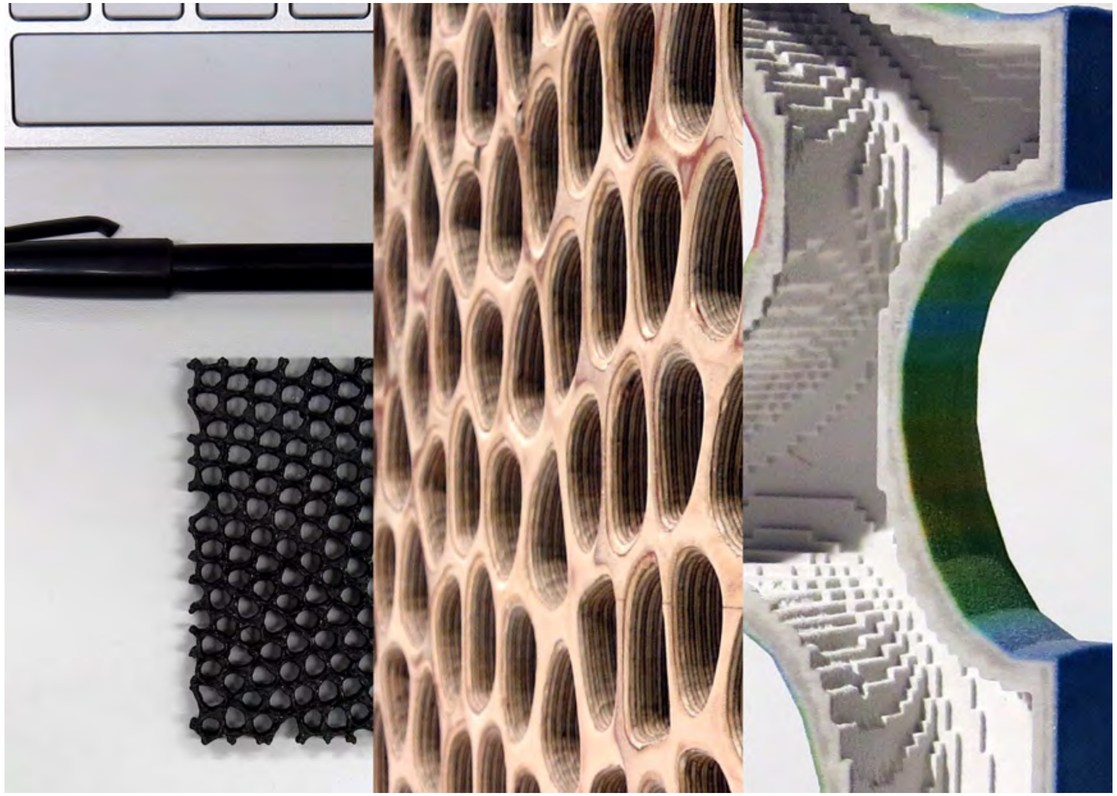
DARLAB

DARLab (Digital Architectural Robotics lab) is a research platform in architecture education that advances experimentation and cross-discipline collaboration among professors, students and industry partners to expand the boundaries of architectural practice.
We are a mixed team of qualified experts from all over the world who work together to obtain the best results out of avant-garde technologies applied to architecture and design. The intention is to give to students and visitors a 360 knowledge of the matter.

The DARLab is located in London South Bank University's Southwark campus, division of Architecture and Build Environment. LSBU is a top modern university in London for its research 'impact'. Nearly three-quarters of London South Bank University's (LSBU) research projects were awarded the two highest possible ratings for 'impact' by the latest university research excellence exercise - REF 2014.



Our Objectives:

Research
Innovation
Sustainability

Federico Rossi AADipl FRSA RIBA II SBA nl

Founder and Director of the DARLAB. Studied at the University of Florence and graduated from the Architectural Association School of Architecture in London. He gained significant professional experience working with Nigel Coates, SOM and Zaha Hadid Architects. He is academic leader for the DARLAB and senior lecturer at London South Bank University, where he is responsible for the digital design courses at Ba(Hons) and MArch in architecture.

We work with

Volkswagen

Quayola

A2i

scm group
The specialists in the wood industry

ARCHITECTURE OF THE FUTURE

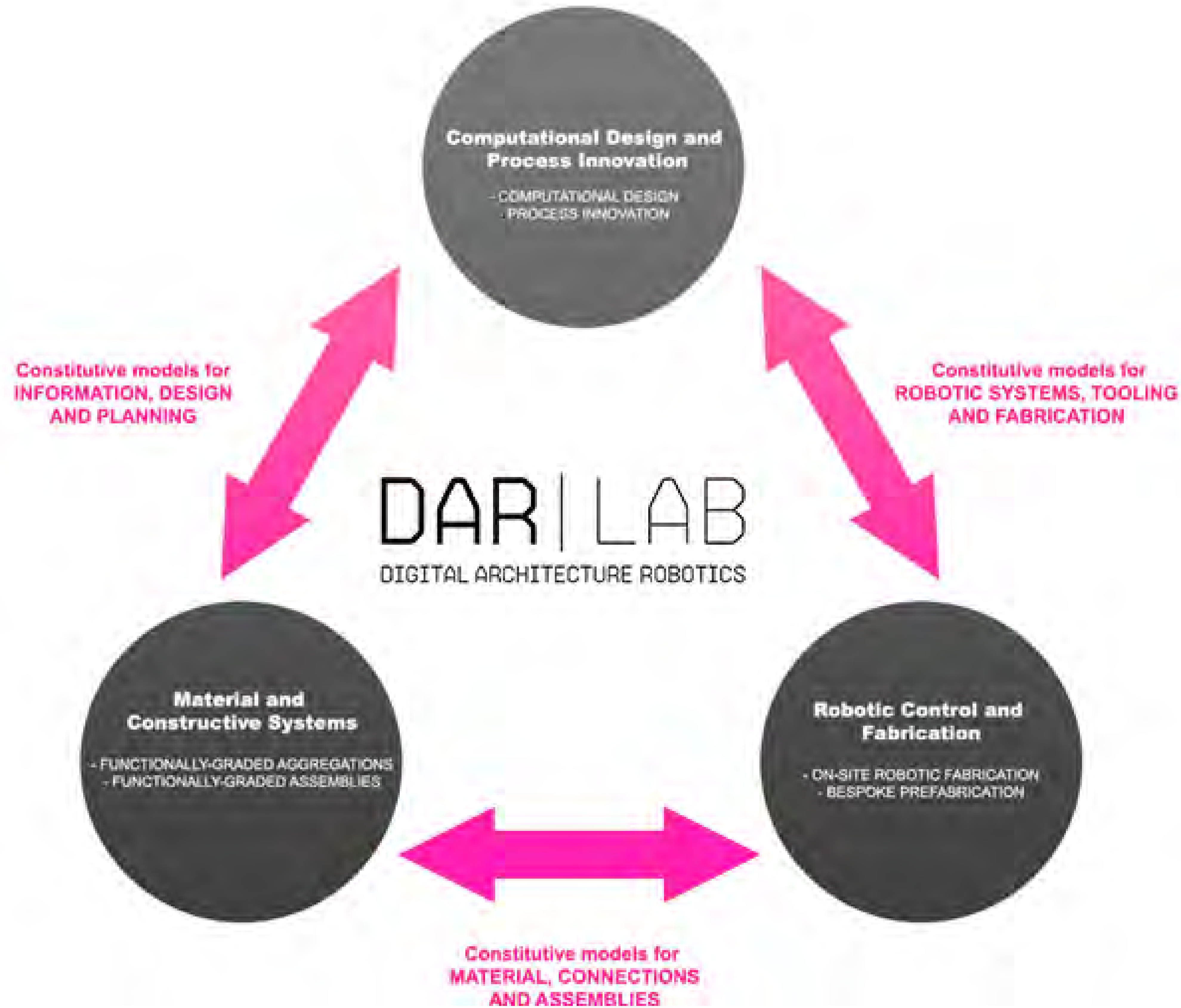
AUTODESK.

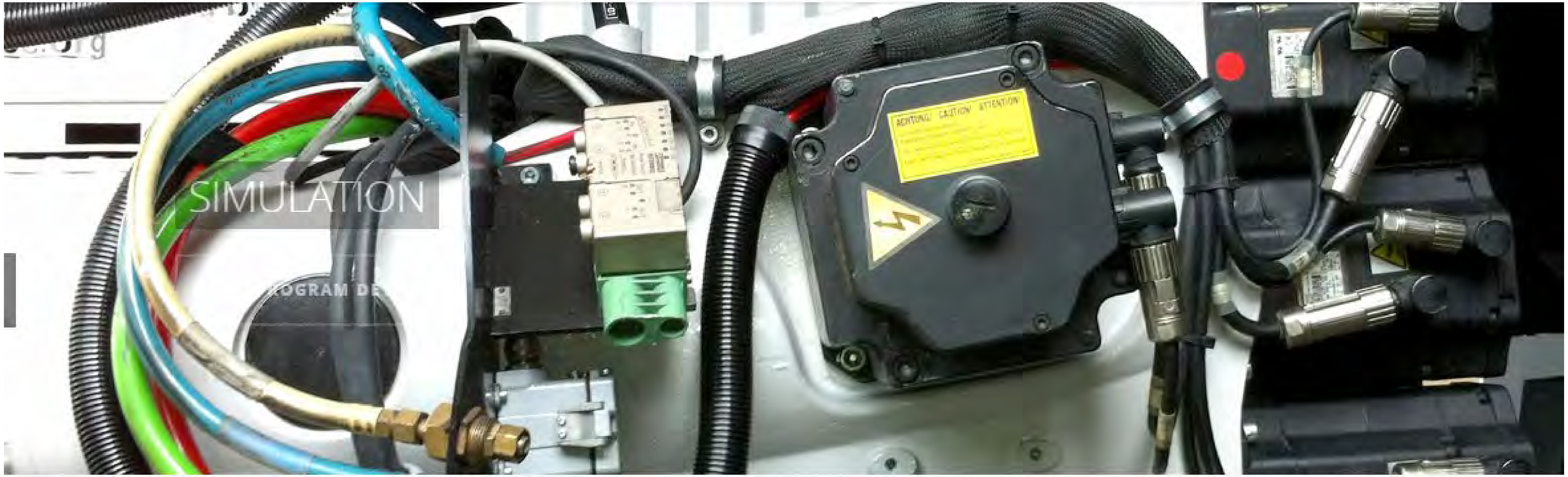
TITANREALITY™

KUKA

UNITED VISUAL ARTISTS


WE SPEAK ROBOTS
KUKA


Computational Design and Process Innovation
- COMPUTATIONAL DESIGN
- PROCESS INNOVATION
Constitutive models for INFORMATION, DESIGN AND PLANNING
Constitutive models for ROBOTIC SYSTEMS, TOOLING AND FABRICATION
DAR | LAB
DIGITAL ARCHITECTURE ROBOTICS
Material and Constructive Systems
- FUNCTIONALLY-GRADED AGGREGATIONS
- FUNCTIONALLY-GRADED ASSEMBLIES
Robotic Control and Fabrication
- ON-SITE ROBOTIC FABRICATION
- BESPOKE PREFABRICATION
Constitutive models for MATERIAL, CONNECTIONS AND ASSEMBLIES



DIGITAL DESIGN

Accusantium quam, ultricies eget tempor id, aliquam eget nibh et. Maecen aliquam, risus at semper ullamcorper, magna quam.

COMPUTATION DESIGN

Accusantium quam, ultricies eget tempor id, aliquam eget nibh et. Maecen aliquam, risus at semper ullamcorper, magna quam.

SIMULATION

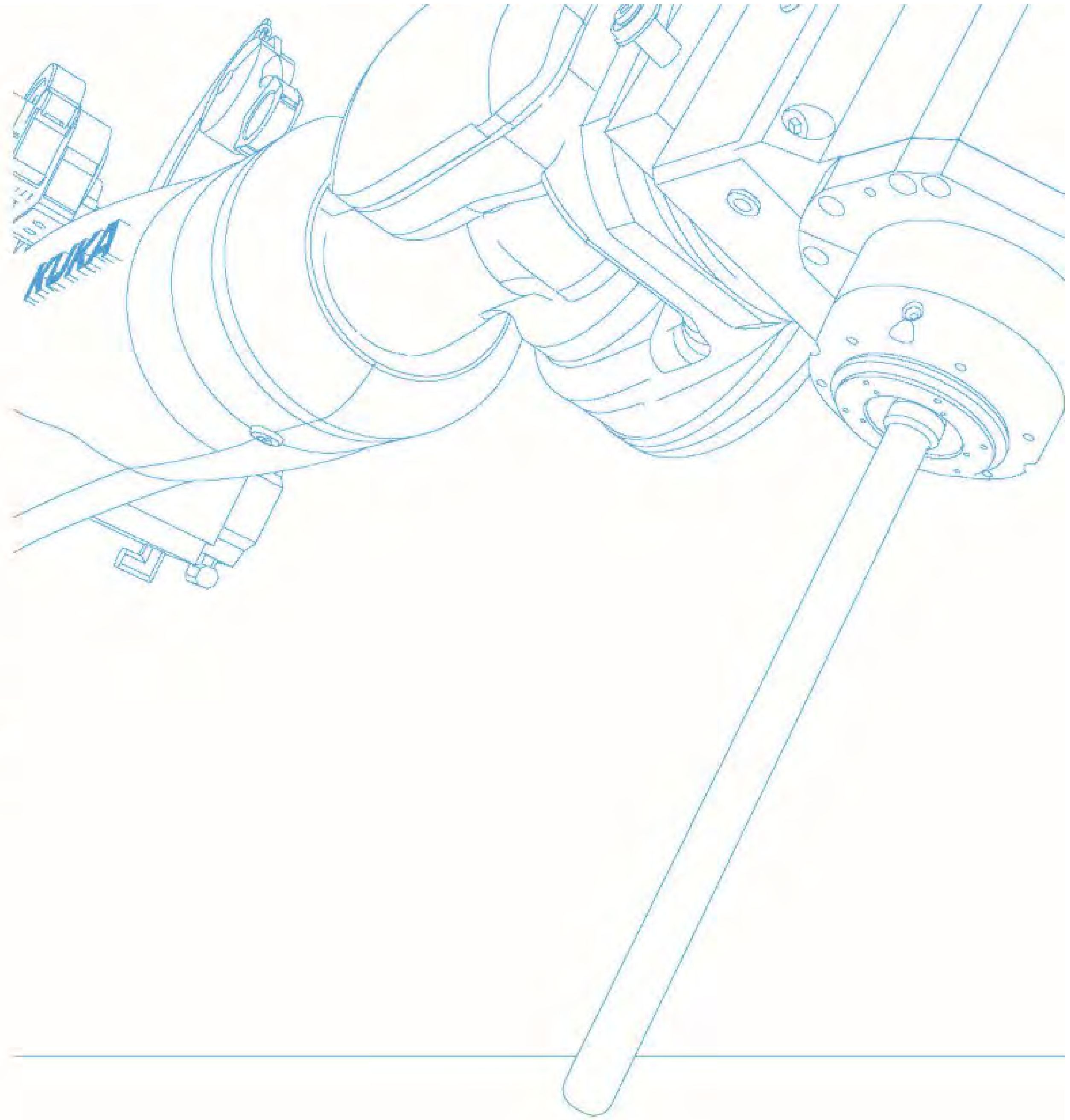
Accusantium quam, ultricies eget tempor id, aliquam eget nibh et. Maecen aliquam, risus at semper ullamcorper, magna quam.

ROBOTIC FABRICATION

Accusantium quam, ultricies eget tempor id, aliquam eget nibh et. Maecen aliquam, risus at semper ullamcorper, magna quam.

