparse systems of linear equations. Attacking these problems efficiently requires an in-depth knowledge of the underlying theory, algorithms, and data structures found in sparse matrix software libraries. Here, Davis presents the fundamentals of sparse matrix algorithms to provide the requisite background. The book includes CSparse, a concise downloadable sparse matrix package that illustrates the algorithms and theorems presented in the book and equips readers with the tools necessary to understand larger and more complex software packages.With a strong emphasis on MATLAB and the C programming language, Direct Methods for Sparse Linear Systems equips

readers with the working knowledge required to use sparse solver packages and write code to interface applications to those packages. The book also explains how MATLAB performs its sparse matrix computations.Audience This invaluable book is essential to computational scientists and software developers who want to understand the theory and algorithms behind modern techniques used to solve large sparse linear systems. The book also serves as an excellent practical resource for students with an interest in combinatorial scientific computing.Preface; Chapter 1: Introduction; Chapter 2: Basic algorithms; Chapter 3: Solving triangular systems; Chapter 4: Cholesky factorization; Chapter 5: Orthogonal methods; Chapter 6: LU factorization; Chapter 7: Fill-reducing orderings; Chapter 8: Solving sparse linear systems; Chapter 9: CSparse; Chapter 10: Sparse matrices in MATLAB; Appendix: Basics of the C programming language; Bibliography; Index. Seminar paper from the year 2017 in the subject English - Pedagogy, Didactics, Literature Studies, grade: 82%, , language: English, abstract: Two methods of teaching foreign languages, the “Direct Method” and the “Grammar Translation Method” are described and compared. The underlying principles with main focus on acquisition of communicative skills and grammatical knowledge respectively are illustrated. Looking at possible results of either method we find that there is no gradual difference between them in the sense of better or worse, but that both have completely different targets. The suggestion is made to combine different methods in order to achieve multiple goals and to vary the emphasis according to individual goals. The most ancient and probably most fundamental controversy in language teaching is the one between “Direct Method” and “Grammar Translation Method”. Both of these have totally different underlying approaches. For interested educational stakeholders or educators, there are two important questions, they should think of before looking for an appropriate method: What do I want the students to achieve? How can the learners reach this goal? One can think of different goals which should be reached by teaching a language and every teacher will want to cover most of them in their teaching. The emphasis however is very divers between the different approaches that have been developed over the years. And the most apparent difference, a completely different idea of how to teach language shows up between the two mentioned methods and their approaches respectively. This is why it is so interesting and exciting to compare these two methods and this is why I will try to tackle that task in this paper. The first and main goal of teaching a language obviously is teaching the language. But here rises already the first question: What is the

language that we want the learners to learn? Are we talking about skills in oral or written language? Is our focus more on active or passive language i.e. on speaking and writing or listening and reading respectively? Are we concerned about correctness or fluency? Does correctness mean formulating grammatically correct sentences or texts, does it refer to perfect pronunciation and intonation, are we talking about style aptly adapted to the contextual situation? And does fluency have to do with the speed of writing or speaking, with the ability to develop own ideas and own formulations while speaking or writing rather than using memorized phrases? Or do we want the learners to know about the language, understanding its structure, its roots, its development? Ne?as' book Direct Methods in the Theory of Elliptic Equations, published 1967 in French, has become a standard reference for the mathematical theory of linear elliptic equations and systems. This English edition, translated by G. Tronel and A. Kufner, presents Ne?as' work essentially in the form it was published in 1967. It gives a timeless and in some sense definitive treatment of a number issues in variational methods for elliptic systems and higher order equations. The text is recommended to graduate students of partial differential equations, postdoctoral associates in Analysis, and scientists working with linear elliptic systems. In fact, any researcher using the theory of elliptic systems will benefit from having the book in his library. The volume gives a self-contained presentation of the elliptic theory based on the "direct method", also known as the variational method. Due to its universality and close connections to numerical approximations, the variational method has become one of the most important approaches to the elliptic theory. The method does not rely on the maximum principle or other special properties of the scalar second order elliptic equations, and it is ideally suited for handling systems of equations of arbitrary order. The prototypical examples of equations covered by the theory are, in addition to the standard Laplace equation, Lame's system of linear elasticity and the biharmonic equation (both with variable coefficients, of course). General ellipticity conditions are discussed and most of the natural boundary condition is covered. The necessary foundations of the function space theory are explained along the way, in an arguably optimal manner. The standard boundary regularity requirement on the domains is the Lipschitz continuity of the boundary, which "when going beyond the scalar equations of second order" turns out to be a very natural class. These choices reflect the author's opinion that the Lame system and the biharmonic equations are just as important as the Laplace equation, and that the class of the domains with

