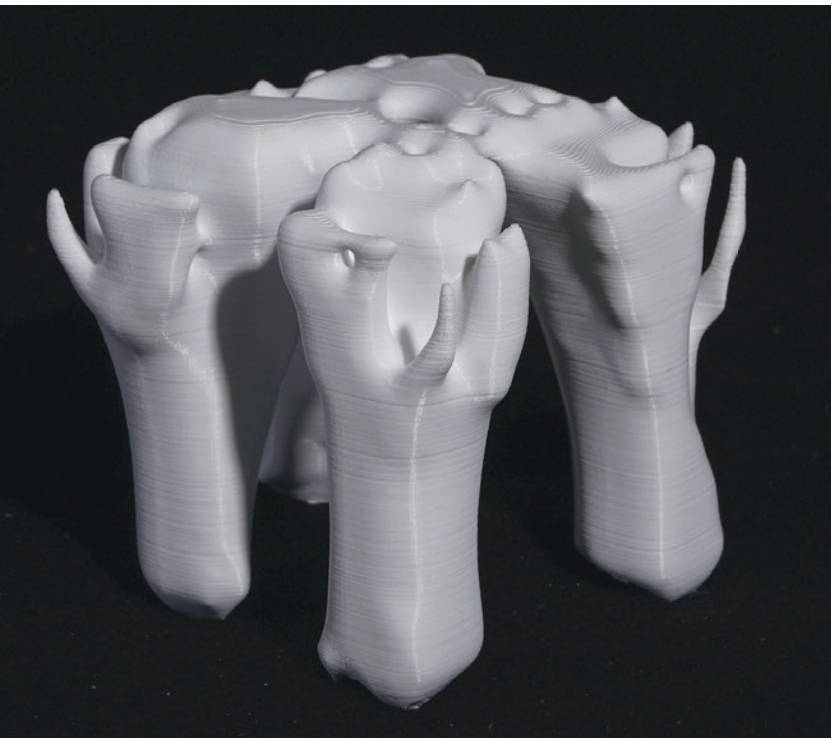
Andrea Rossi
TU Darmstadt - Digital Design Unit
Andrea Rossi is computational designer and researcher, currently PhD candidate at the Digital Design Unit - TU Darmstadt. His current research focuses on the implementation of discrete design strategies and robotic assembly for architectural fabrication. His previous research spans from robotic fabrication to computational urban planning. In the past years, he has been research associate at ETH Zurich, focusing on large scale urban simulations, and robotic fabrication specialist at Coop Himmelb(l)au (Vienna), while also teaching workshops on computational tools in Italy (Politecnico di Milano), Germany (Berlin, HfG Offenbach), and USA (University of Buffalo). His work has been presented extensively, including CAADRIA 2017, XXI Milan Design Triennale 2016, EnCoding Architecture 2013, ACADIA 2013, XIII Venice Architecture Biennale 2012.

Philipp Eisenbach
B + G Ingenieure Bollinger und Grohmann GmbH
Philipp Eisenbach is structural engineer and affiliated to the engineering company Bollinger+Grohmann in Frankfurt and has a lectureship at the University of Kassel. From 2012 he was research associate at the Department of Structural Design at the University of Kassel and received his doctorate 2017 under the supervision of Manfred Grohmann. In 2006 he joined Bollinger+Grohmann and prior he worked for osd-Office for Structural Design in Frankfurt. He teamed up in national and international projects scaling from art installations to multi-story buildings. He studied civil engineering at the Technical University Darmstadt, the University of New South Wales in Sydney and the École Polytechnique Fédérale de Lausanne and is trained as a skilled concrete builder. He is member of the Chamber of Engineers (IngKH), the Council on Tall Buildings and Urban Habitat (CTBUH) and Working Group Concrete Shells of the International Association for Shell and Spatial Structures (IASS).