FA BRI CATI ON

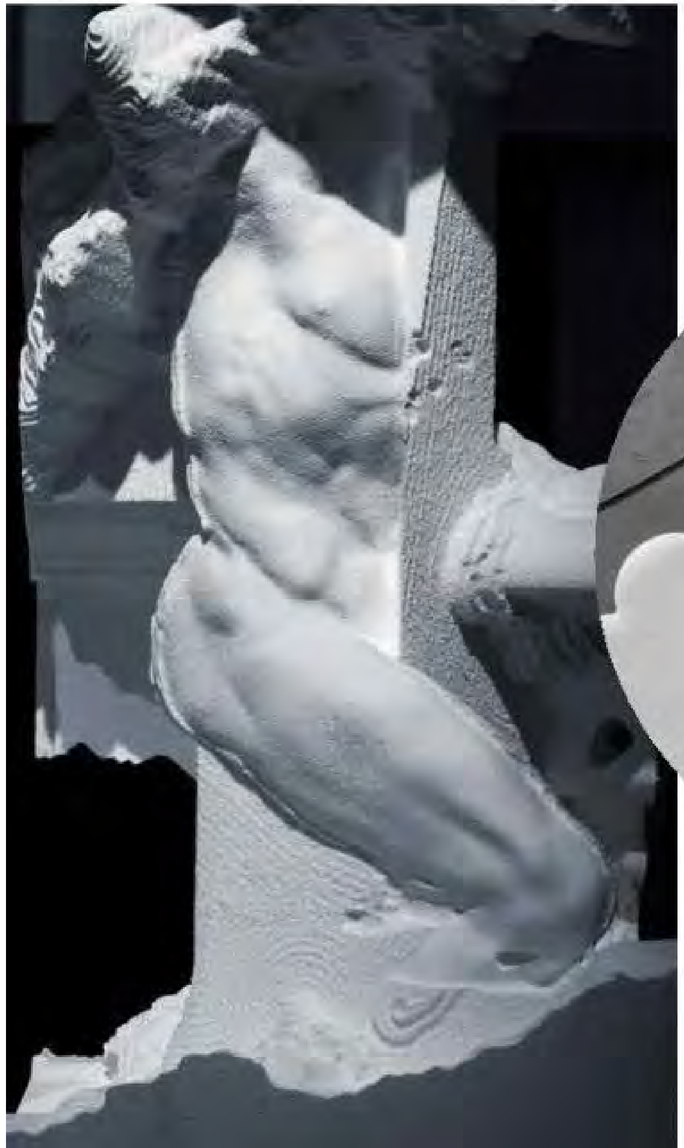
ROBOT



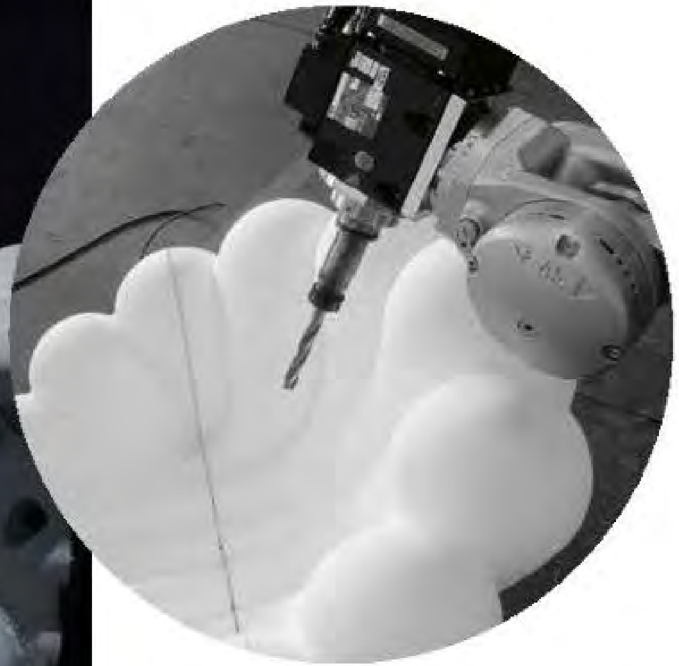
Applications

Regardless the types of part you need to produce, our **robot configurations will provide total flexibility. Streamline** automation for entertainment, design and art projects.

Our technology, your ideas! Unleash your creativity!



Sculptures: design installations with different degrees of complexity



Furniture: home décor & accessories for interior design and furnishing

Signage: 3D advertising signs

Stage scenery: design of backstage elements for theatrical and cinematographic purposes

Materials

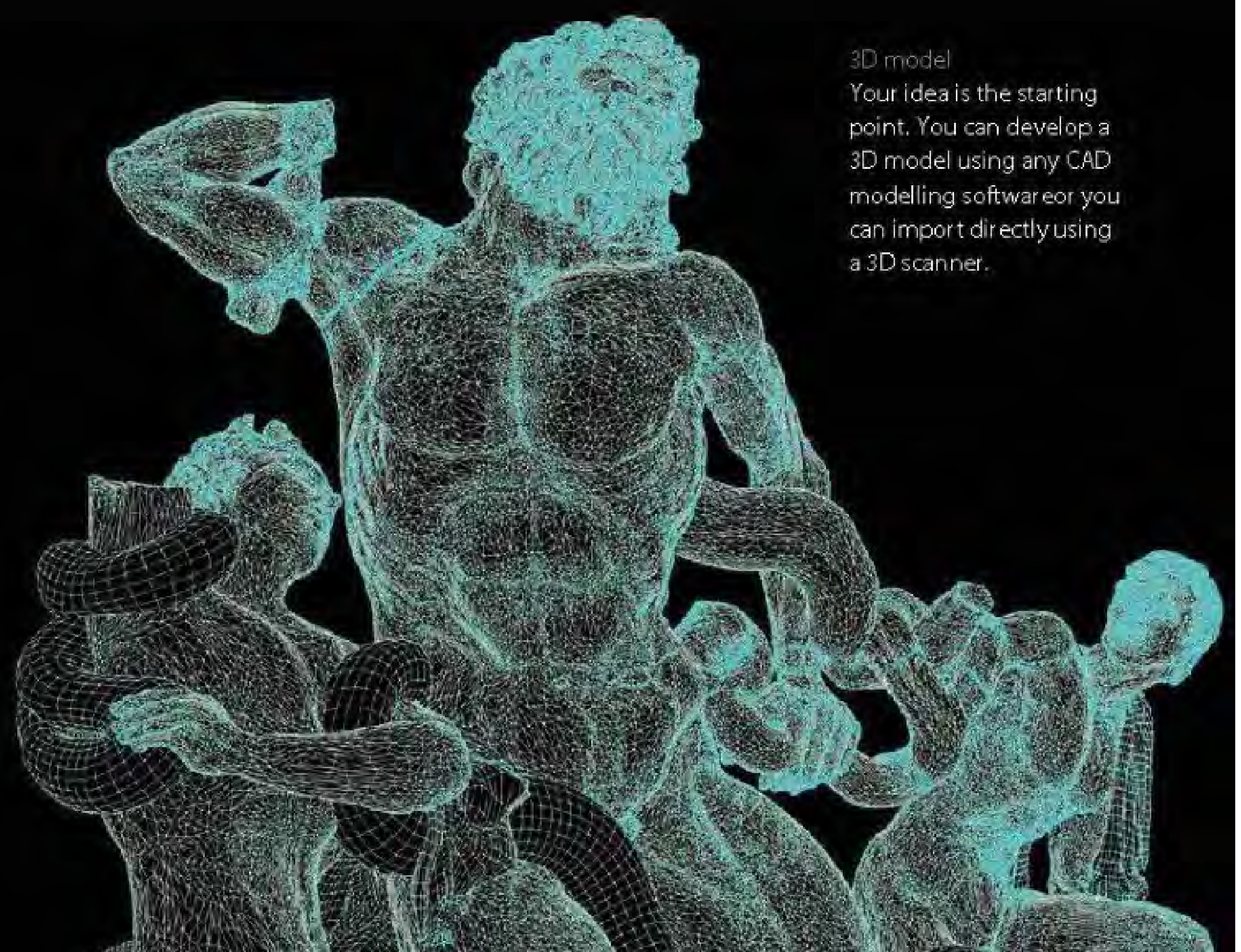
Polistirene/Foam

Wood

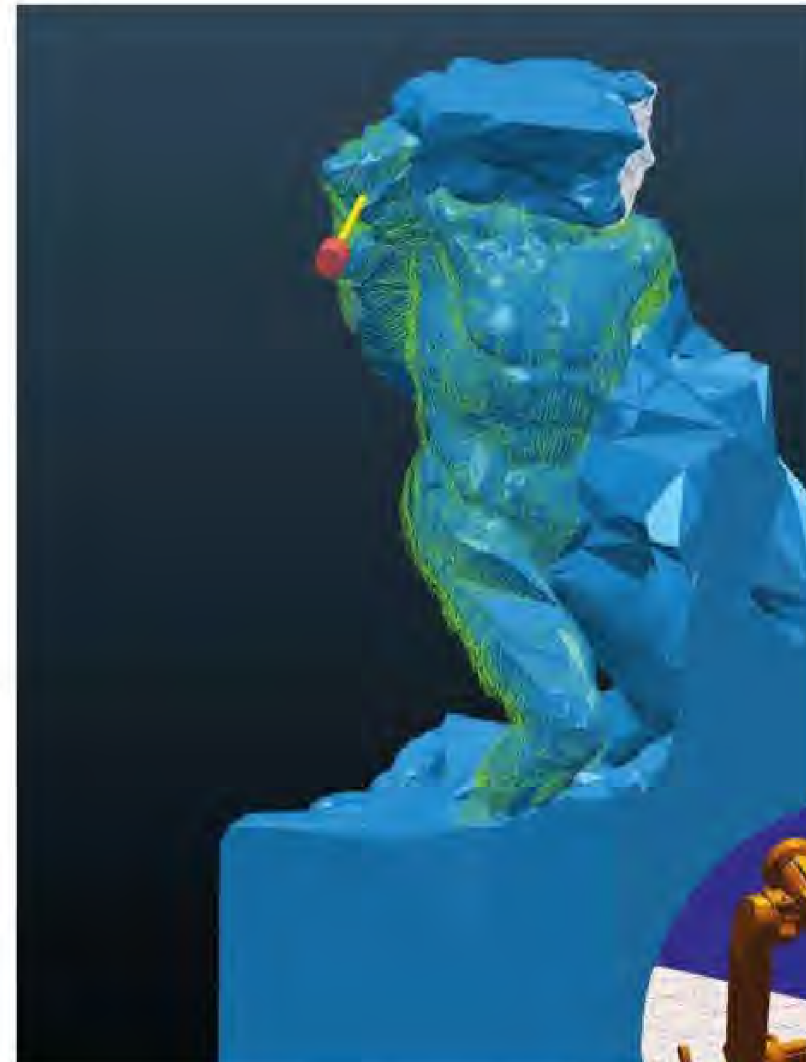
Plastic

Modelling board

Production process

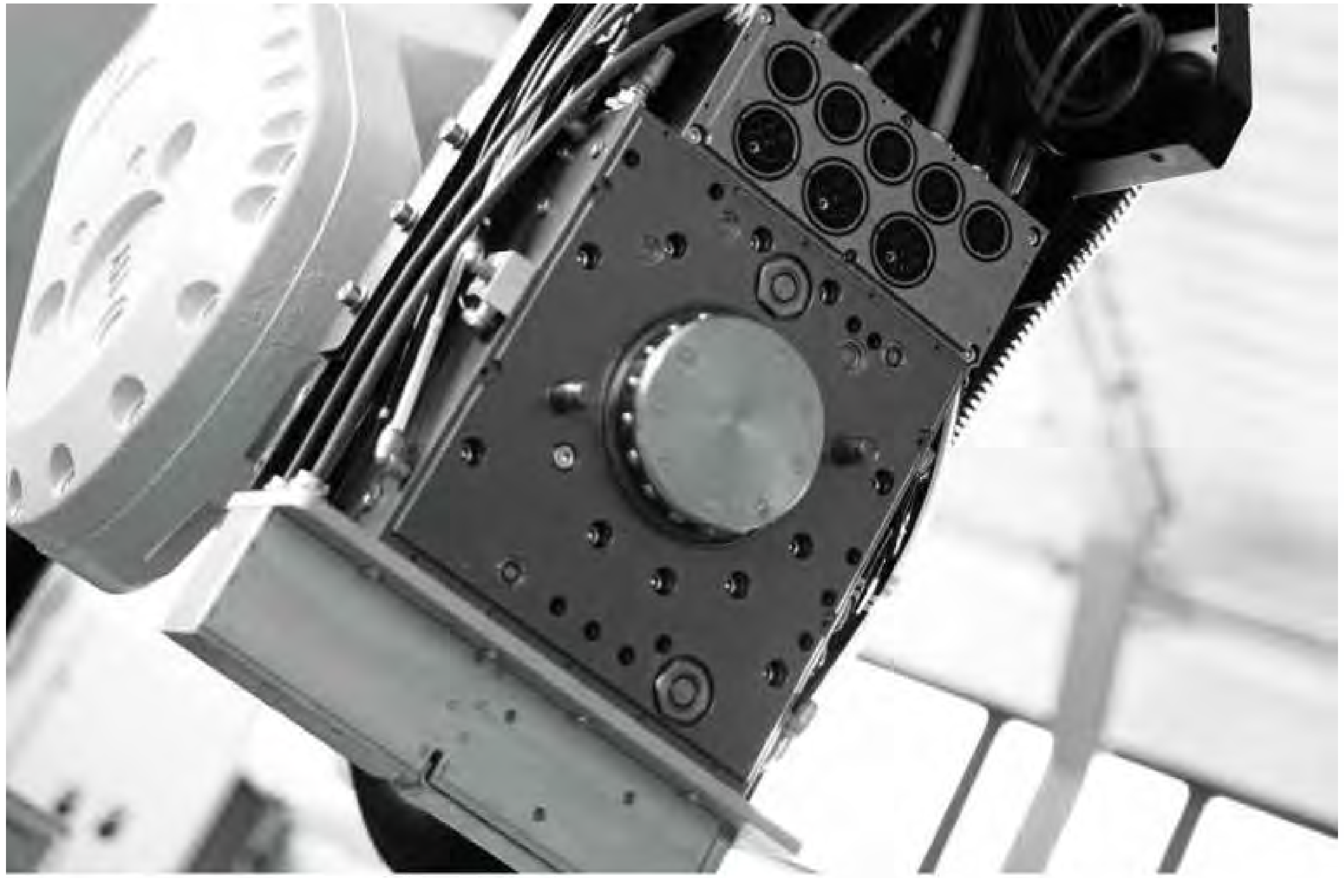


3D model
Your idea is the starting point. You can develop a 3D model using any CAD modelling softwareor you can import directly using a 3D scanner.



Toolpaths and simulation
From the 3D model you generate a toolpath strategy using a 5 axis CAM software solution. Simulate and post-process the CAM output using our proprietary software ROBOmove.

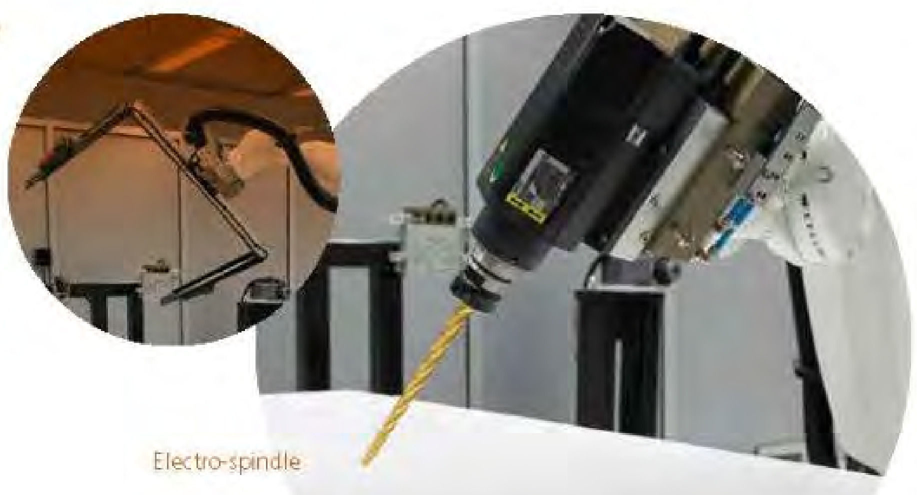
Processing
Import the kinematic simulation into our robot interface QDcnc to start the milling process.



Multifunction

The quick change-plate allows the fast and easy change of the end effector, thus will enable to perform various machining operations using different tools with a single robot solution. Currently are available various end effector such as hotwire cutter, glue deposition and sanding device.

