

Elements Parametric Design Robert Woodbury

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Elements of Parametric Design by Robert Woodbury

Elements of parametric design – Woodbury. Daniel Davis – 11 September 2010. Robert Woodbury was studying parametric design before it even had a name – in 1990 Woodbury called it variational geometry and it was only later that ‘ parametric design ’ stuck. Many of the early pioneers of parametric design have gone on to do other things – or nothing at all – but Woodbury has defined his career by studying parametric design and in particular, how designers use parametric software.

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Elements of Parametric Design | MIT Architecture

This book does a great job of explaining parametric modeling and its potential and current uses. The author speaks honestly about how current and future designers can/will/may use programming, geometry and math to create and solve problems. He does a great job of breaking this down.

Elements of Parametric Design: Woodbury, Robert ...

This website provides design patterns to help you develop your personal craft of parametric design. It is companion to the book Elements of Parametric Design by Robert Woodbury. I gratefully acknowledge the support of the Canadian Natural Science and Engineering Research Council; Bentley Systems, Incorporated; MITACS Accelerate; the Networks of ...

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Driven by new computer and digital fabrication tools, the architectural designs that are built are pushing boundaries of form, customization and construction. Pushed by practices wanting (and needing) to produce novelty, computer-aided design systems are increasingly parametric, that is, they represent designs that change with their input data.

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Parametric design is an approach to the computational design process that is based on algorithmic thinking (Woodbury 2010). Parametric design uses the capabilities of parametric modelling that...

"This book helps designers realize the potential of the parameter in their work. It combines the basic ideas of parametric systems with equally basic ideas from both geometry and computer programming. It uses design patterns as its main tool. A pattern is a generic solution to a shared problem. Using patterns to think and work will help designers master the new complexity imposed on them by parametric modeling. This book explains how to think, model and conceive complex parametric designs. Through design patterns and many examples, it shows designers how to lift their knowledge and skill out of the CAD toolbox into higher levels of design thinking and action."--Back cover.

"This book helps designers realize the potential of the parameter in their work. It combines the basic ideas of parametric systems with equally basic ideas from both geometry and computer programming. It uses design patterns as its main tool. A pattern is a generic solution to a shared problem. Using patterns to think and work will help designers master the new complexity imposed on them by parametric modeling. This book explains how to think, model and conceive complex parametric designs. Through design patterns and many examples, it shows designers how to lift their knowledge and skill out of the CAD toolbox into higher levels of design thinking and action."--Back cover.

Architects use CAD to help them visualize their ideas. Parametric design is a fast-growing development of CAD that lets architects and designers specify the key parameters of their model and make changes interactively. Whenever changes are made the rest of the model updates automatically. Through a detailed description of various parametric, generative and algorithmic techniques, this book provides a practical guide to generating geometric and topological solutions for various situations, including explicit step-by-step tutorials. While the techniques and algorithms can be generalized to suit to any parametric environment, the book illustrates its concepts using the scripting languages of one of the most powerful 3D visualization and animation design software systems (Autodesk 3ds Max MAXScript), one of the most popular open-source Java-based scripting environments (Processing), and a brand new language specifically tailored for parametric and generative design (Autodesk DesignScript). This clear, accessible book will have a wide appeal to students and practitioners who would like to experiment with parametric techniques.

Smartgeometry (SG) is a key influence on the architectural community who explore creative computational methods for the design of buildings. An informal international network of practitioners and researchers, the group meets annually to experiment with new technologies and collaborate to develop digital design techniques. When SG was founded in 2001 by London-based architects and friends Hugh Whitehead (Foster + Partners), J Parrish (AECOM) and Lars Hesselgren (PLP), there was little in the way of parametric tools for architecture. SG was founded to encourage the development, discussion and experimentation of digital design techniques driven by design intent rather than on construction specifications. SG calls for a re-consideration of the design process, where the creation of computational mechanisms become an integral part of designing – not a task done prior to or separate from the process. In the early years of the workshops this need for new ways of design thinking led to the development of Bentley's Generative Components software. In recent years, the ecology of these design environments has diversified to