the Lipschitz continuous boundary (as opposed to smooth domains) is the most natural class of domains to consider in connection with these equations and their applications. Ne?as' book Direct Methods in the Theory of Elliptic Equations, published 1967 in French, has become a standard reference for the mathematical theory of linear elliptic equations and systems. This English edition, translated by G. Tronel and A. Kufner, presents Ne?as' work essentially in the form it was published in 1967. It gives a timeless and in some sense definitive treatment of a number issues in variational methods for elliptic systems and higher order equations. The text is recommended to graduate students of partial differential equations, postdoctoral associates in Analysis, and scientists working with linear elliptic systems. In fact, any researcher using the theory of elliptic systems will benefit from having the book in his library. The volume gives a self-contained presentation of the elliptic theory based on the "direct method", also known as the variational method. Due to its universality and close connections to numerical approximations, the variational method has become one of the most important approaches to the elliptic theory. The method does not rely on the maximum principle or other special properties of the scalar second order elliptic equations, and it is ideally suited for handling systems of equations of arbitrary order. The prototypical examples of equations covered by the theory are, in addition to the standard Laplace equation, Lame's system of linear elasticity and the biharmonic equation (both with variable coefficients, of course). General ellipticity conditions are discussed and most of the natural boundary condition is covered. The necessary foundations of the function space theory are explained along the way, in an arguably optimal manner. The standard boundary regularity requirement on the domains is the Lipschitz continuity of the boundary, which "when going beyond the scalar equations of second order" turns out to be a very natural class. These choices reflect the author's opinion that the Lame system and the biharmonic equations are just as important as the Laplace equation, and that the class of the domains with the Lipschitz continuous boundary (as opposed to smooth domains) is the most natural class of domains to consider in connection with these equations and their applications. This book offers a state-of-the-art overview and includes recent developments of various direct computational analysis methods. It is based on recently developed and widely employed numerical procedures for limit and shakedown analysis of structures and their extensions to a wide range of physical problems relevant to the design of materials and structural components. The book can be used as a

complementary text for advanced academic courses on computational mechanics, structural mechanics, soil mechanics and computational plasticity and it can be used a research text. This book is concerned with the methods of solving the nonlinear Boltz mann equation and of investigating its possibilities for describing some aerodynamic and physical problems. This monograph is a sequel to the book 'Numerical direct solutions of the kinetic Boltzmann equation' (in Russian) which was written with F. G. Tcheremissine and published by the Computing Center of the Russian Academy of Sciences some years ago. The main purposes of these two books are almost similar, namely, the study of nonequilibrium gas flows on the basis of direct integration of the kinetic equations. Nevertheless, there are some new aspects in the way this topic is treated in the present monograph. In particular, attention is paid to the advantages of the Boltzmann equation as a tool for considering nonequi librium, nonlinear processes. New fields of application of the Boltzmann equation are also described. Solutions of some problems are obtained with higher accuracy. Numerical procedures, such as parallel computing, are in vestigated for the first time. The structure and the contents of the present book have some com mon features with the monograph mentioned above, although there are new issues concerning the mathematical apparatus developed so that the Boltzmann equation can be applied for new physical problems. Because of this some chapters have been rewritten and checked again and some new chapters have been added. This monograph is a collective work. The names appear ing on the front cover are those of the people who worked on every chapter. But the contributions of others were also very important: C. Risito for Chapters I, II and IV, K. Peiffer for III, IV, VI, IX R. J. Ballieu for I and IX, Dang Chau Phien for VI and IX, J. L. Corne for VII and VIII. The idea of writing this book originated in a seminar held at the University of Louvain during the academic year 1971-72. Two years later, a first draft was completed. However, it was unsatisfactory mainly because it was ex ce~sively abstract and lacked examples. It was then decided to write it again, taking advantage of -some remarks of the students to whom it had been partly addressed. The actual text is this second version. The subject matter is stability theory in the general setting of ordinary differential equations using what is known as Liapunov's direct or second method. We concentrate our efforts on this method, not because we underrate those which appear more powerful in some circumstances, but because it is important enough, along with its modern developments, to justify the writing of an up-to-date monograph. Also excellent books exist concerning the other