Hot Wire Cutter

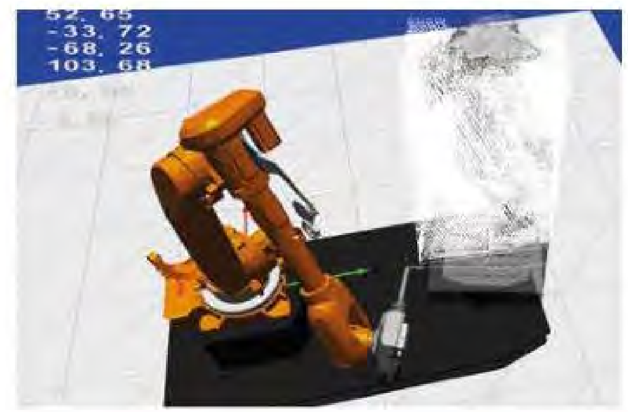


Electro-spindle

Software workflow

CAM

Creation of tool paths for the management of blades, cutters and tools in general



Kinematic Solver

Creation of tool paths for the management of blades, cutters and tools in general

TCP controll software

Proprietary user interface for the full robot control

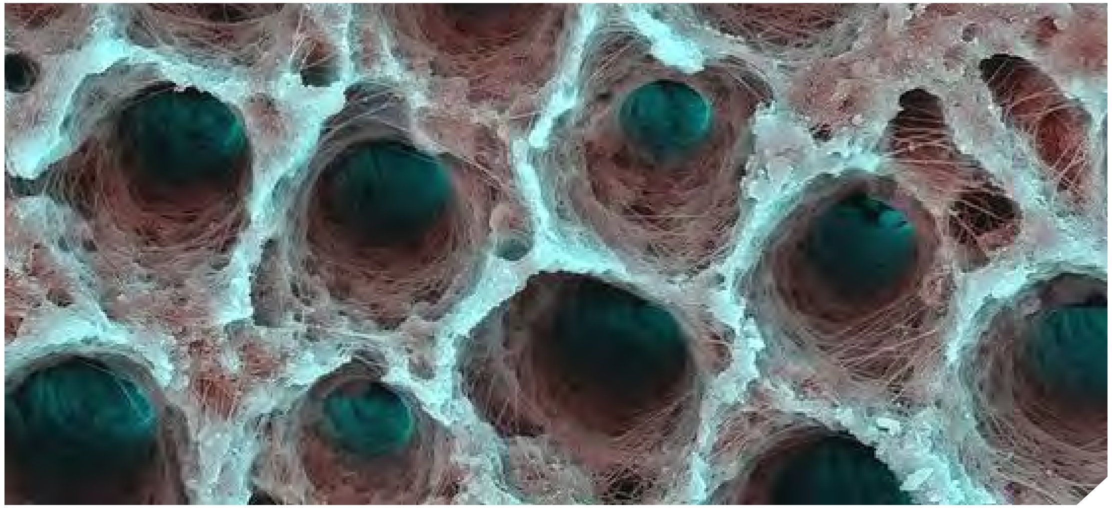
End effector

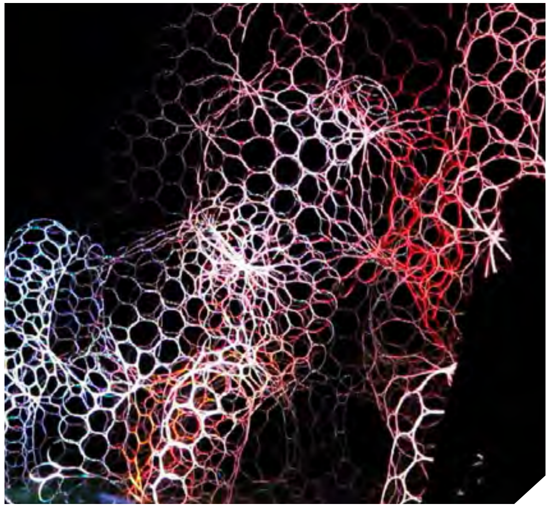
Customized components to increase productivity and automation.

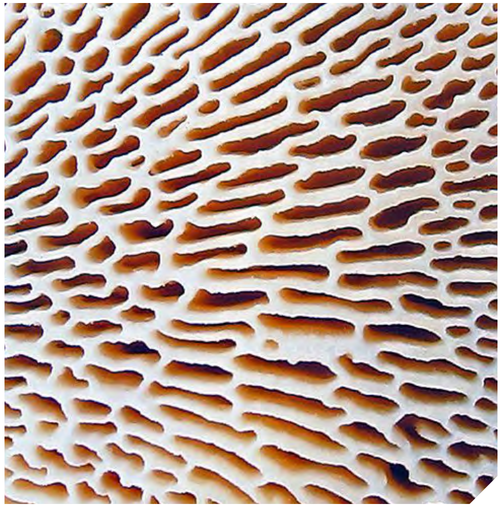
Linear Track
The linear track will add a further axis to the robot, thereby considerably extending the work envelope with no limitations in length.

Rotary tables
The rotary table adds the 7th axis increasing significantly the robot working envelop allowing to mill large parts. For instance the rotary table is a key factor for those who want to make sculptures. The load supported by the rotary table will vary accordingly to task required.

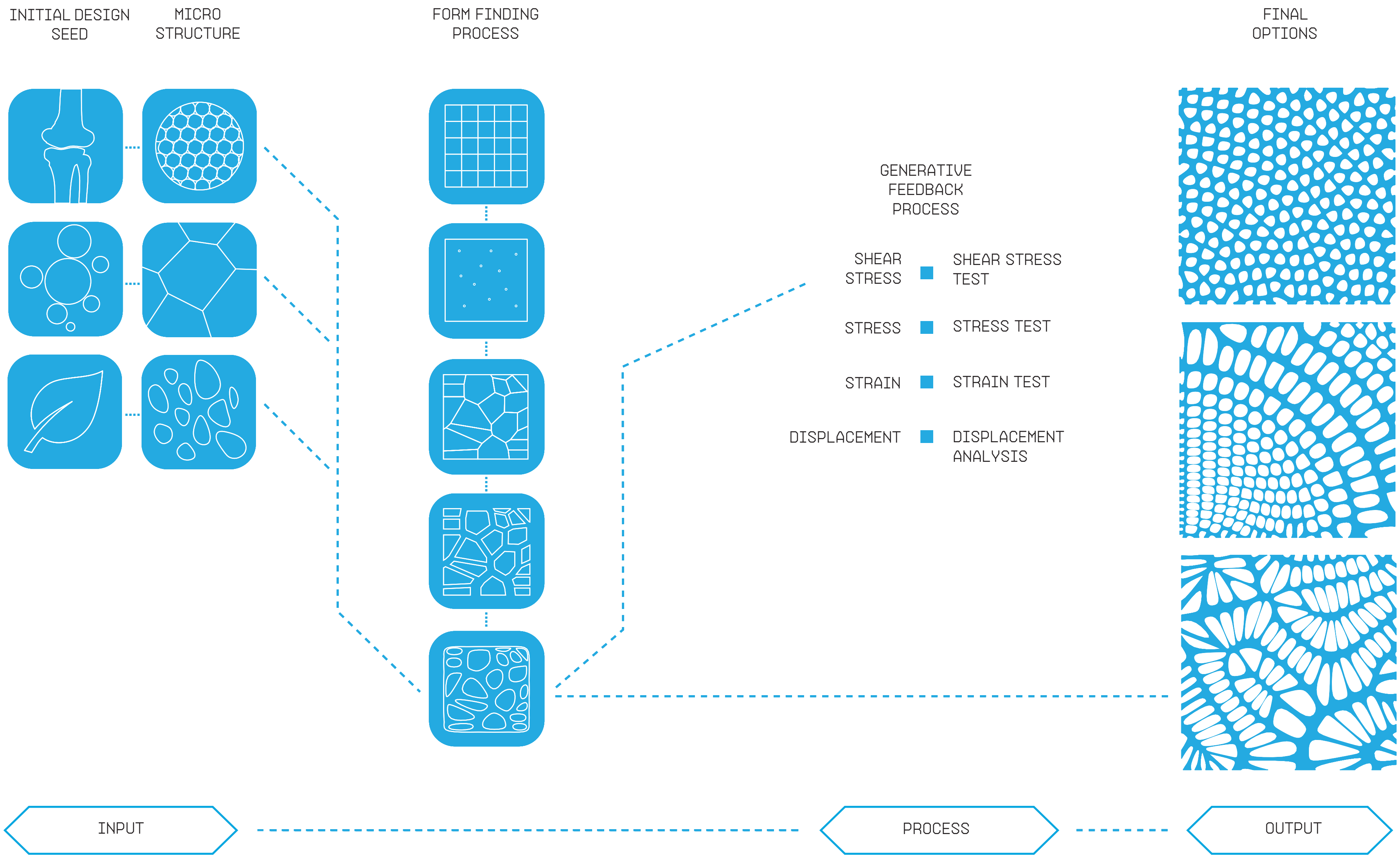
Tool rack
The rack is designed to enable the robot to perform an automatic tool changing. The rack will store safely the tools from dust with open/close mechanism and a pre-setting device will measure the tools through an automated process, minimizing inaccuracies.



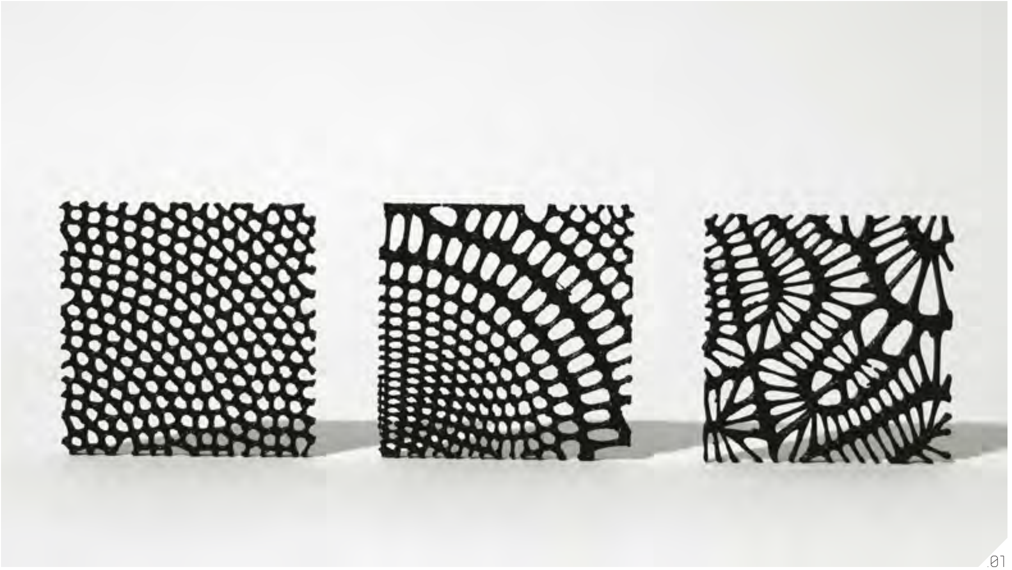




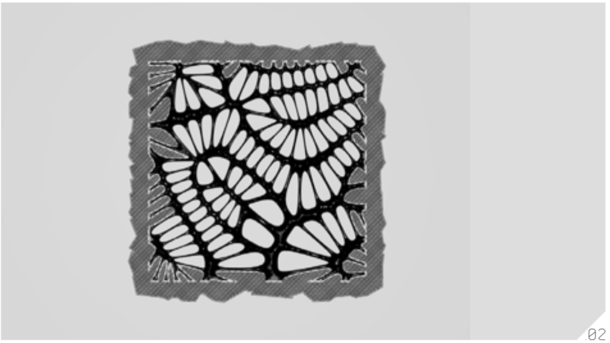
-BONES MICROSTRUCTURE-
/
/
Bones microstructures recorded
at different level of magnification,
with the aid of different instruments.
//



-PANELS ITERATIVE APPROACH-
/
/
Figure showing the process behind the design of the panel.
//



