

TIMBER GRIDSHIELDS

Architecture, structure and craft

JOHN CHILTON
AND GABRIEL TANG



Timber Gridshells Architecture Structure And Craft

Marie Frier Hvejsel, Paulo J.S. Cruz



Timber Gridshells Architecture Structure And Craft:

Timber Gridshells John Chilton, Gabriel Tang, 2016-11-10 Throughout history people have constructed simple timber lattice shelters such as the tepee or yurt covered with animal skins leaves grasses and woven fabrics Over the last fifty years more sophisticated webs of wood have emerged with timber gridshells in particular becoming a structurally expressive form of architecture Recent developments in digital design 3 D modelling software timber fabrication technologies as well as trends towards low carbon construction have further reinforced architects interest in the use of lightweight timber grids and lattice structures This timely book charts the origin and evolution of the timber gridshell and its relation to timber lattice architecture Drawing on a range of international case studies the authors trace the effect advances in technology have had on design and construction in this field providing a clear understanding of the structure morphology design process and construction technology and examining both the application and constraints of timber gridshells in architectural design Timber Gridshells is a highly illustrated up to date resource which provides detailed answers and inspires new ideas As such it is essential reading for students of architecture as well as professional architects

Timber Gridshells John Chilton, Gabriel Tang, 2016-11-10 Throughout history people have constructed simple timber lattice shelters such as the tepee or yurt covered with animal skins leaves grasses and woven fabrics Over the last fifty years more sophisticated webs of wood have emerged with timber gridshells in particular becoming a structurally expressive form of architecture Recent developments in digital design 3 D modelling software timber fabrication technologies as well as trends towards low carbon construction have further reinforced architects interest in the use of lightweight timber grids and lattice structures This timely book charts the origin and evolution of the timber gridshell and its relation to timber lattice architecture Drawing on a range of international case studies the authors trace the effect advances in technology have had on design and construction in this field providing a clear understanding of the structure morphology design process and construction technology and examining both the application and constraints of timber gridshells in architectural design Timber Gridshells is a highly illustrated up to date resource which provides detailed answers and inspires new ideas As such it is essential reading for students of architecture as well as professional architects

Structural Design and Optimization of Lifting Self-forming GFRP Elastic Gridshells based on Machine Learning Soheila Kookalani, Hamidreza Alavi, Farzad Pour Rahimian, 2025-08-26 Structural Design and Optimization of Lifting Self forming GFRP Elastic Gridshells Based on Machine Learning presents the algorithms of machine learning ML that can be used for the structural design and optimization of glass fiber reinforced polymer GFRP elastic gridshells including linear regression ridge regression K nearest neighbors decision tree random forest AdaBoost XGBoost artificial neural network support vector machine SVM and six enhanced forms of SVM It also introduces interpretable ML approaches including partial dependence plot accumulated local effects and SHaply additive exPlanations SHAP Also several methods for developing ML algorithms including K fold cross validation CV Taguchi a technique for order

preference by similarity to ideal solution TOPSIS and multi objective particle swarm optimization MOPSO are proposed These algorithms are implemented to improve the applications of gridshell structures using a comprehensive representation of ML models This research introduces novel frameworks for shape prediction form finding structural performance assessment and shape optimization of lifting self forming GFRP elastic gridshells using ML methods This book will be of interest to researchers and academics interested in advanced design methods and ML technology in architecture engineering and construction fields *Digital Wood Design* Fabio Bianconi,Marco Filippucci,2019-02-24 This book explores various digital representation strategies that could change the future of wooden architectures by blending tradition and innovation Composed of 61 chapters written by 153 authors hailing from 5 continents 24 countries and 69 research centers it addresses advanced digital modeling with a particular focus on solutions involving generative models and dynamic value inherent to the relation between knowing how to draw and how to build Thanks to the potential of computing areas like parametric design and digital manufacturing are opening exciting new avenues for the future of construction The book s chapters are divided into five sections that connect digital wood design to integrated approaches and generative design to model synthesis and morphological comprehension to lessons learned from nature and material explorations to constructive wisdom and implementation related challenges and to parametric transfigurations and morphological optimizations [Advances in Architectural Geometry 2023](#) Kathrin Dörfler,Jan Knippers,Achim Menges,Stefana Parascho,Helmut Pottmann,Thomas Wortmann,2023-10-04 This book contains 34 technical papers presented at the Advances in Architectural Geometry Conference held in Stuttgart 2023 Modern geometric computing increasingly plays a role in modeling environments and processing sensing information providing a variety of tools for the efficient design analysis and manufacturing of complex shapes The research area of architectural geometry AG has emerged at the common border of architecture applied geometry computational design mathematics and manufacturing This book presents the state of the art of research in AG