methods, as for example R. Bellman [1953] and W. A. Coppel [1965]. Learn how to implement BCU methods for fast direct stabilityassessments of electric power systems Electric power providers around the world rely on stabilityanalysis programs to help ensure uninterrupted service to theircustomers. These programs are typically based on step-by-stepnumerical integrations of power system stability models to simulatesystem dynamic behaviors. Unfortunately, this offline practice isinadequate to deal with current operating environments. For years,direct methods have held the promise of providing real-timestability assessments; however, these methods have presentedseveral challenges and limitations. This book addresses these challenges and limitations with theBCU methods developed by author Hsiao-Dong Chiang. To date, BCUmethods have been adopted by twelve major utility companies in Asiaand North America. In addition, BCU methods are the only directmethods adopted by the Electric Power Research Institute in itslatest version of DIRECT 4.0. Everything you need to take full advantage of BCU methods isprovided, including: Theoretical foundations of direct methods Theoretical foundations of energy functions BCU methods and their theoretical foundations Group-based BCU method and its applications Numerical studies on industrial models and data Armed with a solid foundation in the underlying theory of directmethods, energy functions, and BCU methods, you'll discover how toefficiently solve complex practical problems in stability analysis.Most chapters begin with an introduction and end with concludingremarks, making it easy for you to implement these tested andproven methods that will help you avoid costly and dangerous poweroutages. This book provides an overview of direct methods such as limit and shakedown analysis, which are intended to do away with the need for cumbersome step-by-step calculations and determine the loading limits of mechanical structures under monotone, cyclic or variable loading with unknown loading history. The respective contributions demonstrate how tremendous advances in numerical methods, especially in optimization, have contributed to the success of direct methods and their practical applicability to engineering problems in structural mechanics, pavement and general soil mechanics, as well as the design of composite materials. The content reflects the outcomes of the workshop “Direct Methods: Methodological Progress and Engineering Applications,” which was offered as a mini-symposium of PCM-CMM 2019, held in Cracow, Poland in September 2019. This book assembles new methods showing the automotive engineer for the first time how hybrid vehicle configurations can be modeled as systems with discrete

and continuous controls. These hybrid systems describe naturally and compactly the networks of embedded systems which use elements such as integrators, hysteresis, state-machines and logical rules to describe the evolution of continuous and discrete dynamics and arise inevitably when modeling hybrid electric vehicles. They can throw light on systems which may otherwise be too complex or recondite. Hybrid Systems, Optimal Control and Hybrid Vehicles shows the reader how to formulate and solve control problems which satisfy multiple objectives which may be arbitrary and complex with contradictory influences on fuel consumption, emissions and drivability. The text introduces industrial engineers, postgraduates and researchers to the theory of hybrid optimal control problems. A series of novel algorithmic developments provides tools for solving engineering problems of growing complexity in the field of hybrid vehicles. Important topics of real relevance rarely found in text books and research publications—switching costs, sensitivity of discrete decisions and there impact on fuel savings, etc.—are discussed and supported with practical applications. These demonstrate the contribution of optimal hybrid control in predictive energy management, advanced powertrain calibration, and the optimization of vehicle configuration with respect to fuel economy, lowest emissions and smoothest drivability. Numerical issues such as computing resources, simplifications and stability are treated to enable readers to assess such complex systems. To help industrial engineers and managers with project decision-making, solutions for many important problems in hybrid vehicle control are provided in terms of requirements, benefits and risks. To determine the carrying capacity of a structure or a structural element susceptible to operate beyond the elastic limit is an important task in many situations of both mechanical and civil engineering. The so-called “direct methods” play an increasing role due to the fact that they allow rapid access to the request information in mathematically constructive manners. They embrace Limit Analysis, the most developed approach now widely used, and Shakedown Analysis, a powerful extension to the variable repeated loads potentially more economical than step-by-step inelastic analysis. This book is the outcome of a workshop held at the University of Sciences and Technology of Lille. The individual contributions stem from the areas of new numerical developments rendering this methods more attractive for industrial design, extension of the general methodology to new horizons, probabilistic approaches and concrete technological applications. The authors consider dynamic types of inverse problems in which the additional information is

given by the trace of the direct problem on a (usually time-like) surface of the domain. They discuss theoretical and numerical background of the finite-difference scheme inversion, the linearization method, the method of Gel'fand-Levitan-Krein, the boundary control method, and the projection methodand prove theorems of convergence, conditional stability, and other properties of the mentioned methods. Originally published in 1946, this book presents Eliza Marian Butler's inaugural lecture upon becoming Schröder Professor of German at Cambridge University.