.01



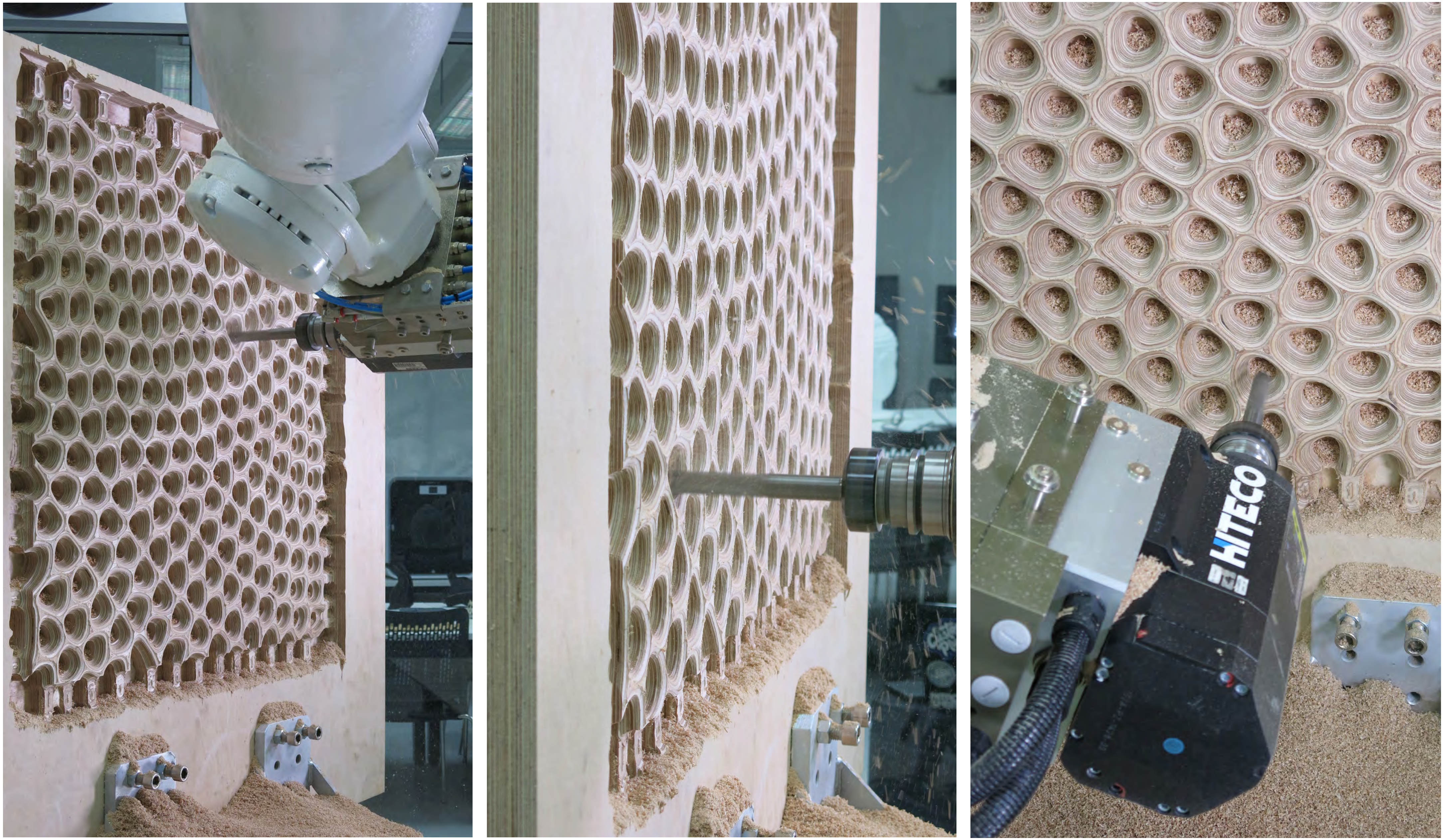
.02

.03

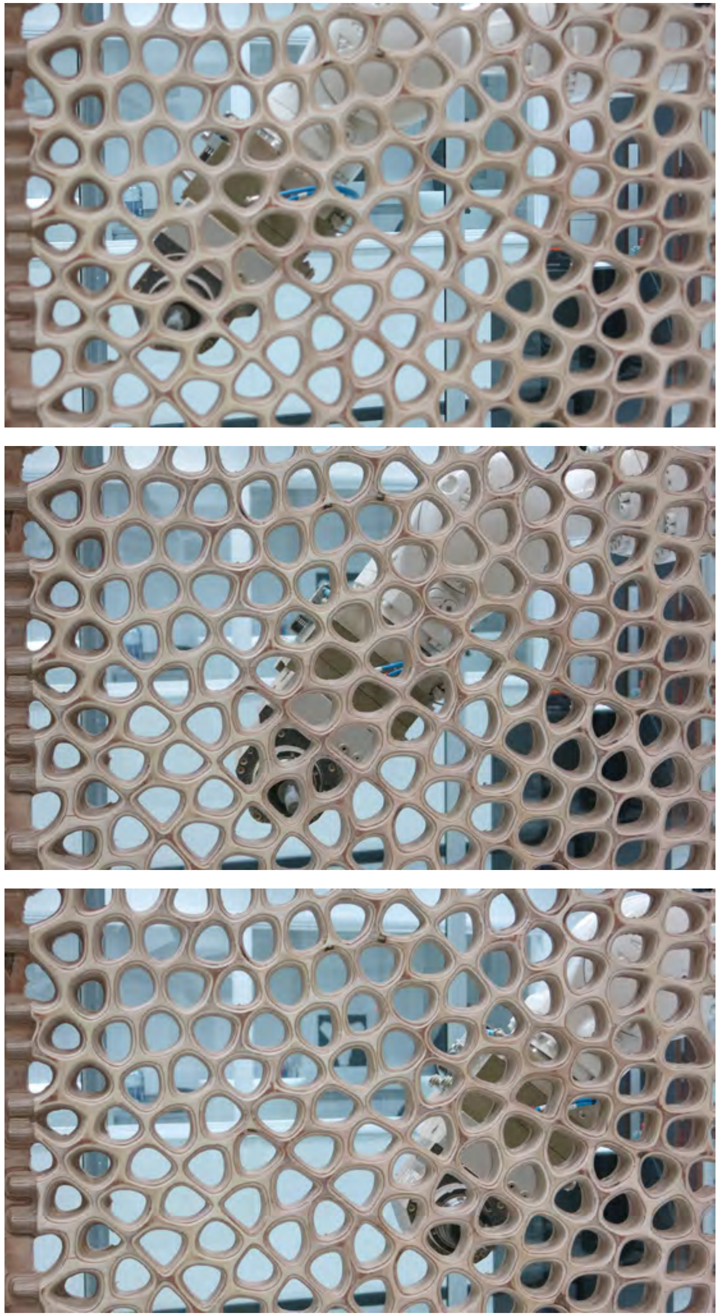
.04

.06

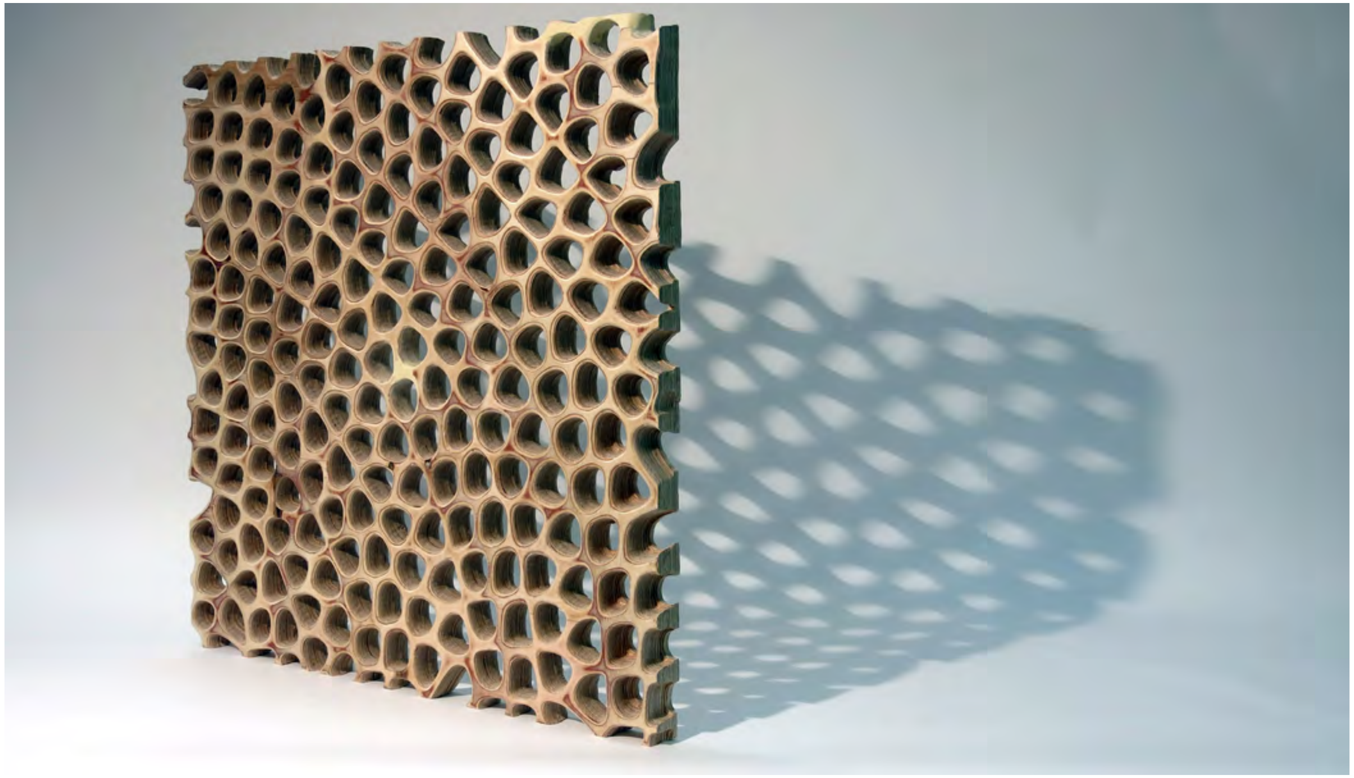
-3D PRINT INITIAL RESEARCH-
/
/
Once the intended result is achieved with the 3d modellation , the next step is to create some physical model.
.01
Initaial research shows 3D printed panels reduced in scale to fit in a hand.
/
.02
Washable material support
/
.03 .04 .05
Each represent a different point of the panel, which then is printed 1:1 scale.
//



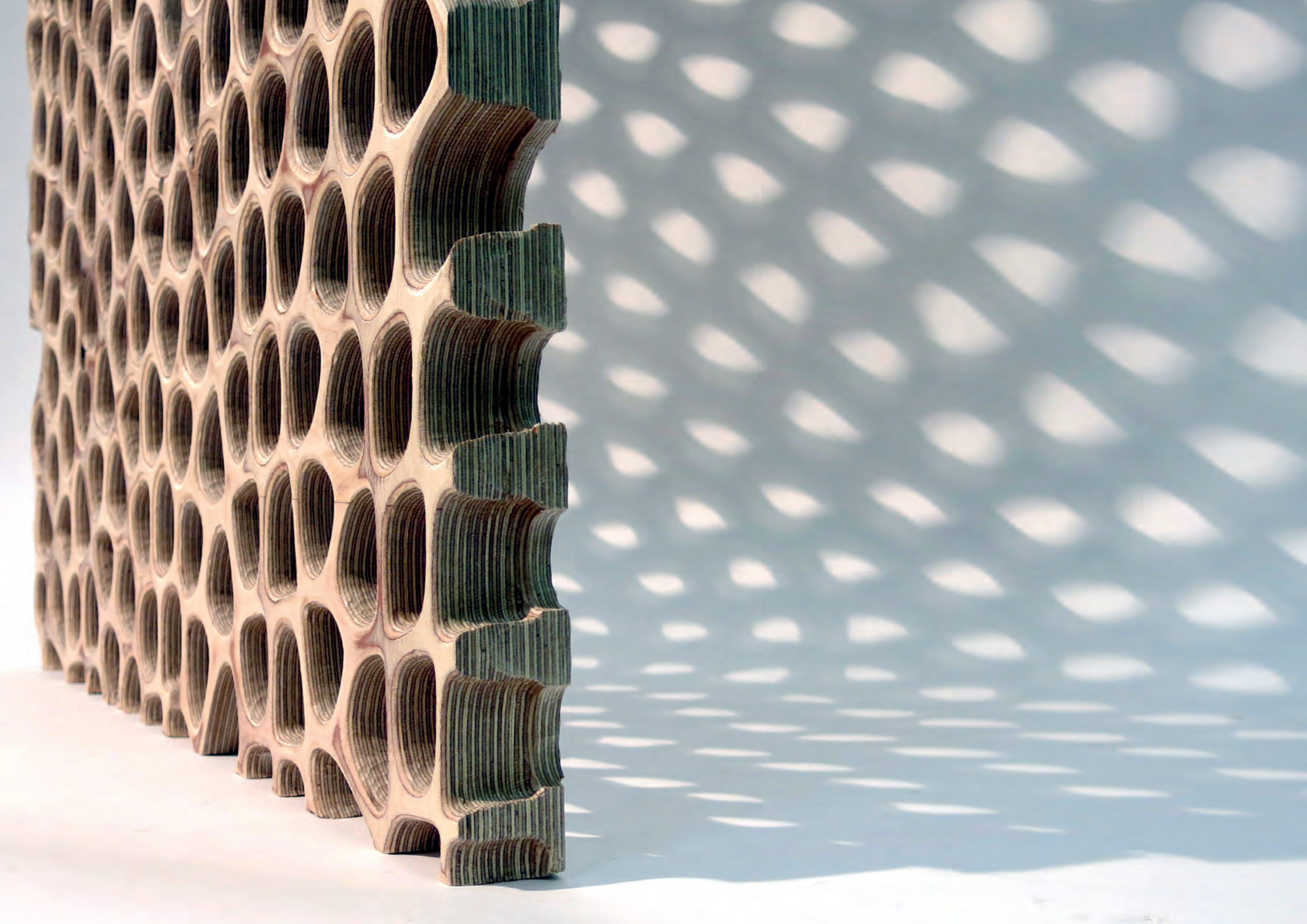
-FABRICATION PROCESS-
/
Morphogenetic pattern, robot milling.
//



-FABRICATION PROCESS-
/
Robot movements.
//



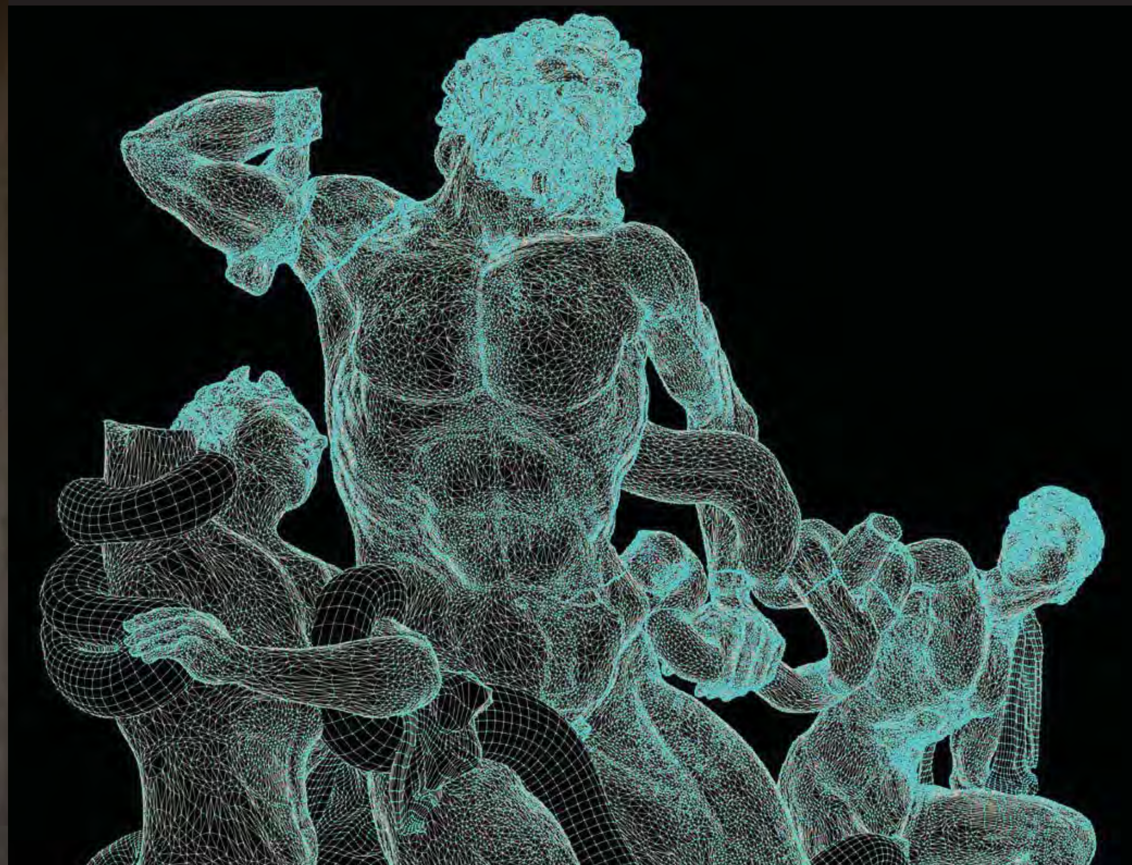
-FABRICATION PROCESS-
/
Final result.
//




DRIVE
VOLKSWAGEN GROUP FORUM
HUMAN
FACTOR
ENDLESS PROTOTYPING
01.07. - 27.08.2016
© Quayola
ARS ELECTRONICA LINZ
DRIVE. Volkswagen Group Forum Berlin
www.drive-volkswagen-group.com