include multiple software platforms, as well as innovative fabrication techniques and interactive environments. SG has grown accordingly from a handful of experts to an international network of designers who are defining the future of design. Founded by digital pioneers, it creates the algorithmic designers of the future. Inside Smartgeometry can be seen as a retroactive manifesto for SG, examining and contextualising the work of the SG community: the digital spaces, prototypes and buildings designed using bespoke tools created in response to architectural ideas. From interactive crowd-sourcing tools to responsive agent-based systems to complex digitally fabricated structures, it explores more than a decade of advances that have been influential for architecture. Through 23 original texts including reflections by the founders, and key contributors such as Robert Aish, Martin Bechthold, Mark Burry, Chris Williams and Robert Woodbury, the book offers a critical state of the art of computational design for architecture. Many international design and engineering firms have participated in SG and the book includes chapters by practitioners from offices such as CASE, Design2Production, Foster + Partners, Grimshaw, Populous and SOM.

Geometric Computation: Foundations for Design describes the mathematical and computational concepts that are central to the practical application of design computation in a manner tailored to the visual designer. Uniquely pairing key topics in code and geometry, this book develops the two key faculties required by designers that seek to integrate computation into their creative practice: an understanding of the structure of code in object-oriented programming, and a proficiency in the fundamental geometric constructs that underlie much of the computational media in visual design.

"Computational Design Thinking, " AD Reader Edited by Achim Menges and Sean Ahlquist The current transition from Computer Aided Design (CAD) to Computational Design in architecture represents a profound shift in design thinking and methods. Representation is being replaced by simulation, and the crafting of objects is moving towards the generation of integrated systems through designer-authored computational processes. While there is a particular history of such an approach in architecture, its relative newness requires the continued progression of novel modes of design thinking for the architect of the 21st century. This AD Reader establishes a foundation for such thinking. It includes multifaceted reflections and speculations on the profound influence of computational paradigms on architecture. It presents relevant principles from the domains of mathematics and computer science, developmental and evolutionary biology, system science and philosophy, establishing a discourse for computational design thinking in architecture. Rather than a merely technical approach, the book will discuss essential intellectual concepts that are fundamental not only for a discourse on computational design but also for its practice. This anthology provides a unique collection of seminal texts by authors, who have either provided a significant starting point through which a computational approach to design has been pursued or have played a considerable role in shaping the field. An important aspect of this book is the manner in which adjacent fields and historical texts are connected. Both the source of original inspiration and scientific thought are presented alongside contemporary writings on the continually evolving computational design discourse. Emerging from the field of science, principally the subjects of morphogenesis, evolution and mathematics, selected texts provide a historical basis for a reconfigured mindset of processes that generate, arrange and describe form.

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Juxtaposed against more contemporary statements regarding the influence of computation on design thinking, the book offers advancements of fundamental texts to the particular purpose of establishing novel thought processes for architecture, theoretically and practically. The first reader to provide an effective framework for computational thinking in design. Includes classic texts by Johan W. von Goethe, D'Arcy Thompson, Ernst Mayr, Ludwig von Bertalanffy, Gordan Pask, Christopher Alexander, John H. Holland, Nicholas Negroponte, William Mitchell, Peter J. Bentley & David W. Corne, Sanford Kwinter, John Frazer, Kostis Terzidis, Michael Weinstock and Achim Menges Features new writing by: Mark Burry, Jane Burry, Manuel DeLanda and Peter Trummer.

