Filigree Robotics

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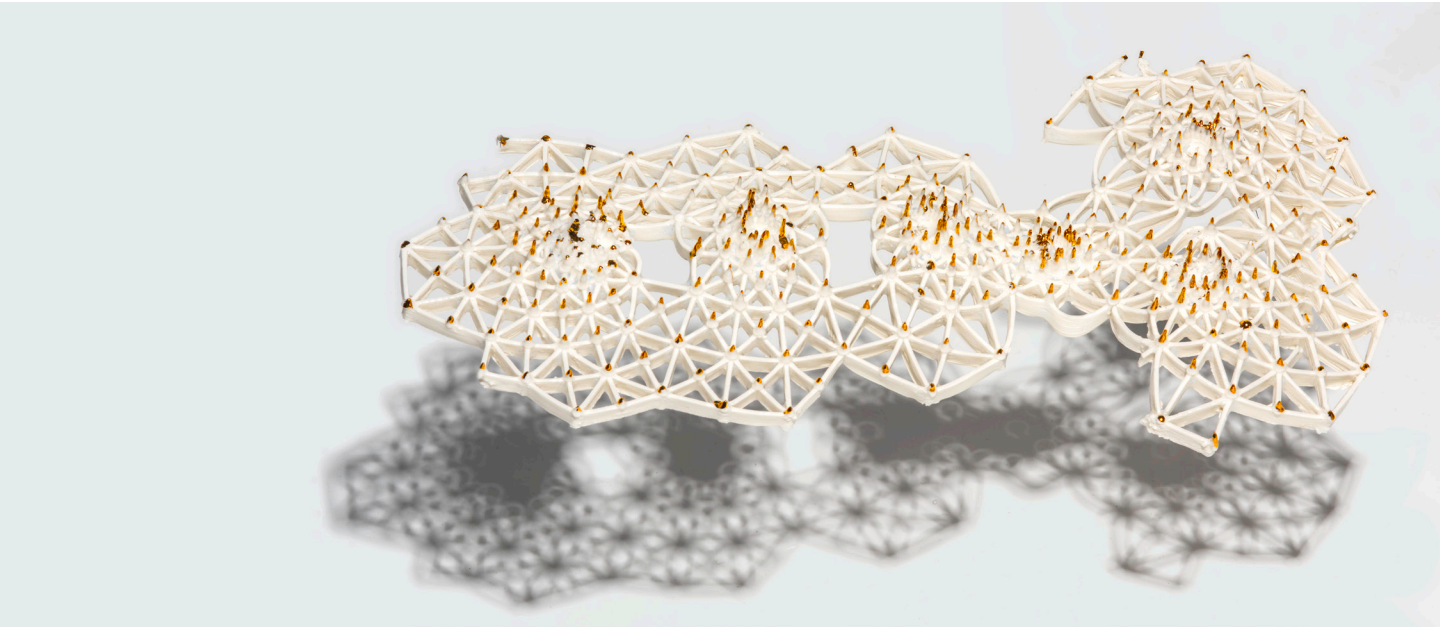
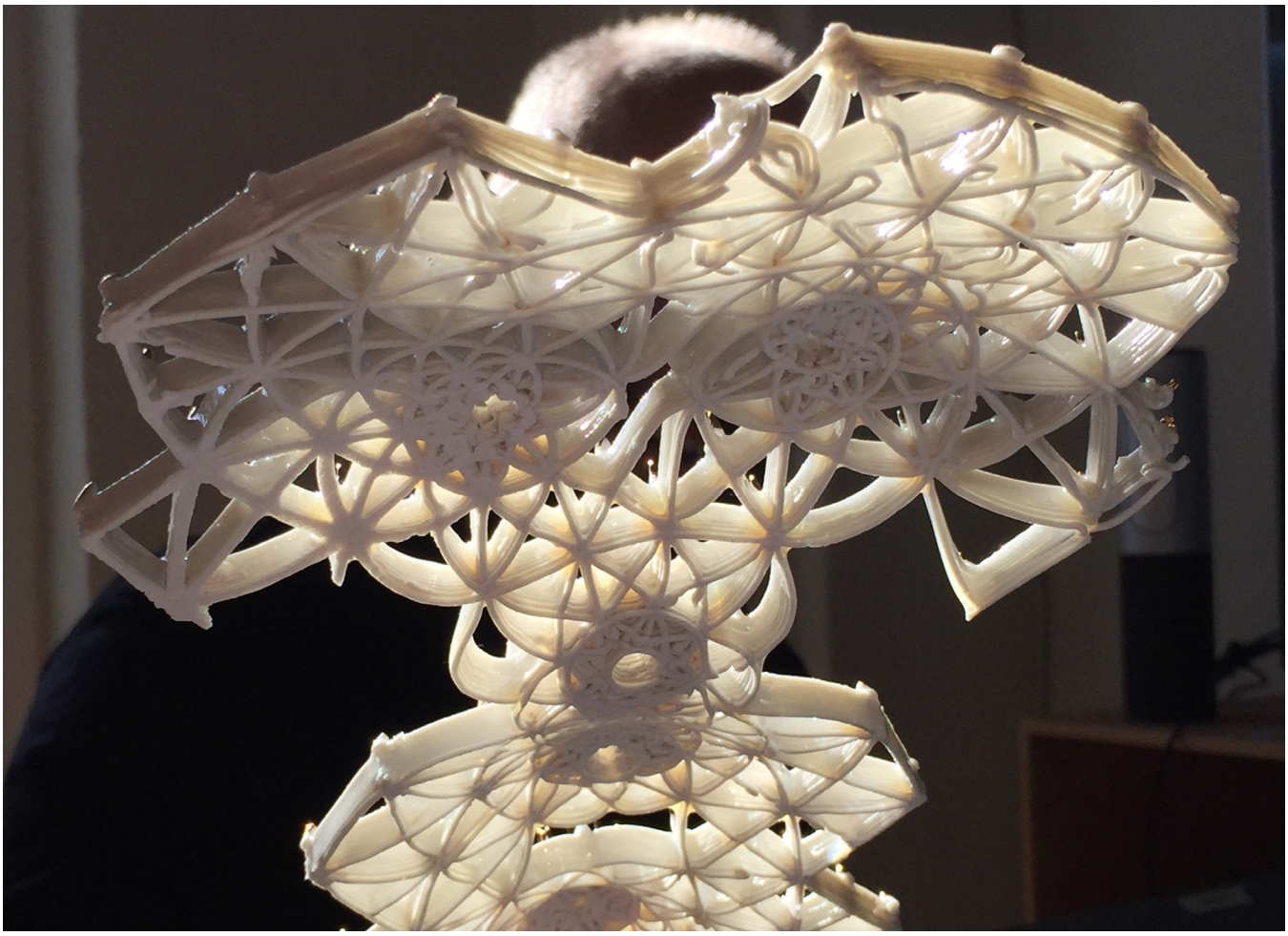