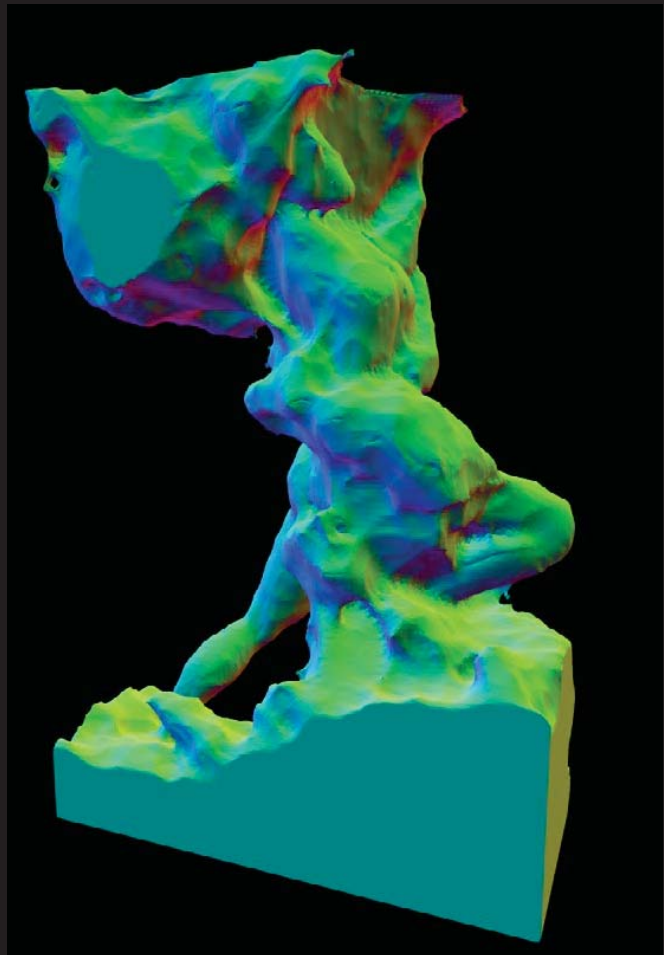
Source

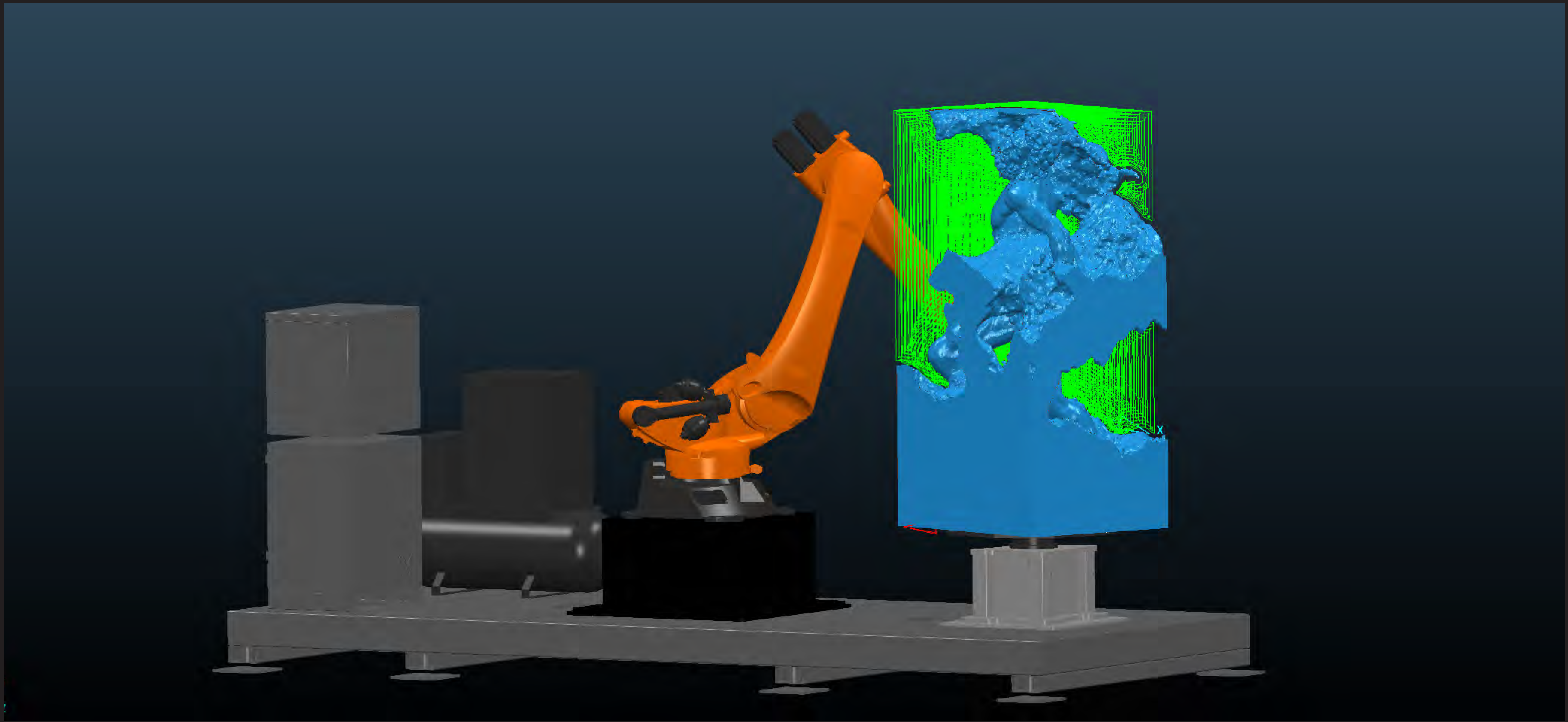
All the produced pieces in the exhibitions are variations and reinterpretations of the Laocoön and His Sons, one of the most iconic ancient sculptures that has been a ground in spiration for generations of artists throughout history (including Michelangelo's unfinished Captives).
The geometry has been acquired through a combination of 3d-scanning and 3d-modelling.

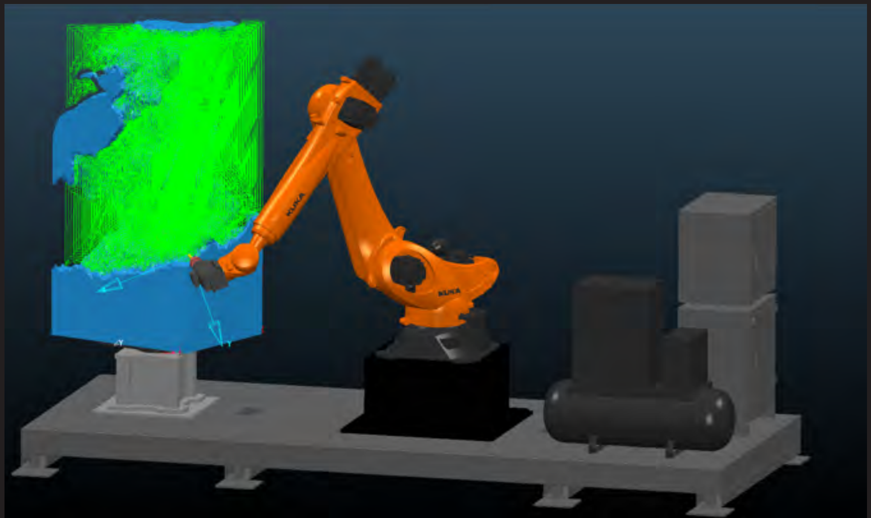


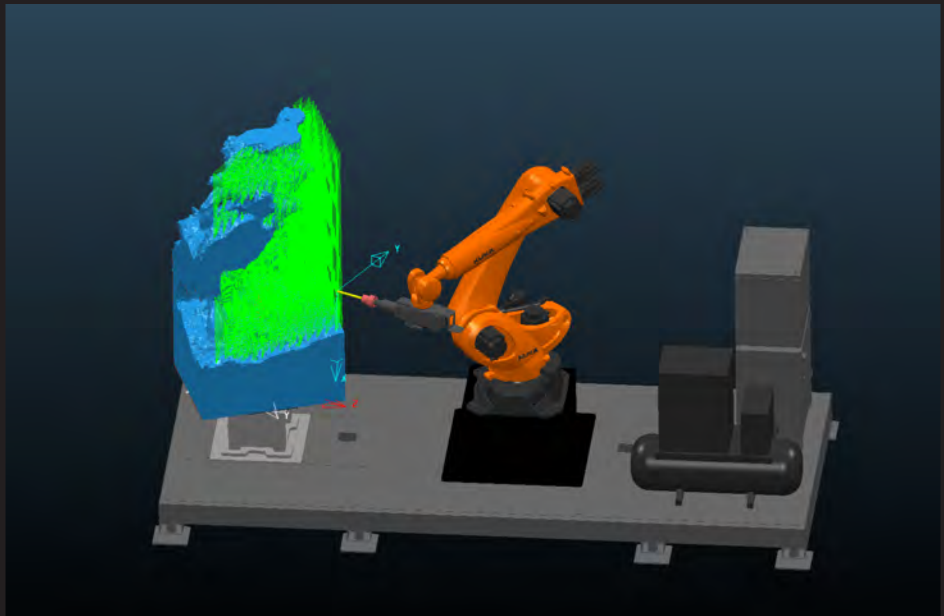
Digital Sculpting

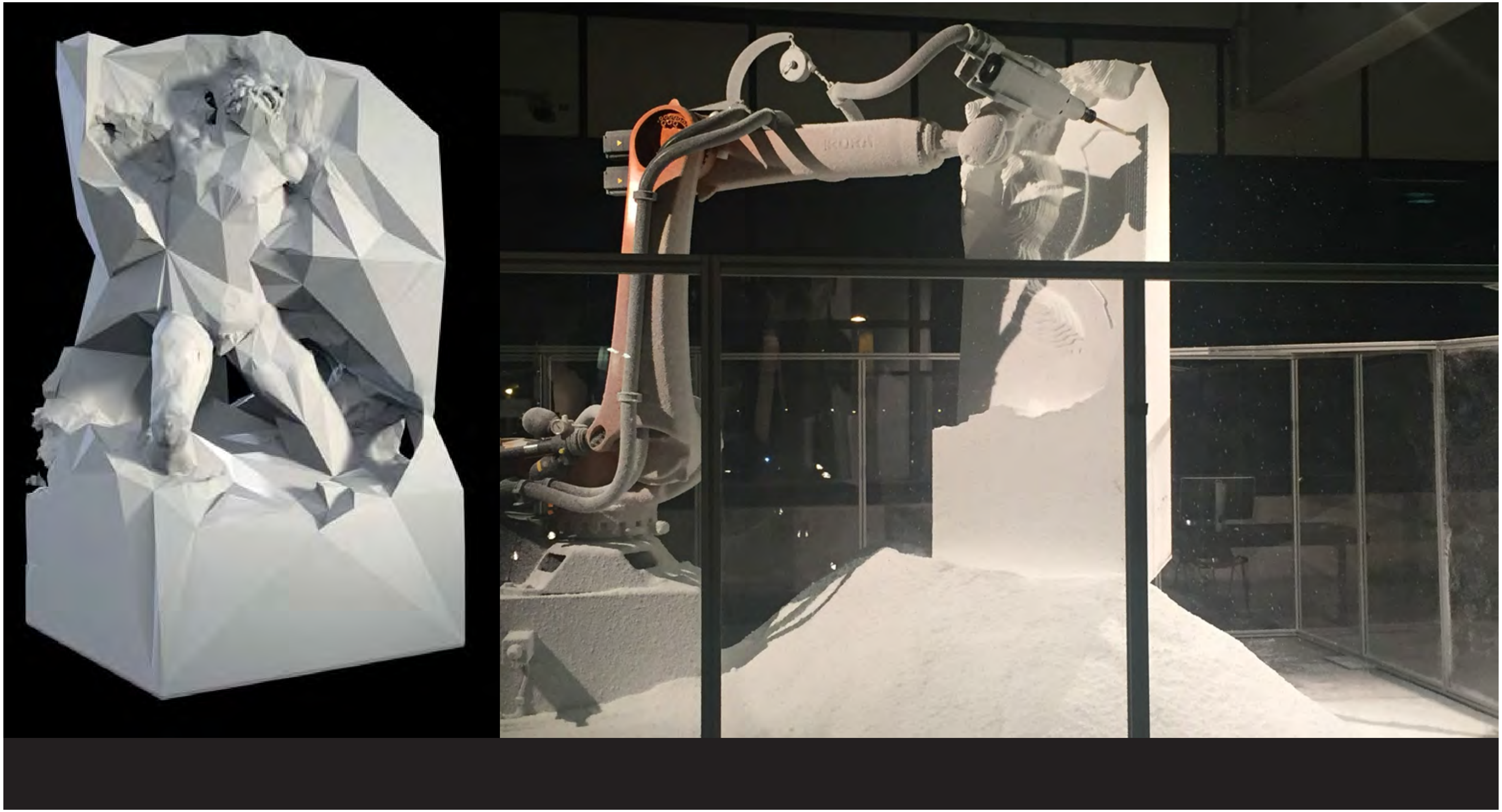
The geometry of the original sculpture is subject through a series of computational processes via custom software specifically built for the project.
Algorithmic formations are digitally grown from and within the sculpture to simulate endless variations.
The designs are then transformed into set of instructions for the robotic milling process





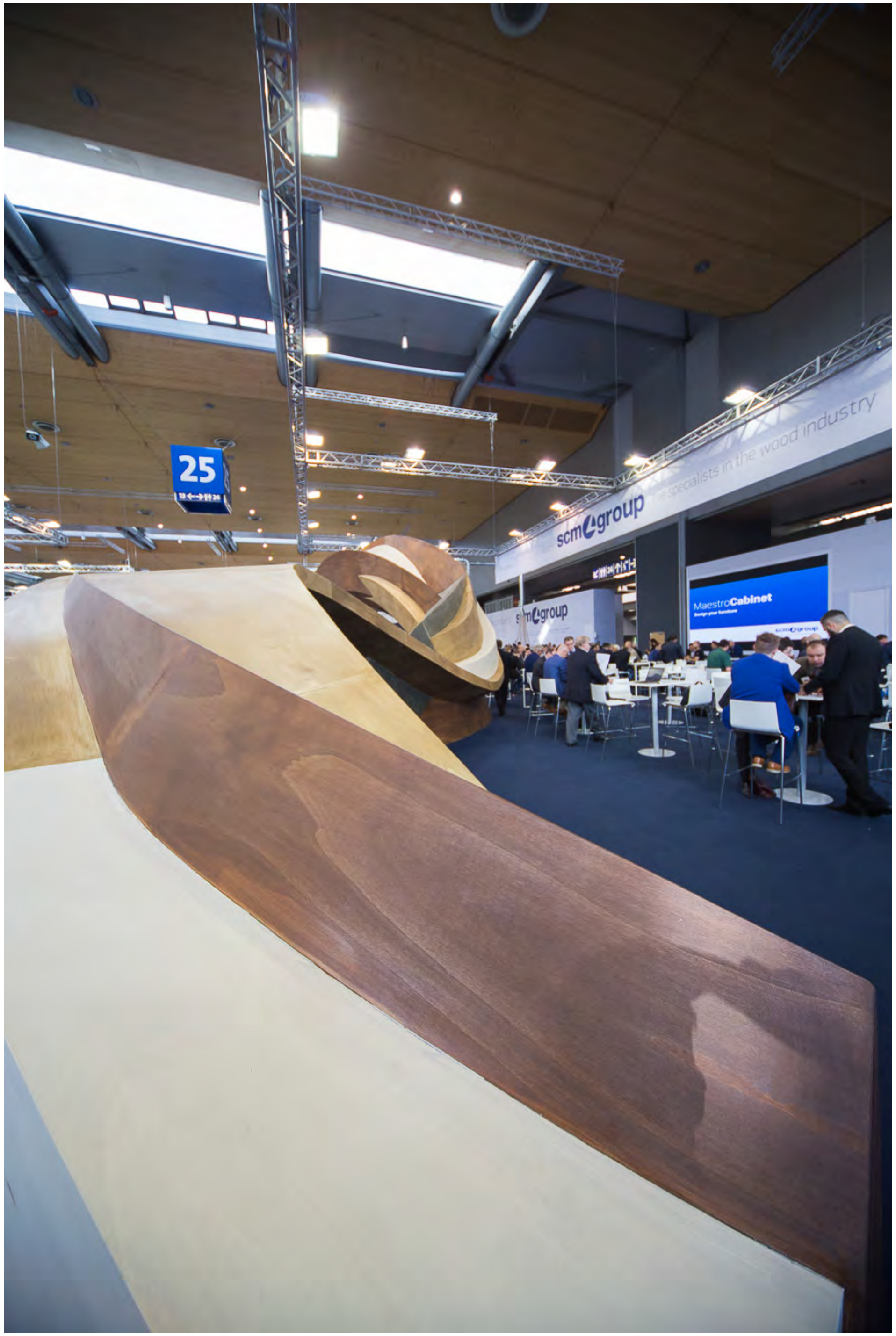




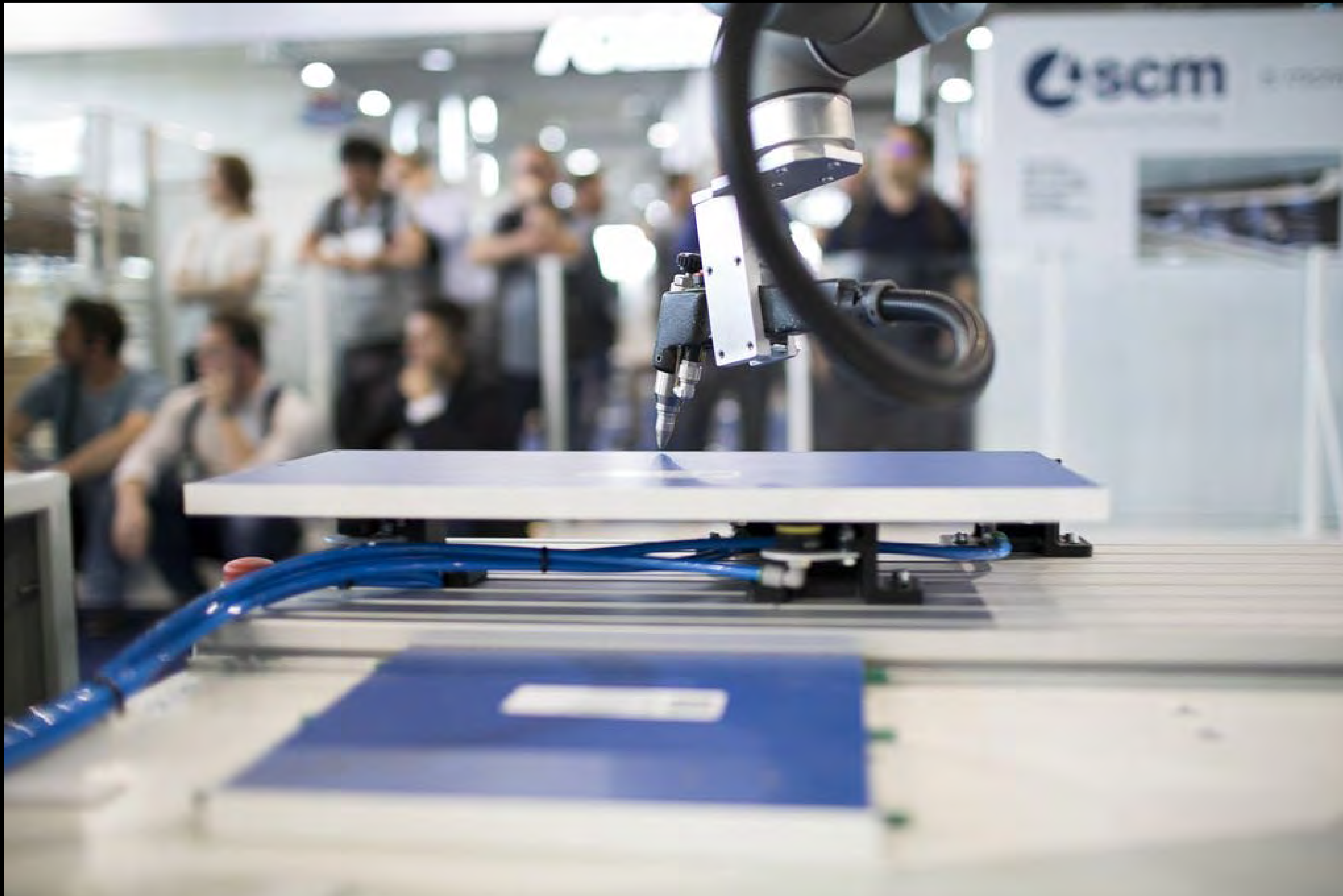


Quayola
Itinerary installation developed for the World Wide Universal Expo Astana 2017