Structures and Architecture. A Viable Urban Perspective? Marie Frier Hvejsel,Paulo J.S. Cruz,2022-07-08 Structures and Architecture A Viable Urban Perspective contains extended abstracts of the research papers and prototype submissions presented at the Fifth International Conference on Structures and Architecture ICSA2022 Aalborg Denmark 6 8 July 2022 The book 578 pages also includes a USB with the full texts of the papers 1448 pages The contributions on creative and scientific aspects in the conception and construction of structures as architecture and on the role of advanced digital industrial and craft based technologies in this matter represent a critical blend of scientific technical and practical novelties in both fields Hence as part of the proceedings series Structures and Architecture the volume adds to a continuous exploration and development of the synergetic potentials of the fields of Structures and Architecture With each volume further challenging the conditions problems and potentials related to the art practice and theory of teaching researching designing and building structures as vehicles towards a viable architecture of the urban environment The volumes of the

series appear once every three years in tandem with the conferences organized by the International Association of Structures and Architecture and are intended for a global readership of researchers practitioners and students including architects structural and construction engineers builders and building consultants constructors material suppliers planners urban designers anthropologists economists sociologists artists product manufacturers and other professionals involved in the design and realization of architectural structural and infrastructural projects *Structural Design of Lightweight*

Architecture Joshua Schultz,Christian Stutzki,2026-01-22 This survey of lightweight specialty structures provides in depth case studies supplemented with technical guidance and an overview of fundamental theories Drawing on almost 75 years of combined professional and academic experience the authors guide readers through the design of lightweight systems space frames grid shells cable nets ethylene tetrafluoroethylene ETFE membranes rails stairs and canopies Each chapter provides an overview of the evolution of each system and provides technical references for further study Images details and calculations from 18 actual projects showcase the process of design and the importance of close collaboration among all members of the project team These case studies include a discussion of design intent analysis methods architectural constraints detailing fabrication and construction methods Because lightweight structures blur the lines between architecture engineering and fabrication care is taken to share key lessons learned from over half a century of firsthand design These topics can be highly technical and broadly extensive and this book serves as a tractable introduction for designers Written for structural architecture students and early career professionals this book is an essential introduction to the fundamentals of each lightweight structural system Architecture and Design for Industry 4.0 Maurizio

Barberio,Micaela Colella,Angelo Figliola,Alessandra Battisti,2023-10-06 This book collects contributions of forefront research and practices related to the use of the enabling technologies of Industry 4 0 in the architecture and design fields and their impact on the UN s Sustainable Developments goals The book is structured into three sections research practice and technologies with the goal of creating a new framework useful for widespread awareness necessary to initiate technology transfer processes for the benefit of the public sector universities research centers and innovative companies and a new professional figure capable of controlling the entire process is essential Thus the book chapters arouse a series of relevant topics such as computational and parametric design performance based architecture data driven design strategies parametric environmental design and analysis computational and parametric structural design and analysis AI and machine learning BIM and interoperability VR and AR digital and robotic fabrication additive manufacturing and 3D printing R D and entrepreneurship circular architecture and didactics In the post digital era where the essence of design lies in the control and information of the process that holistically involves all the aspects mentioned above rather than in formal research it is necessary to understand technologies and analyze the advantages that they can bring in terms of environmental sustainability and product innovation **Materials for Architects and Builders** Arthur Lyons,2019-08-28 Materials for

