

TOPICAL REPORT

DIGITAL DESIGN & FABRICATION

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ARCHITECTURAL FABRICATION



Mario Cucinella designs a giant 3D printed wasp's nest of a house

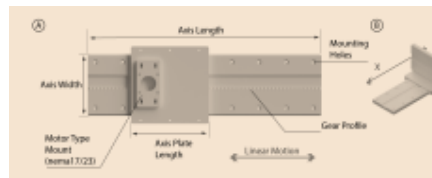
"World's Advanced Saving Project. It is technology "inspired by the potter wasp, WASP builds houses with natural materials, at a cost tending to zero." The Crane WASP is "an innovative technology to print on site eco-districts at low environmental impact." In an era where so many people are moving to cities and living at high density, Mario Cucinella writes that "the idea of the city must be challenged."

Source: Treehugger

BUGA Fibre Pavilion: A Nature-tech Combo for Future Architecture

"With the objective of developing resource-efficient design, researchers, engineers and architects are looking at biology and natural concepts to find minimal-waste solutions for building. The BUGA Fibre Pavilion at Bundesgartenschau 2019 in Heilbronn, Germany, showcased results of extensive biomimetic research by the Institute for Computational Design and Construction (ICD) and the Institute for Building Structures and Structural Design (ITKE) at the University of Stuttgart in order to understand natural principles and apply them to construction."

DIGITAL FABRICATION



Fabricatable Machines: A Toolkit for Building Digital Fabrication Machines

"We present Fabricatable Machines, an open-source toolkit for designing custom fabrication machines. We designed a linear motion module, The Fabricatable Axis, that provides robust automated linear motion. The Fabricatable Axis can be resized, adjusted, and fabricated from different materials."

Source: TEI '20: Proceedings of the Fourteenth International Conference on Tangible, Embedded, and Embodied Interaction

The Application of Digital Fabrication in Architecture, Case Study: Prototyping a Scale Model

"The research purpose is identifying the teaching procedure of digital fabrication in producing architectural scale models. The method is to analyze the questionnaire from the architecture students that join the workshop."

Source: Proceedings of the EduARCHsia & Senvar 2019 International Conference (EduARCHsia 2019)

Digital Fabrication and How It Affects the Future of Indonesian Construction World

"By using qualitative and descriptive analysis, and combined by the literature study approach, this research wishes to evaluate the

3D PRINTING



Innovations in Automated Machines, 3D Printing, and Laser Technology

"This Advanced Manufacturing Technology TechVision Opportunity Engine (TOE) profiles advancements in 3D printing, robotic gripper systems, material handling, automated storage, robotics, and laser technology."

Source: Frost and Sullivan

ROBOTIC FABRICATION



These European robotics startups are smartly transforming construction industry in 2020

"Construction is one of the most world's largest industries but it is dated as it relies on tools developed decades ago. While many architects and related professionals design digitally, the construction is still manual, which is the root cause of inefficiencies in the industry."

Source: Silicon Canals

Robots are printing 3D bridges in Amsterdam

"Amsterdam's robot-printed steel bridge, the first of its kind in the world, is more attractive than you might expect. Its curved, raw steel balustrades with intricate mesh detailing are typical of the optimised aesthetic of 3D printing."

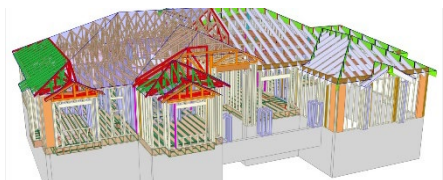
Source: Stuff

MIT: New Algorithms for Robotic Spatial Extrusion Planning

"MIT scientists are researching new ways to improve automated systems, outlining their findings in the recently published 'Scalable and Probabilistically Complete Planning for Robotic Spatial Extrusion.' Exploring new ways to integrate robotics into production, the authors have created a new concept for robotic spatial extrusion, accompanied by complete planning algorithms."

Source: 3DPrint.com

DIGITAL DESIGN



Design and build wood-framed projects with the latest timber construction software

"For architects, specifiers, and structural engineers, the latest timber software aids in visualization, design, and construction of projects with wood products. These programs integrate seamlessly with BIM, Autodesk, and Rhino for easy

effects of digital fabrication in Indonesia's current construction world, and how it will affect the country's construction world soon."

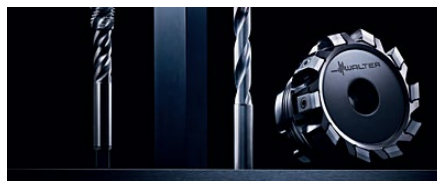
Source: Proceedings of the EduARCHsia & Senvar 2019 International Conference (EduARCHsia 2019)

Encasing Computation: Using Digital Fabrication Approaches to Make Microcontrollers Wearable

"This paper introduces initial attempts to bridge the worlds of digital fabrication and do-it-yourself wearable electronics. It introduces a selection of microcontrollers that are anticipated to work well in a wearable context and provides an overview of five prototypes: Folding Felt Photon, Photon Sleepers, Circuit Playground Aurora Hat, Feather Belt, and Feather Shoes."

Source: TEI '20: Proceedings of the Fourteenth International Conference on Tangible, Embedded, and Embodied Interaction

3D PRINTING



Effect of testing procedures on buildability properties of 3D-printable concrete

"Digital fabrication with concrete enables the efficient and quick creation of architectural/structural elements without formworks. This technology does, however, introduce new challenges, especially concerning the mechanical requirements of printable materials."