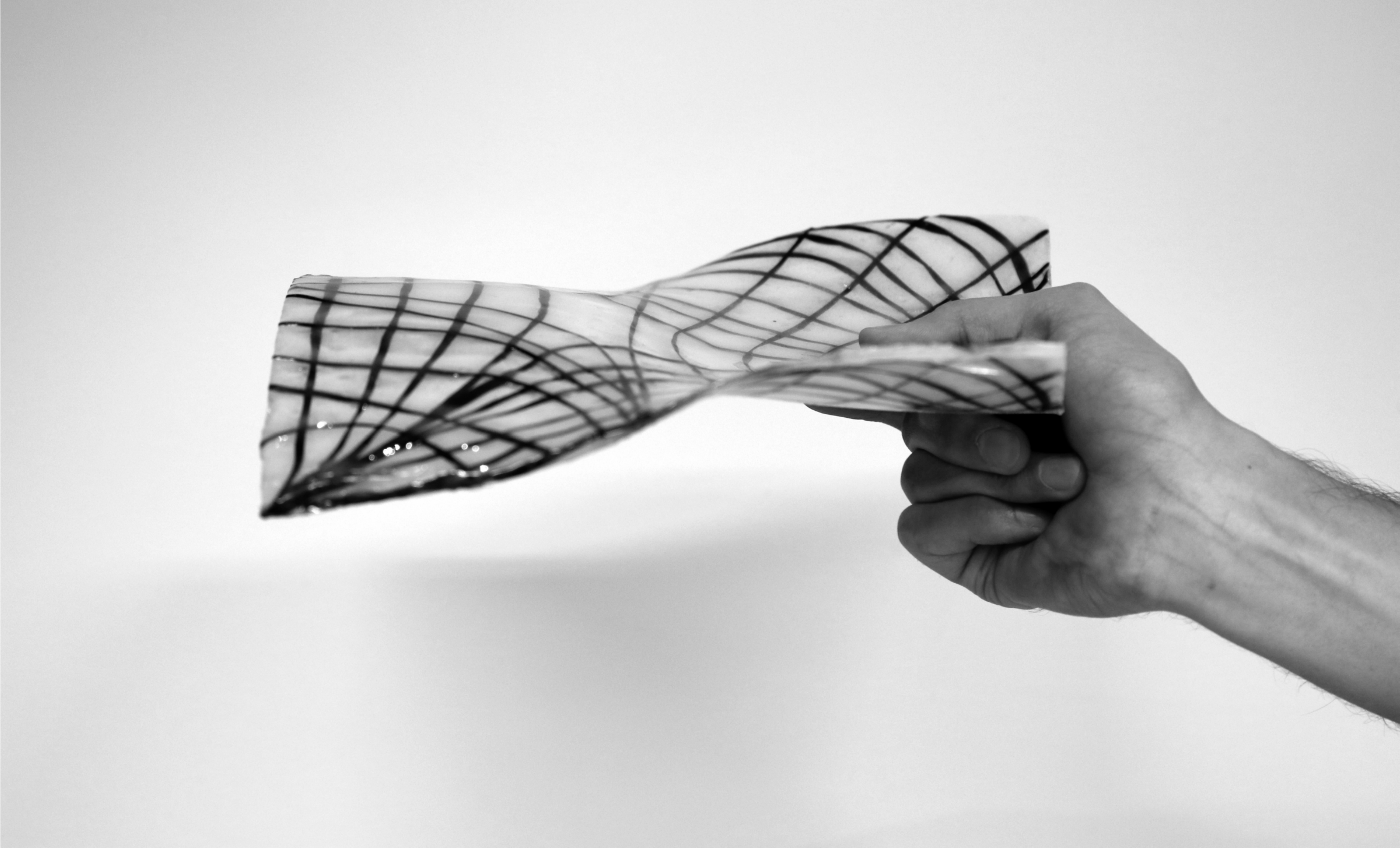
SCM Group
Itinerary Pavilion for Hanover Wood Fair

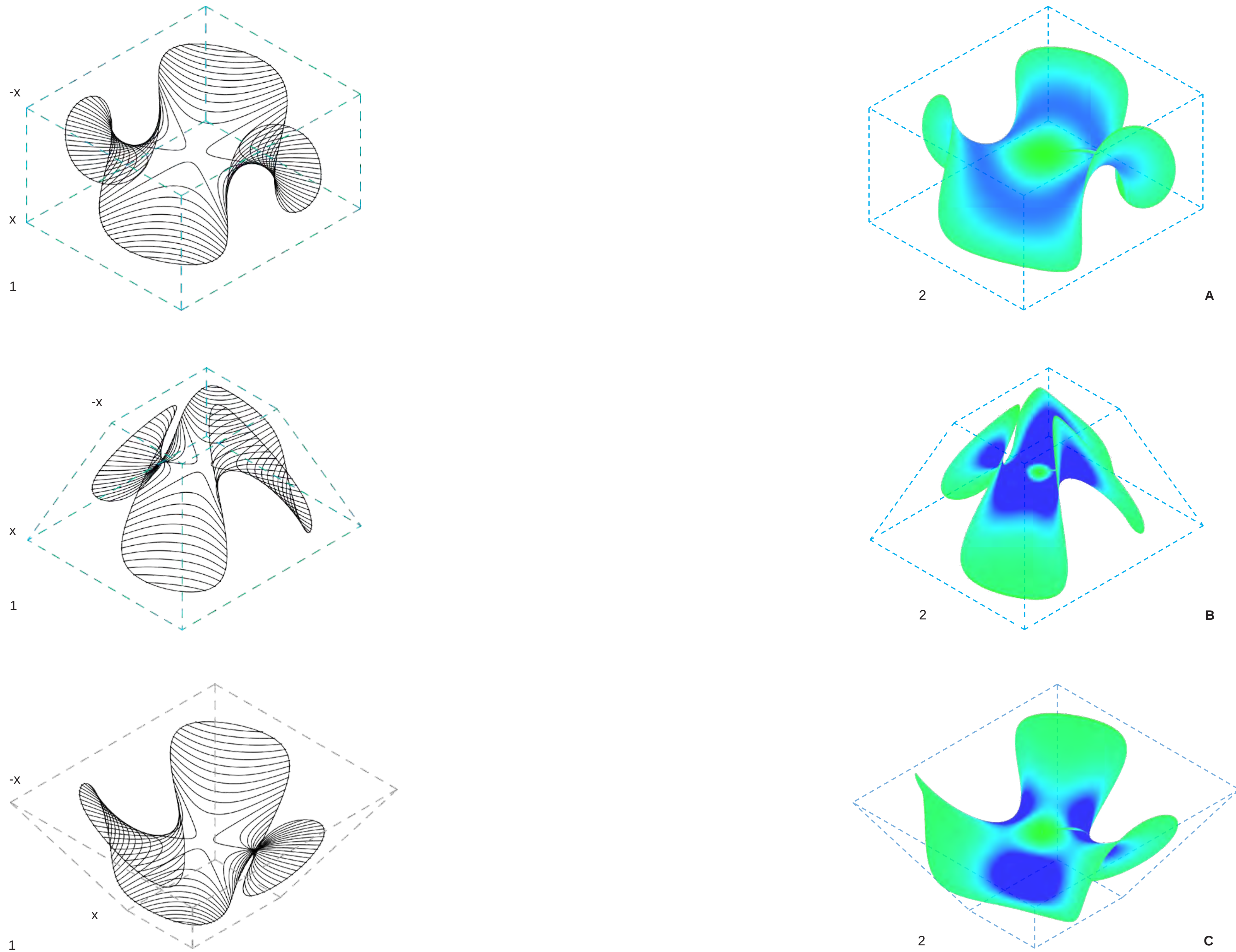

25
scmgroup
the specialists in the wood industry
MaestroCabinet

ROBOT ASSEMBLY


scm


HSK F63



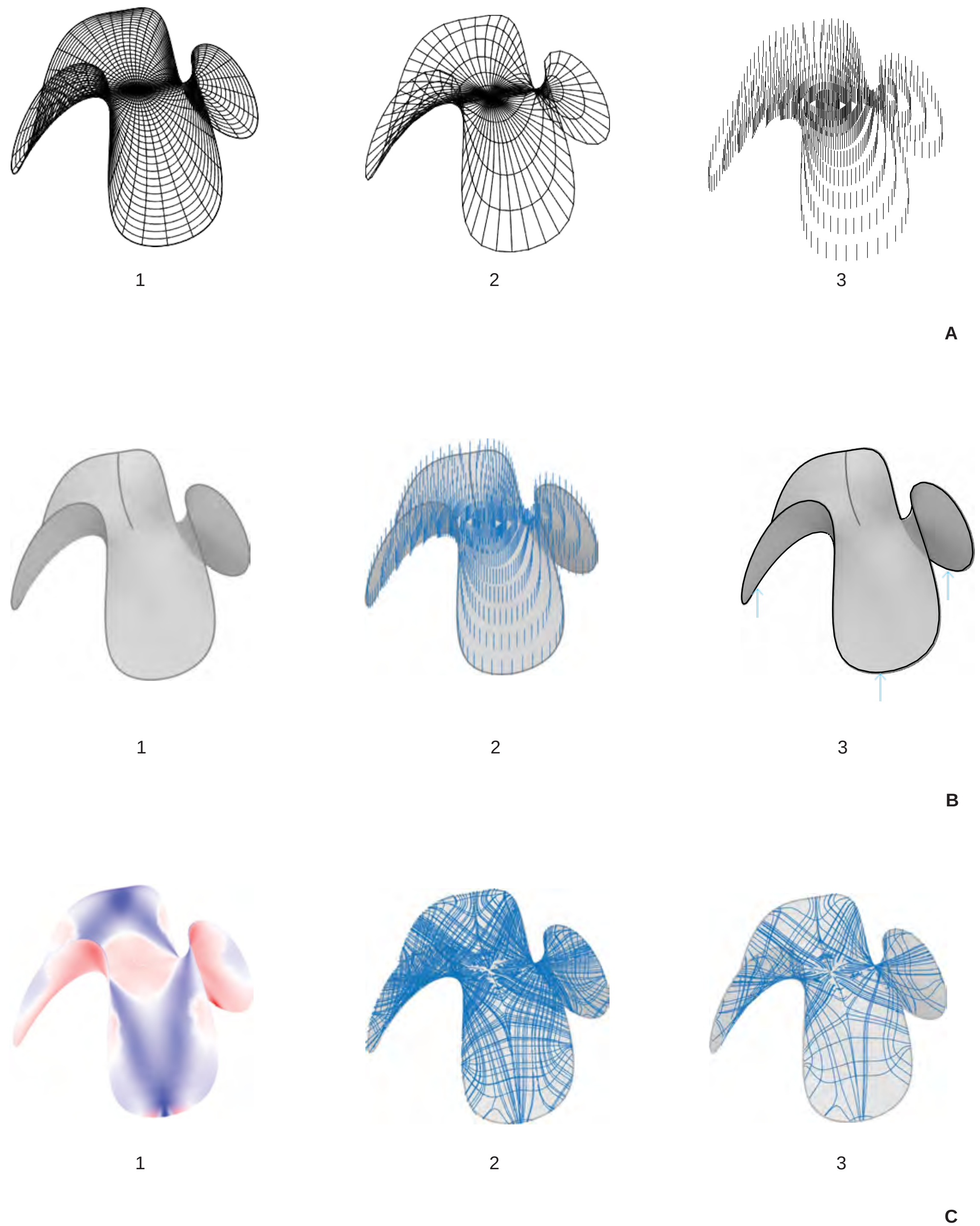


A-C
Bounding box manipulation to adjust height for site requirement.
2. curvature blue is max green is min

A
1. x=0, -x=0, area: 74m²

B
1. x=2, -x=0, area:44m²

C
1. x=-2, -x=1, area: 66m

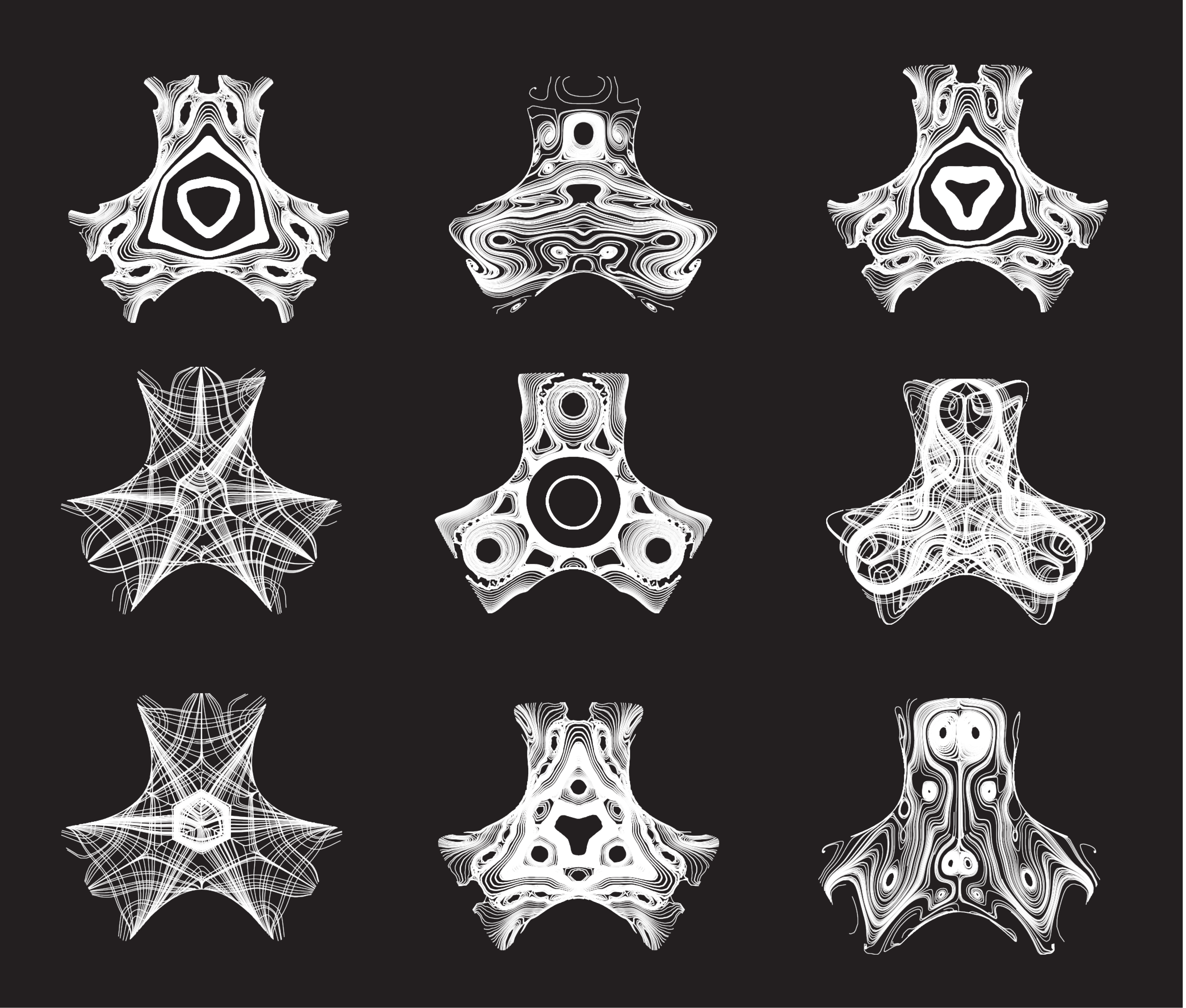


A-C
Karamba algorithm generation process.

