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TOPICAL REPORT

DIGITAL DESIGN & FABRICATION

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DIGITAL FABRICATION

Architects apply the latest in fabrication, design, and visualization to age-old timber

"While mid-to-large range firms around the world have been in competition to build the largest or the tallest timber structures to demonstrate its comparability to concrete and steel, a number of independent practitioners have been applying the latest methods of fabrication, computational design techniques, and visualization software to the primordial material. Here, AN exhibits a cross-section of the experimental work currently being pursued with the belief that timber can be for the future what concrete, steel, and plastic have been in the past."

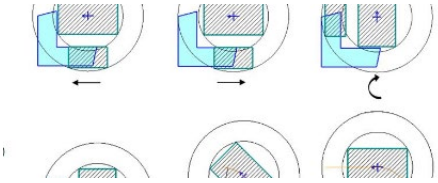
Source: The Architect's Newspaper

A new show at Cooper Union bridges architectural research and fabrication

"With new digital fabrication and design tools and the university-fueled facilities to play with them, architects are able to reach in and engage with the physical construction process of their buildings more than ever before, altering a professional cultural divide that has been occupied by stonemasons, engineers, and contractors for millennia."

Source: The Architect's Newspaper

ROBOT ASSEMBLIES

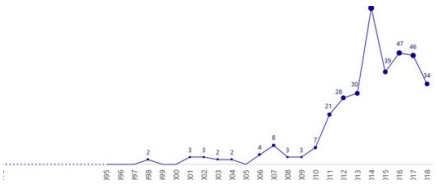


Bricklaying robot moving algorithms at a construction site

"The developed algorithms consist of two separate algorithms, one for moving while directly building walls, another for fast and effective travelling between two points of a map without laying bricks. The developed algorithm has to be tested for different masonry plans and may be optimized in the described ways."

Source: IOP Conference Series: Materials Science and Engineering

COMPUTATIONAL DESIGN

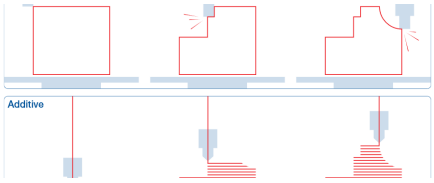


Computational design in architecture: Defining parametric, generative, and algorithmic design

"This paper discusses computational design (CD) and proposes an improved and sound taxonomy for a set of key CD terms, namely, parametric, generative, and algorithmic design, based on an extensive literature review from which different definitions by various authors were collected, analyzed, and compared."

Source: Frontiers of Architectural Research

ADDITIVE MANUFACTURING



3D Printing: A Guide for Decision-Makers

"The pace of adopting 3DP has been slow to date. While revenue growth is increasing rapidly, the extent to which the technology will penetrate mainstream industries and markets in the future is unclear. Further, in many cases it is also not clear whether the impacts will happen at all, or if they do, which of two opposing outcomes might happen: for example, will trade volumes increase or decrease as a result of eventual 3DP scale-up? To navigate these uncertainties, several leading indicators can be monitored to explore possible outcomes. Monitoring those indicators could become part of the planning processes of businesses and national and international agencies"

Source: WEForum

Chris Sharples of ShoP on Direct-to-Fabrication Design and the Future of Architecture

"In this episode, host Aaron Prinz speaks with Chris Sharples, a Co-Founder of the award-winning architecture firm SHoP in New York City. He discusses the SHoP's innovative process of direct-to-fabrication design, the early days of founding the firm, and the future of the profession."
Source: ArchDaily

ROBOTIC FABRICATION

PLY+ wraps st mary chapel in curved brick shell with a woven pattern in the US

"architecture practice PLY+ has extended the st mary mercy hospital in livonia, michigan, with a new project comprising a roman catholic chapel, a reflection room and a muslim prayer room. wrapped in an ironspot brick shell, which helps distinguish it from the existing structure, the chapel features a distinct curved geometry with a conical corner that celebrates the position of the tabernacle – the most important liturgical element within the space .the brick coursing involves rotating masonry in a clockwise orientation from a running bond pattern to a rotating pattern and back again to running bond after rounding the corner. the following course follows the same logic with a counter-clockwise rotation thereby establishing a 'woven' pattern at the corner."
Source: DesignBoom

Dragon Skin wood installation provides outdoor shelter on campus

"Named Dragon Skin in reference to its scale-like shingles, the installation is the third iteration of a collaborative project between UBC's SEEDS Sustainability Program, the School of Architecture and Landscape Architecture (SALA) and the Centre for Advanced Wood Processing (CAWP)."
Source: The Ubyssey

3D PRINTING

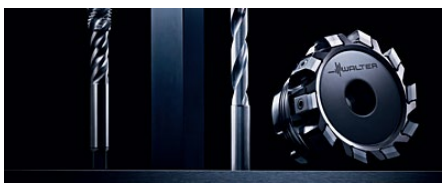
Parametric Architectural Design in Geological Engineering Based on Optimization Algorithm