Architects and Builders provides a clear and concise introduction to the broad range of materials used within the construction industry and covers the essential details of their manufacture key physical properties specification and uses Understanding the basics of materials is a crucial part of undergraduate and diploma construction or architecture related courses and this established textbook helps the reader to do just that with the help of colour photographs and clear diagrams throughout This new sixth edition has been completely revised and updated to include the latest developments in materials research new images appropriate technologies and relevant legislation The ecological effects of building construction and lifetime use remain an important focus and this new edition includes a wide range of energy saving building components

Structures by Design Rob Whitehead, 2019-07-19 Winner of the 2021 TAA Textbook Excellence Award Honorable Mention of the 2021 BTES Book Award Structures by Design Thinking Making Breaking is a new type of structures textbook for architects who prefer to learn using the hands on creative problem solving techniques typically found in a design studio Instead of presenting structures as abstract concepts defined by formulas and diagrams this book uses a project based approach to demonstrate how a range of efficient effective and expressive architectural solutions can be generated tested and revised Each section of the book is focused on a particular manner by which structural resistance is provided Form Arches and Cables Sections Beams Slabs and Columns Vectors Trusses and Space Frames Surfaces Shells and Plates and Frames Connections and High Rises The design exercises featured in each chapter use the Think Make Break method of reiterative design to develop and evaluate different structural options A variety of structural design tools will be used including the human body physical models historical precedents static diagrams traditional formulae and advanced digital analysis The book can be incorporated into various course curricula and studio exercises because of the flexibility of the format and range of expertise required for these explorations More than 500 original illustrations and photos provide example solutions and inspiration for further design exploration

Physical Models Bill Addis, Karl-Eugen Kurrer, Werner Lorenz, 2020-09-25 Physical models have been and continue to be used by engineers when faced with unprecedented challenges when engineering science has been inadequate or even non-existent and in any other situation when engineers have needed to raise their confidence in a design proposal to a sufficient level in order to begin construction For this reason models have mostly been used by designers and constructors of highly innovative projects when previous experience has not been available The book covers the history of using physical models in the design and development of civil and building engineering projects including Robert Stephenson's Britannia Bridge in the 1840s the masonry Aswan Dam in the 1890s and the Boulder Dam in the 1930s tidal flow in estuaries and wind and seismic loads on structures from the 1890s the acoustics of concert halls and the design of thin concrete shell roofs from the 1920s and the dynamic behaviour of tall buildings from the 1930s as well as and cable net and membrane structures in the 1960s Individual designers featured include Eduardo Torroja Pier Luigi Nervi Heinz Hossdorf Heinz Isler Frei Otto Sergio Musmeci and Mamoru Kawaguchi The book concludes

with overviews of the current use of physical models alongside computer models for example in boundary layer wind tunnels seismic engineering hydrology soil mechanics and air flow in buildings Traditionally progress in engineering has been attributed to the creation and use of engineering science the understanding of materials properties and the development of new construction methods The book argues that the use of reduced scale models has played an equally important part in the development of civil and building engineering However like the history of engineering design itself this crucial contribution has not been widely reported or celebrated The book includes 39 chapters written by 29 authors from ten different countries