A
Initiation
1. Parallel domain specification.
2. Initial surface meshing.
3. Seeding.

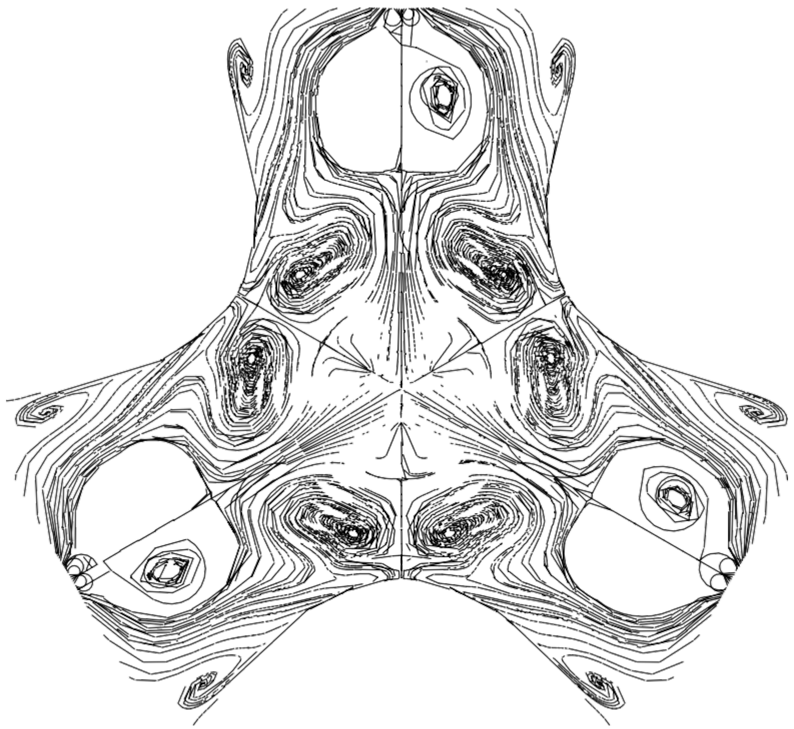
B
Generation
1. Defining the type of structure.
2.Stating the force location and the type of force.
3.Stating the support location and type of supports.

C
Processing
1. Structural analysis.
2.Interpolation and tracing.
3. Rationalizing.



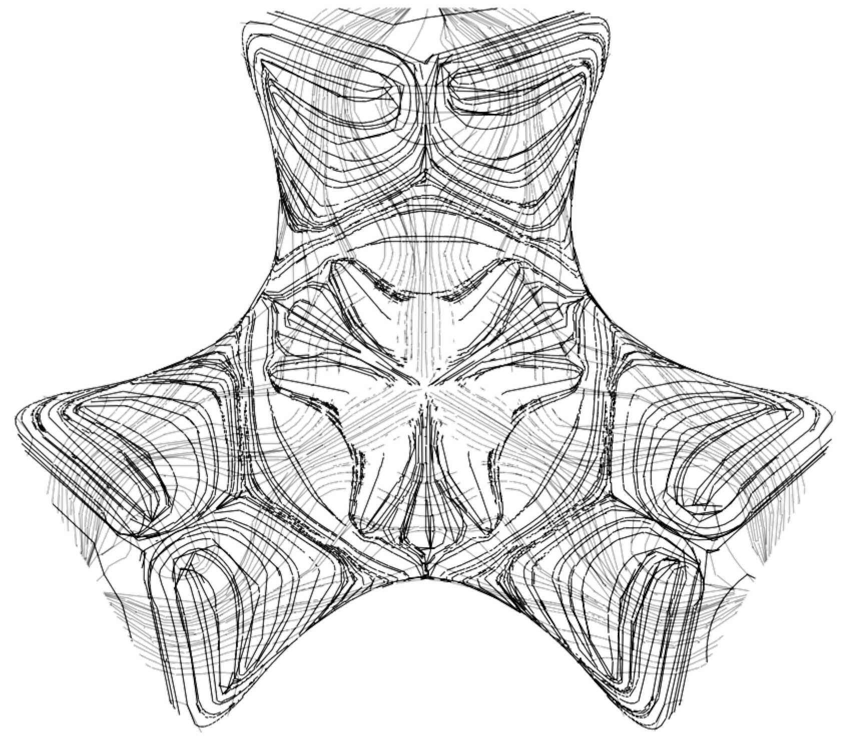
Stress Line Iteration

Structural algorithm generation creates options for various outcome for different circumstances.



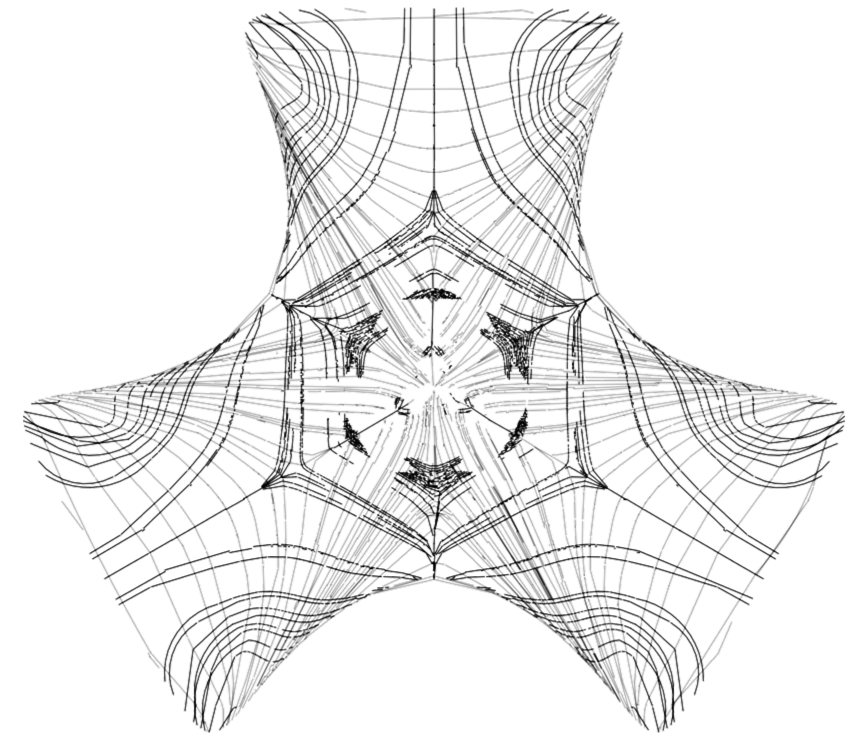
Setting	Force flow
Constraint	Ground support
Force	Gravity load

A



Setting	Principle stress
Constraint	Ground support
Force	Gravity load

B



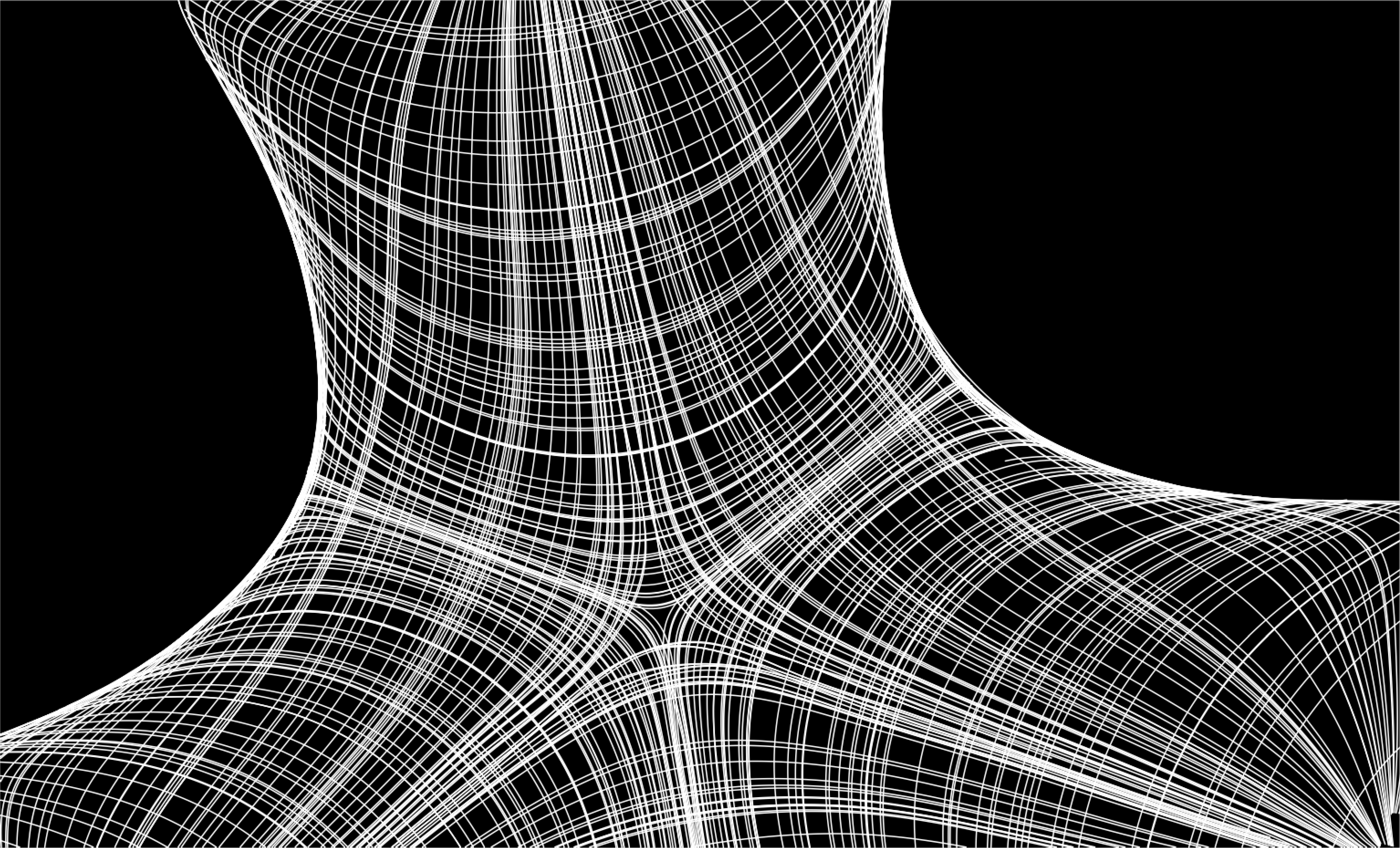
Setting	Principle Moment
Constraint	Ground support
Force	Gravity load

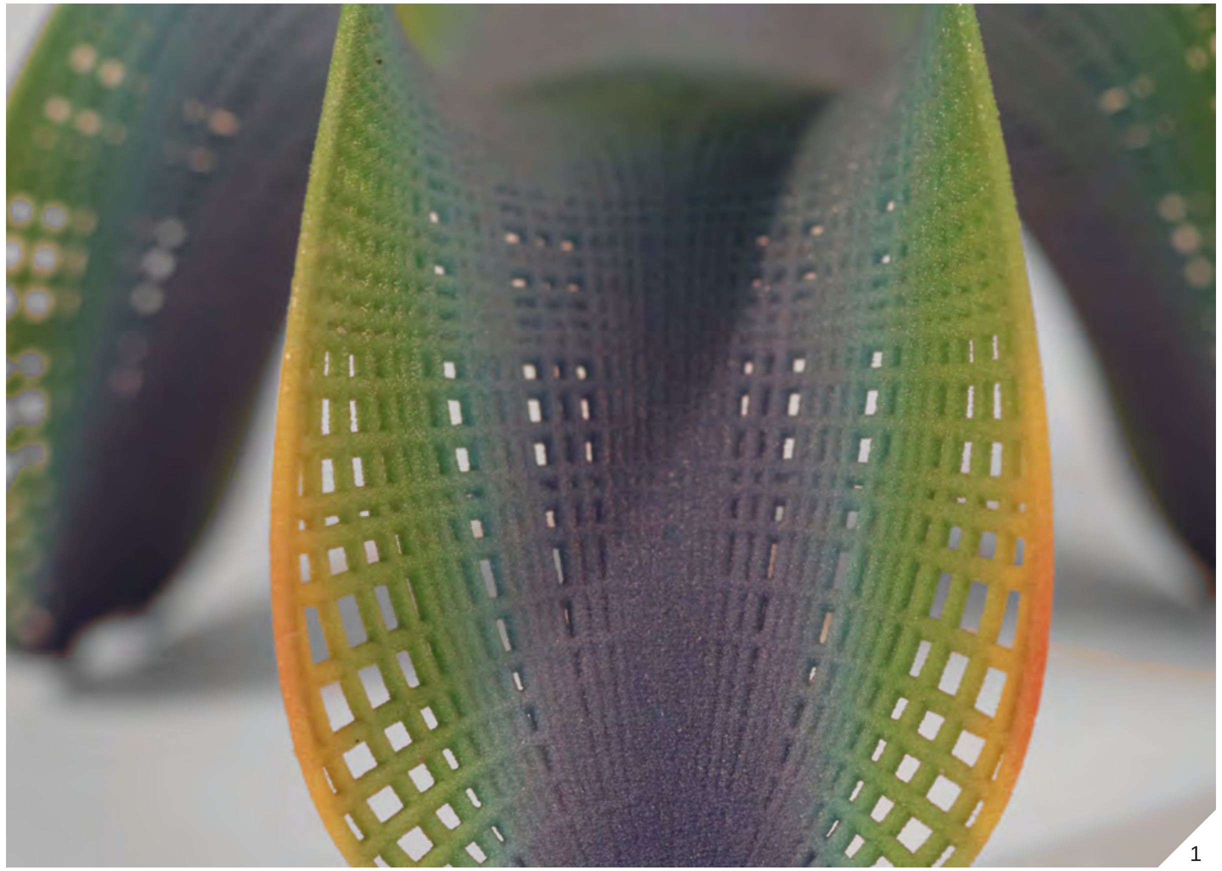
C

A
Inspired by fluid dynamics, force flow (FF) lines or load paths illustrate the load distribution in structures.

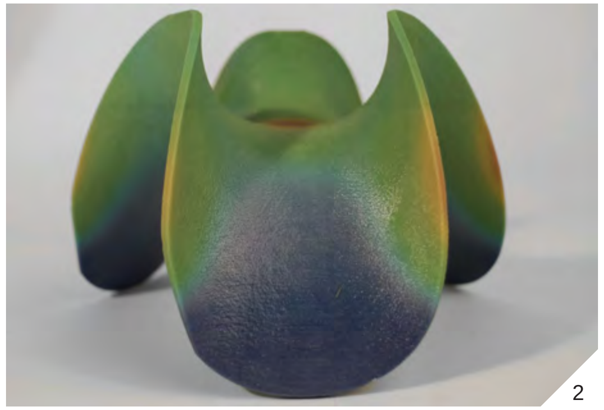
B
Principal stress (PS) lines are tangent to the principal stress directions. Principal and second principal stress lines intersect at 90degrees. In a cantilever they either run parallel or at right angle to the free boundaries.

C
Principle moment (PM) works like the Principal Stress Lines component Instead of principal stress lines it returns principal moment lines.

