

«Mesh Mould» Receives Swiss Technology Award 2016

Zurich, 25 November 2016 – Yesterday, the project team behind the novel building technology «Mesh Mould» received the Swiss Technology Award in the category «Inventors» at the 11th Swiss Innovation Forum in Basel. The award ceremony was attended by around 1000 opinion leaders from Swiss economy, politics and society. «Mesh Mould», which was developed by researchers of ETH Zurich, allows to build load-bearing concrete elements of any shape without formwork.

Each building that we construct today is being built twice: Once as formwork that gives the fluid concrete its final shape and once in concrete itself. Especially in the case of individual buildings, the formwork can only be used once, before it ends up on the trash heap. This causes enormous material waste and immense costs. Norman Hack, project leader of «Mesh Mould», and his five-person team of ETH Zurich worked intensively to resolve this problem. With their novel solution approach they were able to convince the top-level jury of the Swiss Technology Award 2016. «We are very happy about the award that highlights the great potential of «Mesh Mould»», says Hack.

Novel Building Technology Is the Result of Close Interdisciplinary Collaboration

After being launched at the Future Cities Laboratory of the Singapore ETH Centre, «Mesh Mould» was transferred to ETH Zurich. At present, project leader Hack, PhD researcher in architecture, drives the project together with five other researchers from ETH Zurich within the framework of the Swiss National Centre of Competence in Research (NCCR) Digital Fabrication. «For the development of the project, knowledge of researchers from the disciplines of architecture, robotics, materials science and structural engineering was needed», states Hack. In close interdisciplinary collaboration the research team developed the worldwide first technology which combines the two functions of formwork and reinforcement within a digital fabrication process.

Robotic Fabrication Process Enables Combination of Formwork and Reinforcement

Firstly, a mechatronic end-effector mounted on a mobile robot fabricates a dense steel-mesh on the basis of a computational design model. In a second step, concrete is poured inside the mesh. Thanks to the dense mesh-structure and the particular concrete mixture, the concrete does not run out laterally. Whilst other digital building technologies, such as the 3D printing of concrete, are still struggling to find a solution for the integration of reinforcement, the steel-meshes fabricated with «Mesh Mould» are able to assume the functions of both formwork and reinforcement.

A Remarkable Contribution to Greater Freedom of Design, Sustainability and Efficiency on Building Sites

According to Hack, «Mesh Mould» has big advantages for both bespoke and standardised concrete architecture: Whilst in the case of individual architecture, the great benefit of the new technology lies in the fact that no material- and cost-intense one-way formworks are needed, the advantage for standardised concrete structures is that the structures can be structurally optimised. Because of the standardised formworks, walls for example today need to be built with a continuous thickness over their whole length. In contrast, the thickness of a wall built with «Mesh Mould» can vary over its whole length depending on the required load-bearing capacity of the specific sections. As a result, besides the formwork, also concrete can be saved. «With «Mesh Mould», we protect our environment, are able to build at lower price and enjoy unlimited freedom of design», so Hack.

In 2017, «Mesh Mould» will be implemented on the modular research and innovation building NEST of Empa in Dübendorf as part of the Unit of the NCCR Digital Fabrication. The research team is already looking forward to this first real-world application at 1:1 building scale.

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Link to project video, project credits and images can be found on the following pages »

Project Video

<https://www.youtube.com/watch?v=4PGd3al59SA>

Note: In few days, the English version will also be available on the YouTube channel of the NCCR Digital Fabrication.

Project Credits

Research program: National Centre of Competence in Research (NCCR) Digital Fabrication

Project leader: Norman Hack

Collaborators: Kathrin Dörfler, Dr. Jaime Mata Falcón, Dr. Nitish Kumar, Alexander Nikolas Walzer, Dr. Tim Wangler

Contributing professorships: Gramazio Kohler Research, Institute for Technology in Architecture, ETH Zurich; Agile & Dexterous Robotics Lab, Institute for Robotics and Intelligent Systems, ETH Zurich; Physical Chemistry of Building Materials Group, Institute for Building Materials, ETH Zurich; Concrete Structures and Bridge Design, Institute of Structural Engineering, ETH Zurich

Industry partners: Sika Technology AG, Noe Schaltechnik GmbH

Institution which launched the project in its first phase: Future Cities Laboratory, Singapore ETH Centre

About the NCCR Digital Fabrication

Initiated in 2014, the National Centre of Competence in Research (NCCR) Digital Fabrication aims to revolutionize architecture through the seamless combination of digital technologies and physical building processes. Over 50 researchers from six different disciplines collaborate to develop ground-breaking technologies for tomorrow's construction. Their research allows Switzerland to take a leading position within the global field of digital fabrication. The NCCR Digital Fabrication is the first NCCR focused on architecture and construction funded by the Swiss National Science Foundation (SNSF). Initiated at ETH Zurich, it is partnered with EPF Lausanne, Empa and the Bern University of Applied Sciences.

More Information: www.dfab.ch

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Images on the next page »

Images



File name: sta2016-1.jpg

Caption: Representatives of the project team behind «Mesh Mould» with the Swiss Technology Award 2016. Back row, from left to right: Dr. Timothy Wangler, Alexander Nikolas Walzer, Norman Hack. Front row, from left to right: Dr. Nitish Kumar, Kathrin Dörfler

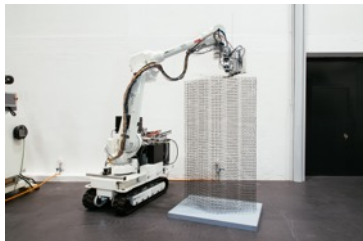
Credits: SIF 2016



File name: mesh-mould-1.jpg

Caption: Robotic end-effector with fabricated, two meter high mesh structure.

Credits: NCCR Digital Fabrication



File name: mesh-mould-2.jpg

Caption: Construction robot In situ Fabricator with fabricated, two meter high mesh structure.

Credits: NCCR Digital Fabrication



File name: mesh-mould-3.jpg

Caption: Mesh Mould prototype being filled with concrete. Thanks to the mesh typology and the specific concrete mixture, the concrete remains inside the structure.

Credits: NFS Digitale Fabrikation



File name: mesh-mould-4.jpg

Caption: Finish of a two meter high, concrete-filled prototype.

Credits: NFS Digitale Fabrikation



File name: mesh-mould-5.jpg

Caption: Mesh Mould technology during a test fabrication on the Empa NEST building in Dübendorf.

Credits: NFS Digitale Fabrikation