Sustainable Architecture - Between Measurement and Meaning Carmela Cucuzzella, Sherif Goubran, 2021-01-05 Each day new articles books and reports present new methods standards and technologies for achieving sustainability in architecture Additionally new materials technological gadgets and data are increasingly considered the staples of architecture's future As we increasingly embrace this techno advancement we must be equally aware that we may be pushing architecture into a managerial science and away from its core concerns such as expression contextuality functionality and aesthetics Sustainable architecture that is focused on the abstract measurements of consumption energy and emissions loses sight of the vital role that architecture holds in our world it is the field that creates our public spaces and our places of dwelling of business of production of leisure and creation Additionally it fails to comprehend the human dimension of buildings as elements that are deeply connected to their sites historic contexts and that play a key role in defining our social relations and our connection to the spaces we occupy and utilize Sustainable Architecture Between Measurement and Meaning takes a step back to reflect on how sustainability in the built environment can be theorized and practiced critically This book exposes that architecture remains a human and social science that lies at the intersection of measurements and meanings It reveals that sustainable architecture can still operate in a dialectic space of expression rather than serving as a manifesto for either the technical or socio cultural extremes It purports that the human intuition senses and skills still holds the key to unravelling alternative futures of sustainable built spaces And that most importantly humans still have a place in sustainable architecture This book will be of interest to students early career scholars established researchers and practitioners studying sustainability in the built environment It can be used as a reference to those in the fields of design architecture landscape and urban design urban studies geography social sciences and engineering

Michael Balz John Chilton, 2023-06-03 This book presents a review of the work of the architect Michael Balz pioneer of concrete shell architecture It discusses his projects both realized and unbuilt many being designed in collaboration with the renowned Swiss engineer Heinz Isler Profusely illustrated with original drawings and photographs Michael Balz Shells and Visions caters to the increasing interest in the design and construction of free form reinforced concrete shells consequent on the advent of 3D modelling and form finding software The book describes architectural designs and practical construction issues to motivate contemporary shell designers Balz's experience of dealing with such difficulties as incompatibility with non

structural features and the insertion of windows into shells and the assessment of buildings long term performance allow readers to learn more easily how to cope with such issues in their own work The book introduces Michael Balz his early work with other architects including his work on pneumatic forms with Frei Otto and his evolution into an exponent of organic architecture It then discusses completed projects including the outdoor Theater unter den Kuppeln 1976 Ballettsaal 1979 and Balz House 1981 Competitions Balz entered and unrealized shell projects also receive attention as does his work on the urban scale highlighting conceptual designs of mega cities His visionary megastructures encourage the exploration of innovative solutions for city spaces by architects faced with today s increased urbanization Michael Balz Shells and Visions will be of interest to students and professionals in the fields of architecture structural engineering building and urban design It s reflections on the cultural and contextual aspects of Balz s work will help the architectural historian to appreciate its long term significance

Structures and Architecture Mario Rinke,Marie Frier Hvejsel,2025-06-23 Structures and Architecture REstructure REMaterialize REthink REuse contains the contributions to the 6th International Conference on Structures and Architecture ICSA 2025 Antwerp Belgium 8 11 July 2025 As a response to the pressing global climate and energy crisis and with new settings and tools the design and construction of our built environment needs reconsideration and extension The papers call for a re imagination of current practices regarding structures and architecture The volumes of the series are published every three years in tandem with the conferences organised by the International Association of Structures and Architecture They aim to reach a global audience of researchers practitioners and students including architects structural and construction engineers builders and building consultants constructors material suppliers planners urban designers anthropologists economists sociologists artists product manufacturers and other professionals involved in the design and realisation of architectural structural and infrastructural projects

Thinking While Doing Stephen Verderber,Ted Cavanagh,Arlene Oak,2019-06-04 The active engagement of architecture students in the design and construction of real projects is today an important dimension at more than 150 universities worldwide Yet this emerging field continues to suffer from an insubstantial scholarly foundation An initiative of universities in North America has developed a consistent and innovative practice model which sets a new standard for this key aspect of education and professional practice