Named a Notable Book in the 21st Annual Best of Computing list by the ACM! Robert Sedgewick and Kevin Wayne ' s Computer Science: An Interdisciplinary Approach is the ideal modern introduction to computer science with Java programming for both students and professionals. Taking a broad, applications-based approach, Sedgewick and Wayne teach through important examples from science, mathematics, engineering, finance, and commercial computing. The book demystifies computation, explains its intellectual underpinnings, and covers the essential elements of programming and computational problem solving in today ' s environments. The authors begin by introducing basic programming elements such as variables, conditionals, loops, arrays, and I/O. Next, they turn to functions, introducing key modular programming concepts, including components and reuse. They present a modern introduction to object-oriented programming, covering current programming paradigms and approaches to data abstraction. Building on this foundation, Sedgewick and Wayne widen their focus to the broader discipline of computer science. They introduce classical sorting and searching algorithms, fundamental data structures and their application, and scientific techniques for assessing an implementation ' s performance. Using abstract models, readers learn to answer basic questions about computation, gaining insight for practical application. Finally, the authors show how machine architecture links the theory of computing to real computers, and to the field ' s history and evolution. For each concept, the authors present all the information readers need to build confidence, together with examples that solve intriguing problems. Each chapter contains question-and-answer sections, self-study drills, and challenging problems that demand creative solutions. Companion web site (introcs.cs.princeton.edu/java) contains Extensive supplementary information, including suggested approaches to programming assignments, checklists, and FAQs Graphics and sound libraries Links to program code and test data Solutions to selected exercises Chapter summaries Detailed instructions for installing a Java programming environment Detailed problem sets and projects Companion 20-part series of video lectures is available at informit.com/title/9780134493831

Based on course-tested material, this rigorous yet accessible graduate textbook covers both fundamental and advanced optimization theory and algorithms. It covers a wide range of numerical methods and topics, including both gradient-based and gradient-free algorithms, multidisciplinary design optimization, and uncertainty, with instruction on how to determine which algorithm should be used for a given application. It also provides an overview of models and how to prepare them for use with numerical optimization, including derivative computation. Over 400 high-quality visualizations and numerous examples facilitate understanding of the theory, and practical tips address common issues encountered in practical engineering design

optimization and how to address them. Numerous end-of-chapter homework problems, progressing in difficulty, help put knowledge into practice. Accompanied online by a solutions manual for instructors and source code for problems, this is ideal for a one- or two-semester graduate course on optimization in aerospace, civil, mechanical, electrical, and chemical engineering departments.

This Fourth Edition introduces the latest theory and applications in optimization. It emphasizes constrained optimization, beginning with a substantial treatment of linear programming and then proceeding to convex analysis, network flows, integer programming, quadratic programming, and convex optimization. Readers will discover a host of practical business applications as well as non-business applications. Topics are clearly developed with many numerical examples worked out in detail. Specific examples and concrete algorithms precede more abstract topics. With its focus on solving practical problems, the book features free C programs to implement the major algorithms covered, including the two-phase simplex method, primal-dual simplex method, path-following interior-point method, and homogeneous self-dual methods. In addition, the author provides online JAVA applets that illustrate various pivot rules and variants of the simplex method, both for linear programming and for network flows. These C programs and JAVA tools can be found on the book's website. The website also includes new online instructional tools and exercises.

The production of architecture, both intellectually and physically, is on the brink of a fundamental change. Computational design enables architects to integrate ever more multifaceted and complex design information, while the industrial logics of conventional building construction are eroding rapidly in a context of increasingly ubiquitous computer-controlled manufacturing and fabrication. A novel convergence of computation and materialisation is about to emerge, bringing the virtual process of design and the physical realisation of architecture much closer together, more so than ever before. Computation provides a powerful agency for both informing the design process through specific material behaviour and characteristics, and in turn informing the organisation of matter and material across multiple scales based on feedback from the environment. Computational design and integrated materialisation processes allow for uncovering the inherent morphogenetic potential of materials and thus are opening up a largely uncharted field of possibilities for the way the built environment in the 21st century is conceived and produced. In order to effectively introduce and outline the enabling power of computational design along with its inherent relationship to a biological paradigm, this publication looks at formation and materialisation in nature, integrative computational design, and engineering and manufacturing integration. Architectural contributors include: Cristiano Cecatto, Neri Oxman, Skylar Tibbits and Michael Weinstock. A scientific perspective by Philip Ball and J Scott Turner. Features: Buro Happold's SMART group, DiniTech, Foster + Partners' Specialist Modelling Group, the Freeform Construction group and Stuttgart University's Institute for Computational Design.

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