Source: Construction and Building Materials

3D printable magnesium oxide concrete: towards sustainable modern architecture

"Reactive magnesium oxide cement (RMC) is gaining increasing attention as a sustainable construction material due to its significantly low carbon footprint during the production as well as the operational phase compared to the conventional Portland cement."

Source: Additive Manufacturing

An automated system for 3D printing functionally graded concrete-based materials

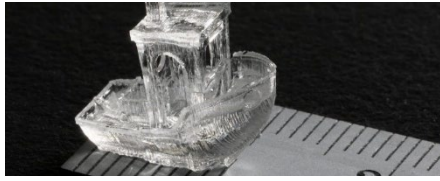
"This paper proposes a new strategy, aimed at the design and fabrication of functionally graded concrete parts with specific thermo-mechanical performance. The paper describes the development of the AM system to materialize such parts."

Source: Additive Manufacturing

collaboration between designers and manufacturers."

Source: Archpaper

3D PRINTING



Groundbreaking 3D-Printing With Unprecedented Precision and Resolution – All in Record Time

"Researchers at EPFL have developed a new, high-precision method for 3D-printing small, soft objects. The process, which takes less than 30 seconds from start to finish, has potential applications in a wide range of fields, including 3D bioprinting."

Source: Scitechdaily

Printing the cities of the future in 3D

"According to ONU projections, by 2050 more than 9.7 billion people will inhabit Earth with 68 percent living in urban areas. Of this 9.7 billion, the World Bank estimates that 4.4 billion will live in Africa and 4.9 billion in Asia."

Source: BBVA

Engineering the exquisite: German catholic church installs 3D printed retable in partnership with FIT AG

"Topologically designed brackets for aeroplanes, latticed heat exchangers for racing vehicles, medical implants with organic architectures; these are the sorts of applications we've come to expect from additive manufacturing. But additive innovation can come in many different forms, as FIT AG recently discovered in a project commissioned by a small parish church in Altmühldorf, Upper Bavaria."

Source: TCT Magazine

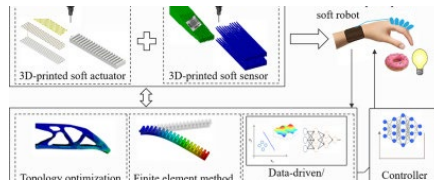
The Weave: 3D Printed Ceramic Brick Structure Builds Alternative View of Matter

"In 'The Weave – An Investigation into the Intersection of Craft and 3D-printing,' Albin Karlsson and Johanna Jonsson of Sweden's Lund University have written a master's thesis centered around a new type of 3D printed ceramic brick and their unique desire to reconnect humanity with matter and the material world."

Source: 3DPrint.com

AI Spacefactory to unveil first 3D-printed Martian eco-retreat on Earth

4D PRINTING



4D printing additive manufacturing review; Mechanism, Challenges, Applications and Future

"In 4D printing process, the material configuration will be converted to a converter that will be exposed to external motivation such as heat, water, chemicals, electrical current, and magnetic energy. It is expected that in the future, this technology will be widely used, requiring the application of various engineering disciplines, including mechanical engineering, in the fabrication and production of objects, because the overall outlook for the 4D printing process is that intelligent materials To use the computational challenges and experimental knowledge to the optimum level. In this article, after reviewing the 3D printing and introducing smart materials, the issue of 4D printing using this material is discussed."

Source: Modares Mechanical Engineering 2020

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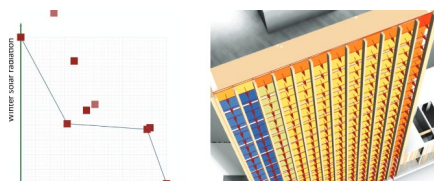


Computational generation and conformal fabrication of woven fabric structures by harmonic foliation

"This paper presents a framework for computational generation and conformal fabrication of woven thin-shell structures with arbitrary topology based on the foliation theory which decomposes a surface into a group of parallel leaves."

Source: Computer Methods in Applied Mechanics and Engineering

PARAMETRIC MODELLING



Parametric Explorations In Architecture From The Urban Scale To The Technological Detail

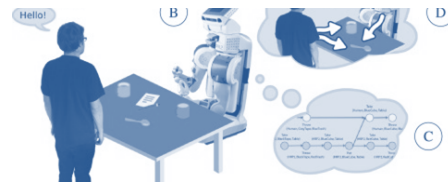
"Promising "an eco-retreat unlike any other", AI Spacefactory is bringing a version of its 3D-printed Mars habitat concept to Earth this spring, for guests wanting a taste of what it would be like to live on another planet. Emily Eastman reports"

Source: GlobalTrender

"The social, environmental and economic changes that characterize the new millennium impose new challenges for the design of urban settlements, buildings and objects. In this context, the parametric architecture can become an innovative design support tool to favour smarter, more resilient, more adaptive, more sustainable projects."

Source: Publishing Series on PROJECT | Essays and Researches

ROBOTICS FABRICATION



Technologies and Techniques for Collaborative Robotics in Architecture: establishing a framework for human-robotic design exploration

"This study investigates the technological and methodological challenges in establishing an indeterministic approach to robotic fabrication that allows for a collaborative and creative design/fabrication process. The research objective enquires into how robotic processes in architecture can move from deterministic fabrication processes towards explorative and indeterministic design processes."

Source: Publishing Series on PROJECT | Essays and Researches

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