Resilience vs Pandemics Ali Cheshmehzangi,Maycon Sedrez,Hang Zhao,Tian Li,Tim Heath,Ayotunde Dawodu,2024-01-06 Resilience vs Pandemics Innovations in Public Places and Buildings explores innovative solutions for architecture and public places during and after the pandemic Additionally the authors contribute to the documentation of architectural and social transformations that have been prompted by previous transmissible diseases as this knowledge can inform responses to future pandemics In this volume the chapters present critical exploratory multi and interdisciplinary and cutting edge research approaches with a particular focus on the effects of COVID 19 and other highly transmissible diseases on the design use performance and perception of the built environment particularly at the building scale This volume aims to

organize a collection of scientific studies reviews analysis recommendations and solutions in the fields of urban design architecture design landscape design etc The overarching goal is to document new approaches to create and enhance built environment resilience Chapters shed light on novel methods tools processes regulations behaviours and other relevant details contributing to a comprehensive understanding of this crucial issue The two scales of the built environment under consideration are 1 Public Places including research on transformations death emergencies changes requirements adaptability usability virtual immersion historical perspectives interactivity shifts in use and programs etc 2 Buildings including regulations shifts in use and program non pharmaceutical interventions human interactions and human machine interfaces The book covers a wide range of studies including physical and non physical studies which may refer to the city infrastructure green blue spaces housing policy making health services social and economic issues etc The findings and results of various global case study examples contribute to the decision making of governments organizations and institutions as well as inspire scholars and future research for developing resilience in the post pandemic era *Fabricate 2024* Bob Sheil, Marilena Skavara, Mette Ramsgaard Thomsen, Phil Ayres, 2024-04-04 *Fabricate 2024* Creating Resourceful Futures is the fifth volume in the series of *Fabricate* publications The first conference Making Digital Architecture explored the ways in which technology design and industry are shaping the world around us Since then we have become finely attuned to the negative impacts of this shaping The 2024 conference hosted in Copenhagen sets focus on the pressing need to develop new models for architectural production that rethink how resource is deployed its intensity its socio ecological origins and sensitivity to environment This book features the work of designers engineers and makers operating within the built environment It documents disruptive approaches that reconsider how fabrication can be leveraged to address our collective and entangled challenges of resource scarcity climate emergency and burgeoning demand Exploring case studies of completed buildings and works in progress together with interviews with leading thinkers this edition of *Fabricate* offers a plurality of tangible models for design and production that set a creative and responsible course towards resourceful futures

Fabricate 2020 Jane Burry, Jenny E. Sabin, Bob Sheil, Marilena Skavara, 2020-04-06 *Fabricate 2020* is the fourth title in the *FABRICATE* series on the theme of digital fabrication and published in conjunction with a triennial conference London April 2020 The book features cutting edge built projects and work in progress from both academia and practice It brings together pioneers in design and making from across the fields of architecture construction engineering manufacturing materials technology and computation *Fabricate 2020* includes 32 illustrated articles punctuated by four conversations between world leading experts from design to engineering discussing themes such as drawing to production behavioural composites robotic assembly and digital craft **Comparison** Fabrizia Berlingieri, Francesca Zanotto, 2020 *Design Driven Research* encompasses many different forms of research in which architectural design and artistic practices and the results thereof are implemented as a means to generate and disseminate new knowledge This includes contemporary alternative formulations of

the field like Artistic Research Research by Design Practice Based Led Research Creative Practice Research CA2RE is a joint Erasmus strategic partnership of nine European universities in association with EAAE ELIA and ARENA and it supports early career researchers and Ph D students to improve the quality of their research CA RE explicates the transformative and innovative power of highly individual strategies in artistic research the diversity of research traditions and the integrative nature of architectural design research able to face the contemporary knowledge fragmentation from humanities social sciences and technology Along with the CA2RE timeline project the focus of Milano conference narrows by comparing design strategies and tactics applied to highlight common approaches and methodological specificities within the consortium and the broader community involved Timber Gridshell Architecture Olga Popovic Larsen, Gabriel Tang, John Chilton, 2013-04-01

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