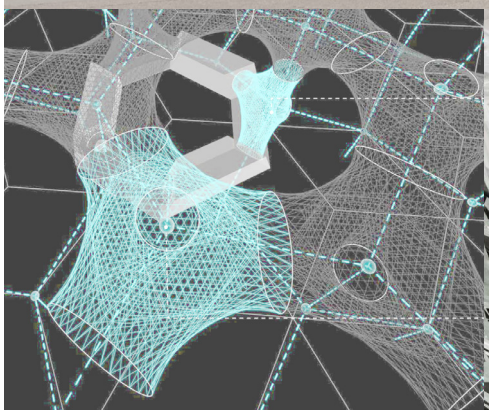

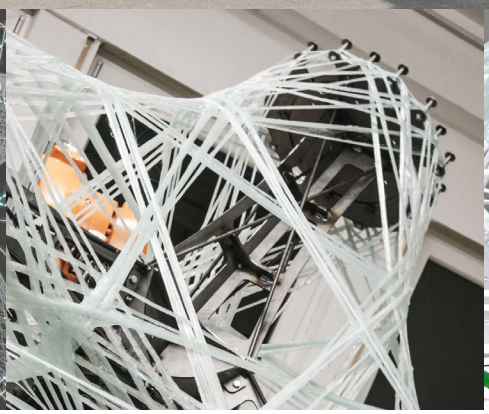

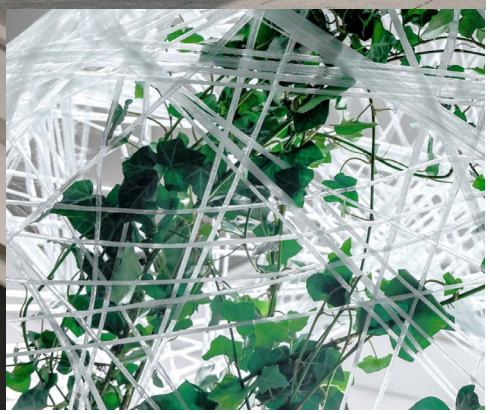

Urban Micro Climate Canopy

Professorship for Green Technologies in Landscape Architecture (TUM)

Chair for Building Technology and Climate Responsive Design (TUM)

FibR GmbH, Stuttgart

Technical University of Munich
Professorship for Green Technologies in Landscape Architecture

Technical University of Munich
Chair for Building Technology and Climate Responsive Design

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reinventing composites
Stuttgart

„Urban Micro Climate Canopy“ is an architectural prototype which showcases an innovative hybrid of technological composite structures and plants. The canopy offers new ways of improving the microclimate in our cities by integrating mosses and climbing plants into a robotically fabricated lightweight construction. It can be experienced in public space for the first time during the „Luminale - Biennale for Light Art and Urban Design“ from 18th to 23rd of March 2018 at the Hauptwache in Frankfurt am Main, Germany.

The project was developed in an interdisciplinary team of architects, landscape architects and engineers of the Technical University of Munich TUM at the interface of teaching and research. It is the first experimental building of a research cooperation between the Professorship for Green Technologies in Landscape Architecture (TUM), the Chair for Building Technology and Climate Responsive Design (TUM) and the company FibR GmbH from Stuttgart.

In particular, against the background of climate change and the increasing urban densification, the design of public spaces is an ever-increasing challenge. Trees are good for the urban climate, but they also need space and especially soil for their roots. In cities, however, large dense areas are sealed and underground volumes occupied with technical installations and infrastructure. The „Urban Micro Climate Canopy“ was developed to overcome these constraints and bring vegetation to dense urban areas as an „artificial tree crown“.

Based on novel robotic fabrication methods, it is possible to create a modular lightweight structure that is transparent yet highly stable. The construction integrates vegetation areas which enable the growth of climbing plants and mosses. Mosses are known to bind fine dust and nitrogen oxides and thus contribute to improving the air quality. Climbing plants can quickly develop large leaf surfaces and thus - like a full-grown tree - create a cooling shade roof.

By combining computational design techniques and robotics with the climatic and aesthetic potentials of living plants, an innovative micro-architecture is being created with large potentials for the design of public spaces with improved outdoor comfort, especially in urban heat islands. These „artificial trees“ can integrate light installations and sensors for microclimatic measuring. This will allow the collection of valuable data on the urban microclimate and the installation’s impact on perceived comfort by the users.

The structure creates areas with different shadows and lighting moods. The material efficiency of the underlying lightweight structure is accompanied by a lightness and transparency, which opens up special opportunities for illumination of public spaces. The glass fibers used for the support of the structure are not only structurally performant, but at the same time exhibit excellent light-conducting properties.

The prototype is a showcase for potentially much larger implementations. The aim is to populate public squares with such structures in order to modulate urban climate conditions at the human scale and simultaneously improve the spatial and atmospheric quality of open public spaces.

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The design process started with the constructive goal to develop lightweight modules that accommodate different plants and technical elements and can be adapted to changing spatial requirements and local conditions. An innovative robotic fabrication technology for lightweight structures was used to manufacture these elements. Reusable frame constructions are wrapped by an industrial robot with resin-impregnated glass fiber bundles, resulting in doubly curved, net-like structures. After curing of the resin, the frame is removed and reused for the production of other elements. Various design requirements can be addressed by variation of the winding pattern, the thickness of the fiber bundles and the number of layers. The result is a material-efficient, waste-free production process in which the commonly necessary mold construction is obsolete.

The „Urban Micro Climate Canopy“ was initially exhibited during the „Munich Creative Business Week 2018“ at the Deutsches Museum in Munich. Following the Luminale in Frankfurt, the approximately 3-meter-high prototype will be set up on the campus of the TUM with a footprint of approximately 7.2 by 5 meters in the summer of 2018, where it will undergo further tests. Additionally to the ivy plants used so far, various climbing plants will be tested for their performance and a rainwater management system will be integrated into the base of the canopy. In a next research step, the growth patterns and the microclimatic performance of different plant species are to be parameterized in order to systematically integrate them into the computational design process and to simulate their effects.

Project facts:

Locations:
Munich, Deutsches Museum: March 03 - 11, 2018
Frankfurt, Hauptwache, Luminale: Biennale for Light Art and Urban Design: March 18 - 23, 2018
Munich, Technische Universität München, Arcisstraße 21: around the end of May 2018
Completion: 2018
Covered area: 38m²
Construction width: 7m
Construction height: 3.5m
Weight of the lightweight construction: 560kg - 15kg/m²

More information: http://www.umcc.eu

Contact: ferdinand.ludwig@tum.de

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We are looking forward to a possible publication of our project. Please send us a proof copy of your planned contribution before publication. The image and text material contained in this press kit may only be used if the following shortcredits are mentioned:

Professorship for Green Technologies in Landscape Architecture, TUM
Prof. Ferdinand Ludwig, Lorenz Boigner

Chair for Building Technology and Climate Responsive Design, TUM
Prof. Thomas Auer, Daniele Santucci

FibR GmbH
Moritz Dörstelmann

If possible, we are happy if all project participants and sponsors can be mentioned in your publication:

Professorship for Green Technologies in Landscape Architecture, TUM
Prof. Ferdinand Ludwig, Lorenz Boigner

Chair for Building Technology and Climate Responsive Design, TUM
Prof. Thomas Auer, Daniele Santucci

FibR GmbH
Moritz Dörstelmann

Design-Team: Teodor Andonov, Andrea Fölbach, Carlo Guernier, Luciano Majorano, Francesco Martini, Qiguan Shu, Björn Siegmund, Marco Zanchetta

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