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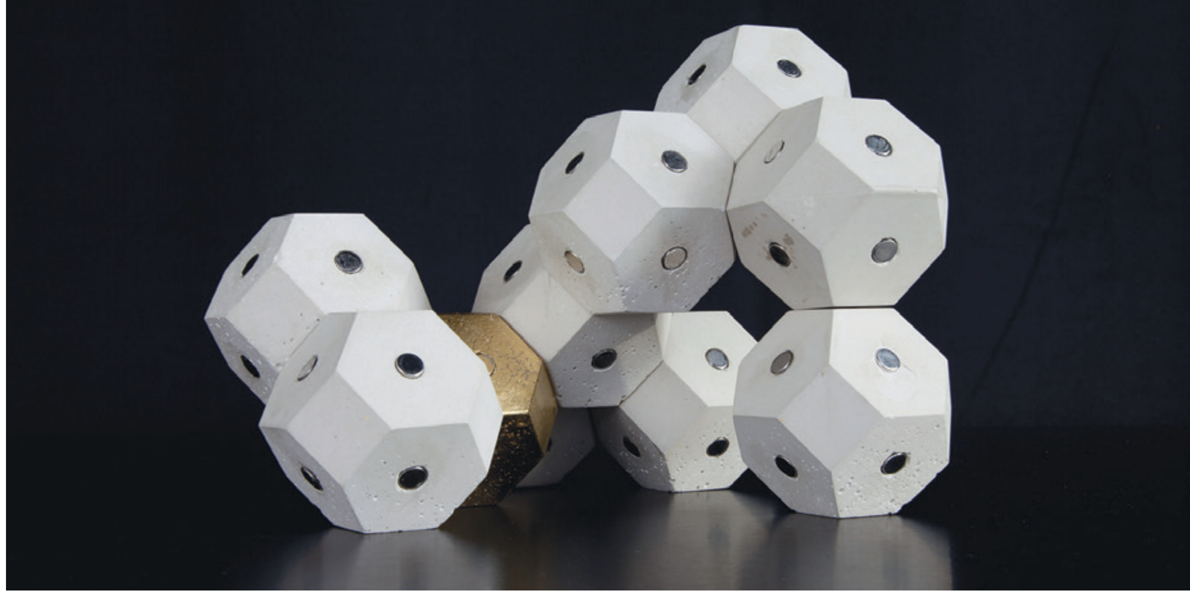

AGGREGATED STRUCTURES: APPROXIMATING TOPOLOGY OPTIMIZED MATERIAL DISTRIBUTION WITH DISCRETE BUILDING BLOCKS

Andrea Rossi, Philipp Eisenbach

September 22nd - 24th, 2017
Rhinoceros, Grasshopper, Karamba, Millipede

The Master Class aims at exploring the combination of current developments in voxel-based design, focusing on topology optimization of material distributions, with research into novel concepts of materials as "digital" entities, composed of discrete elements that can be reversibly assembled in an aggregative process. The participants will be introduced to a custom design and structural optimization design process: relying on voxel-based approaches, topology optimization algorithms will be used to determine density distribution of material under user-defined load and support condition. The resulting density field will be used as driver for the aggregative growth of modular components, approximating the optimized material allocation by combining repetitive modules.

In a masterclass format, the program will focus on the digital workflow of generating topologically optimized material distributions and approximating them with discrete assemblies of modular units. Given a finite set of ready-made physical components with snap-fit connections, participants will explore how the same components could be reused to assemble different structures, generated in response to different structural loads and supports conditions. Such explorations will inform the aggregation processes used, as well as potentially lead to the production of new components designs, to be manufactured and tested during the masterclass. The final output will consist of a series of physical aggregation of modules, representing a response to specific structural constrains.

Through the masterclass, the participants will be introduced to computational methods to generate discrete structures from the aggregation of basic modular units (custom DDU-developed Grasshopper library), as well as to tools to generate optimized material distributions under custom stress conditions (through Millipede), and to strategies to integrate these two separate processes into one coherent design-to-production pipeline.