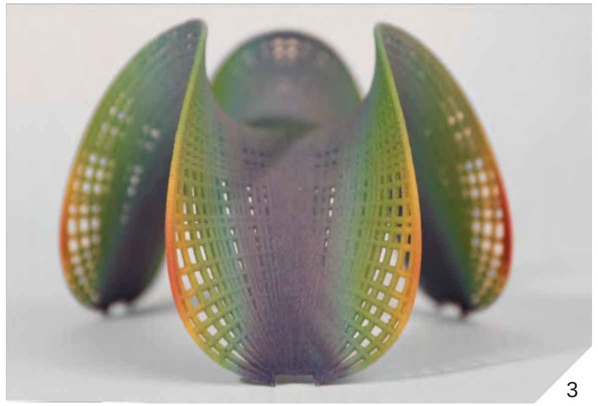




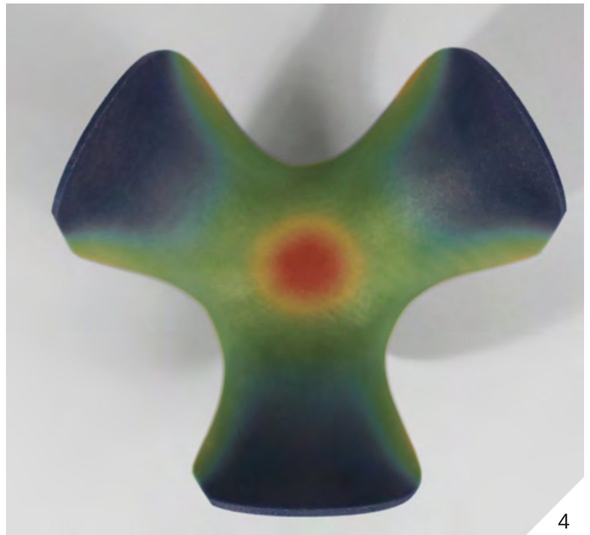
1



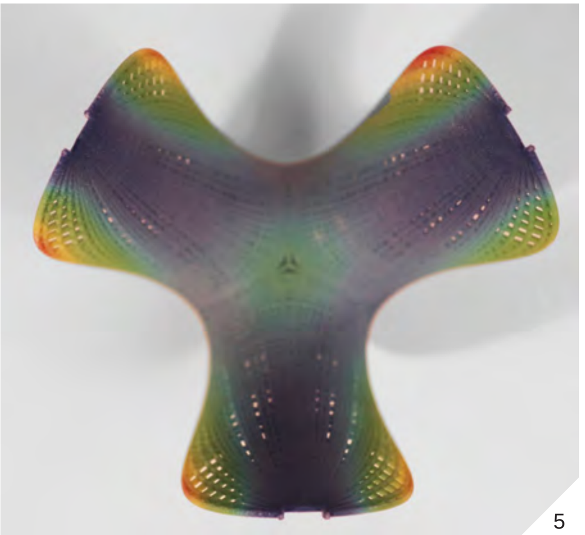
2



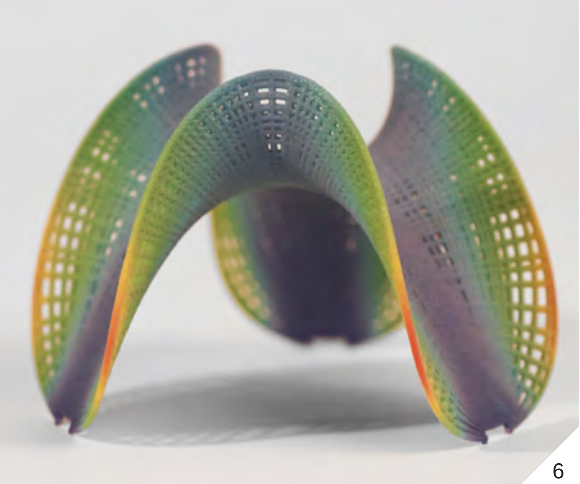
3



4



5



6

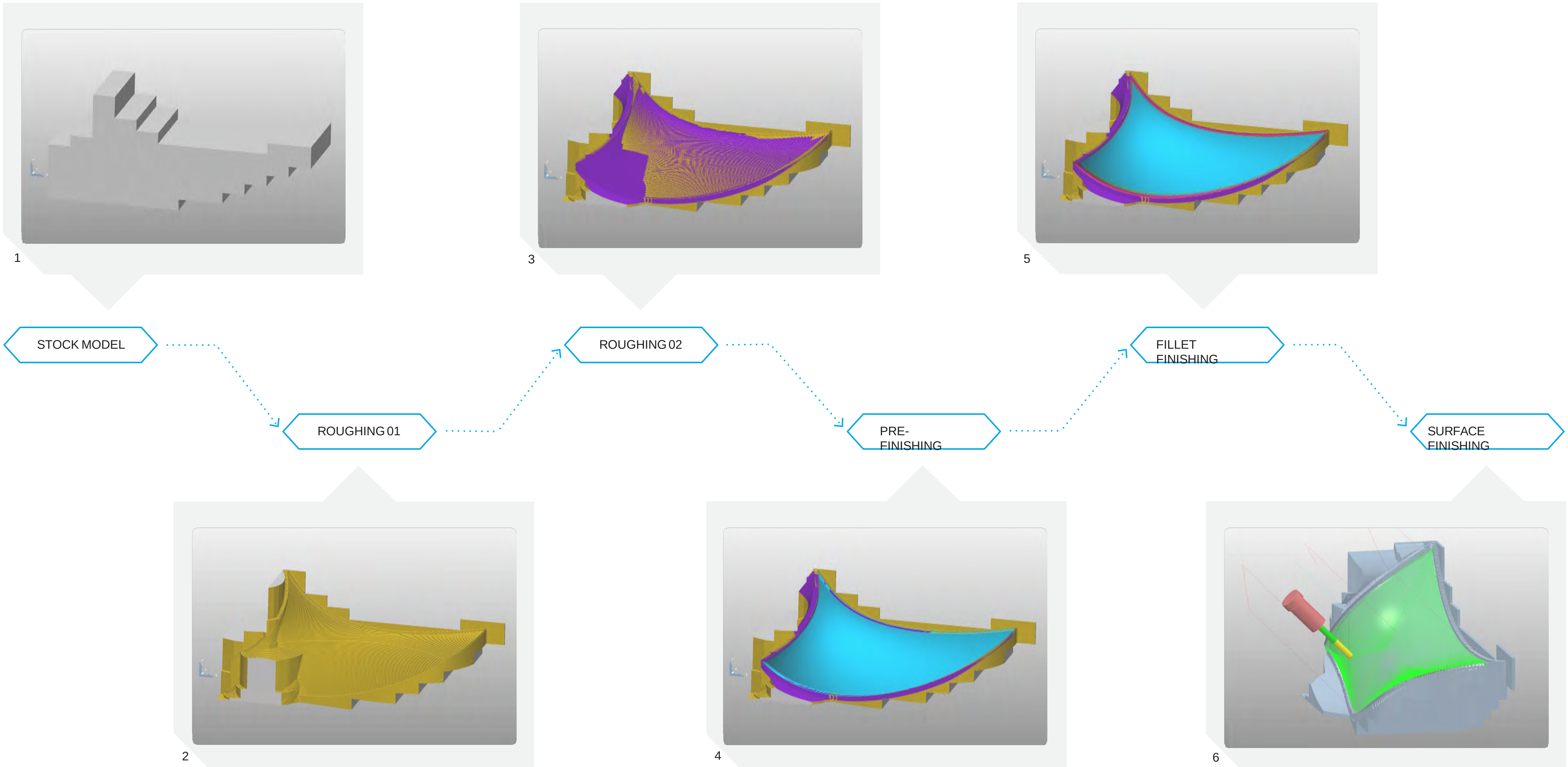
7

1
3D printed Surface remodeled with stress-line to optimize its strength

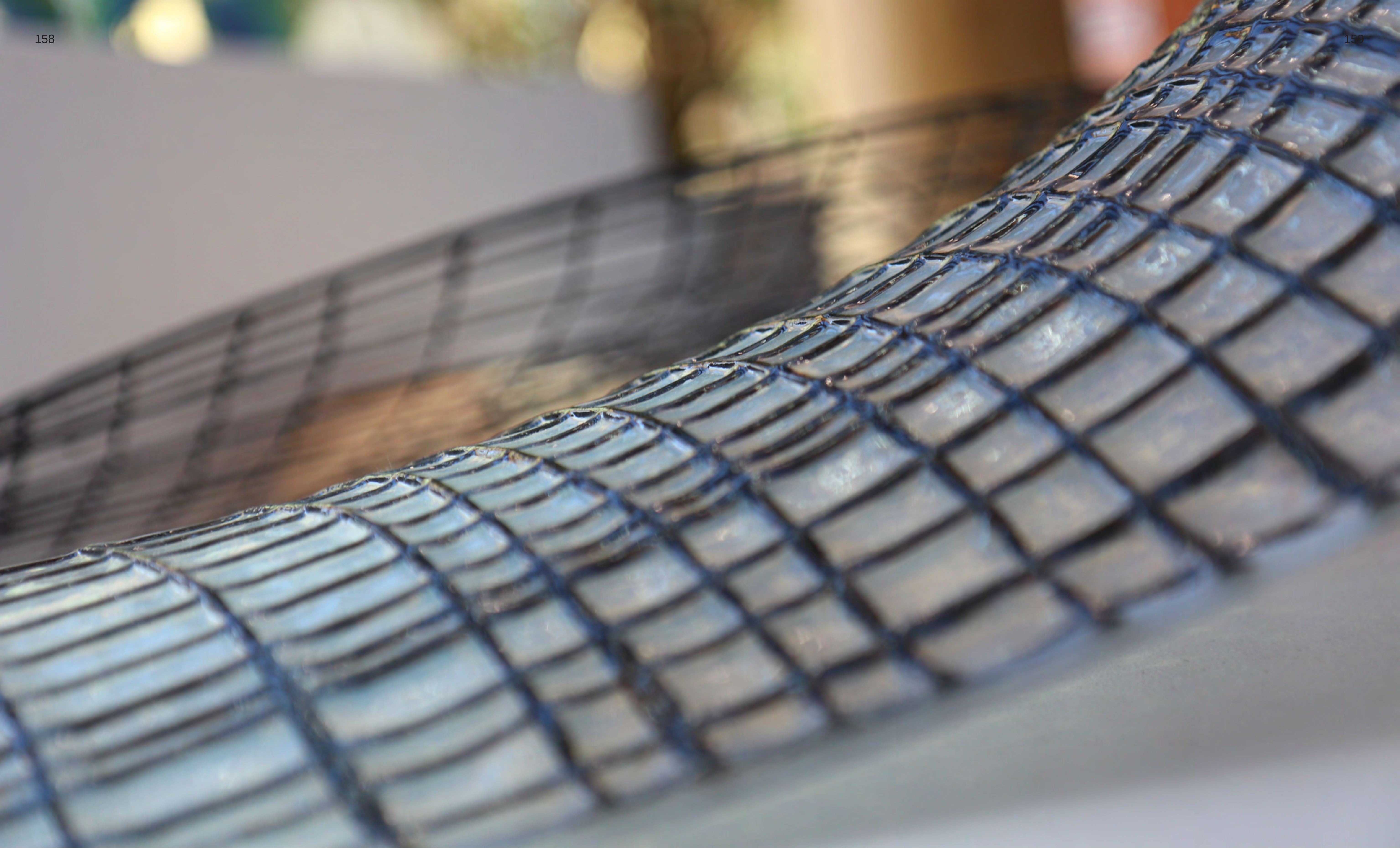
2-3
Comparison model showing before and after stress line optimization. Color gradient showing stress distribution,red is maximum and vice-versa.

4-5
Bottom view comparison model showing before and after stress line optimization.

6-7
Side view comparison model showing before and after stress line optimization. Stress line surface has shown improvement via this testing method.


1
STOCK MODEL
ROUGHING 01
2
3
ROUGHING 02
PRE-
FINISHING
4
5
FILLET
FINISHING
SURFACE
FINISHING
6


YES



USING RECYCLED PLASTIC

4 are also shown). It can be seen that the utilization of the full cross-sectional resistance diminishes with increasing slenderness, indicating that buckling had indeed occurred. Specimen EHS01-100-50-3.0 is shown post-failure in Fig. 5 – ruptures occurred at two cross-sections in each specimen tested.

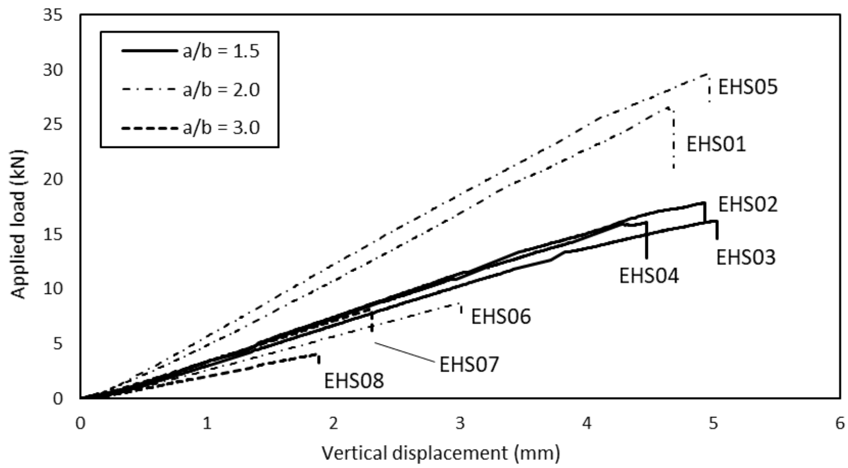


Figure 4: Load–displacement curves for all specimens.

Table 3: Experimental ultimate loads.

Specimen	a/b	$\overline{\lambda}_{\ell}$	Af_y (kN)	$N_{u,exp}$ (kN)	$N_{c,Rd}$ (kN)	$N_{u,exp} / Af_y$	$N_{u,exp} / N_{c,Rd}$
EHS01-100-50-3.0	2.0	1.01	36.5	26.6	19.1	0.73	1.39
EHS02-90-60-2.0	1.5	1.03	23.7	17.9	12.0	0.76	1.50
EHS03-90-60-2.0	1.5	1.03	23.8	16.2	12.1	0.68	1.34
EHS04-90-60-2.0	1.5	1.04	23.4	16.1	11.7	0.69	1.37
EHS05-100-50-3.0	2.0	1.03	35.7	29.7	18.5	0.83	1.61
EHS06-100-50-1.5	2.0	1.50	17.0	8.76	5.14	0.51	1.71
EHS07-105-35-2.0	3.0	1.60	22.7	8.22	7.10	0.36	1.16
EHS08-105-35-1.5	3.0	1.92	15.8	4.10	3.97	0.26	1.03

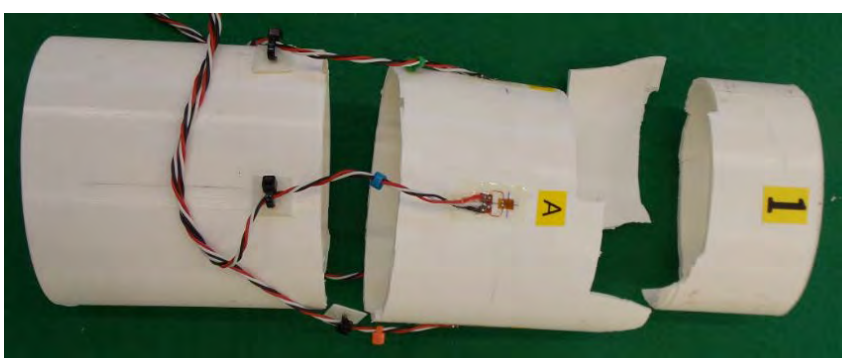


Figure 5: Specimen EHS01-100-50-3.0 post-failure.

The strains at mid-height are plotted against the average compressive stress in Fig. 6 for Specimen EHS01-100-50-3.0. It can be seen that the strain is higher at points A and C where the section is less stiff locally at the points of minimum curvature. The effective elastic modulus of the section calculated at point A is 2397 N/mm^2, a close approximation of the nominal value of 2346 N/mm^2.