"As a widely applied method in many fields, parametric design is now finally exerting influences on architectural industry with the rapid development of Internet technology. For this reason, parametric architectural design is studied in this research based on optimization method. First, parametric design and optimization algorithm are introduced; then, the process of modeling and optimization procedures is discussed; at last, the parametric optimization design is applied to solve the complex architectural design problems. Parametric method will thoroughly affect architectural industry. Therefore, architectural designs should be based on optimization algorithm using parametric design to improve the progress and quality of architectural design."
Source: Geological Behavior

Connection system for gridshell structures using parametric modeling and digital fabrication

"the use parametric modeling environment to model global and local geometry of meshes and nodes. Inputs for the programmed parametric definition include a discretized surface, geometry of the hub notch, and element cross-sections; outputs include element lengths, interconnecting parts geometries, and assembly information. We present a physical model that serves as a proof of the concept developed within the computational modeling environment."
Source: Automation in Construction

3D PRINTING



The 3D printing in industrial design

"In this paper, on the example of engineering studies in the field of industrial design, the use of 3D printing in the process of design will be shown."
Source: Mechanik

DIGITAL DESIGN

Expert Roundup: 20 Experts Share Their 3D Printing Predictions for 2020

"To give you an idea of what to expect in the 3D printing industry in the year ahead, we've reached out to 20 3D printing industry experts. Below, they share their vision and expectations of how 3D printing will evolve in 2020."
Source: AMFG

"World's Largest" 3D Printed Building Unveiled in Dubai

"According to Apis Cor, this building will be the first in an entire region consisting of 3D-printed structures. Printing was completed in August and the total project was finished in October. Unlike other large, 3D-printed buildings, like those made by WinSun, this structure was not made using pre-printed walls that were shipped and assembled on-site."
Source: 3DPrint.com

U.C. Berkeley Researchers 3D Print a Cement-Powder Pavilion

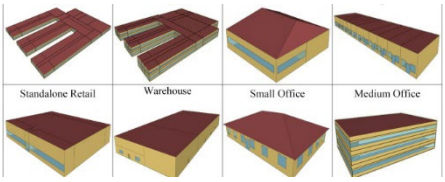
"Architectural applications for 3D printing are steadily advancing and shifting from the creation of component parts to that of entire structures. Earlier this month, a faculty-led student team at the College of Environmental Design at the University of California, Berkeley, unveiled an experimental pavilion whose construction brings the niche fabrication method a step closer to mainstream production."
Source: Architect Magazine

Precht and Mamou-Mani unveil 'Sandwaves' and 'Pixel Gate' 3D printed installations in Saudi Arabia

"The first installation, named Sandwaves, uses a sand 3D printing method and features lattice structures woven in a ribbon-like formation. The second piece comprises a set of stacked cubes, named Pixel Gate, 3D printed using a standard extrusion-based method."
Source: 3D Printing Industry

Food waste as raw material for 3D printed bioplastics

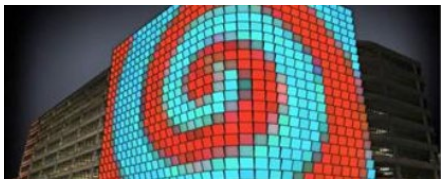
"Extracts of lemon and almond peels can be used for sustainably produced car parts and building components. This BARBARA project jointly funded by the European Union and industry ensures that food waste can be put to good use, replacing petroleum-based plastics with more environmentally friendly bioplastics."
Source: Innovation Origins



A data-driven framework for energy-conscious design of building facade systems

"This framework provides simple recommendations on the energy performance of façade systems for different building types in different climate zones. The applicability of the proposed framework was tested on an innovative ultra-high-performance fiber-reinforced-concrete (UHP-FRC) façade panel."
Source: Journal of Building Engineering

DIGITAL FACADES



Building technique: Digital Facade and LED Lighting as a Smart System in Commercial Buildings

"This paper focuses on digital façade maps on walls with the use of LED systems. The light emitting diode (LED) Modules which are used for outdoor façade lighting element automatically turns the building into a real landmark, attracts users, investors, tourist, government, to mention but a few. Thanks to cutting-edge facade lighting, you can illuminate architectural highlights and even design fascinating color and light effects on outer skins of the building that attract attention."
Source: International Journal of Innovative Science and Research Technology

MATERIAL OPTIMIZATION

UHPFRC Folded Pavilion

"The design of the pavilion starts with a widespread geometric exploration using a phylogenetic tree. This approach has the advantage of exploring different designs at the same time without enclosing the creative process in one path. The geometry of the final pavilion is based on a folded surface, called "Yoshimura", made out of rows of triangles. The profile of the pavilion is bent in order to

create a double curvature and so, more stability."
Source: Journal of Civil Engineering and Architecture 14

Textile reinforced concrete for sustainable structures: Future perspectives and application to a prototype pavilion

"In the present research, results of a 4-year research program on TRC performed by researchers in civil engineering and architecture are presented. The response of the material is first investigated in tension, bending, and shear. On this basis, considerations on the potential of TRC for construction are drawn and an example of application is presented with the construction of a full-scale pavilion entirely in TRC."
Source: Structural Concrete Journal