30x50cm porcelain 3D print after firing and glazing.

Filigree Robotics experiments with the combination of traditional ceramic craft with robotic fabrication in order to generate a new narrative of fine three-dimensional ceramic ornament for architecture.

The project takes its point of departure in the use of ceramics in architecture. While ceramic is currently most used as surface for buildings, it is the intention of this work to exemplify synergies between traditional ceramic and digital fabrication techniques. The projects asks especially how ceramic elements can be transformed into three-dimensional modules, which can follow and shape spatial experiences.

Current industrial ceramic techniques use extrusion or injection processes, which require complex molds and high volume output. 3d printing of ceramics on the other hand is either bound to a planar surface as starting ground or requires support material. Filigree Robotics experiments with a combination of the traditional Danish ceramic technique of 'Overforming' with 3d Laserscan and Robotic extrusion technique. The ceramic material in 'overforming' is formed over a three dimensional form made of a low cost material with a similar expansion rate as clay. The technology is well known in the ceramic craft and has a lineage of use for the making of fine porcelain. 'Overforming' is intuitive as process, allows for an immediate and artistic approach to the creation of the form and invites for experimentation. It is however until now not executed by machines, nor applied in architectural or industrial processes. In Filigree Robotics we combine the crafting of the mold with a



Subsurface effects in fired and glazed 3d print. The processing of the printed clay turns the material into porcelain.

parallel running generative algorithm, which is fed by a constant laserscan of the 3d surface. This algorithm, analyses the topology of the mold, identifies high and low points and uses these as starting point for the ornamentation of a toolpath, which follows the movements of the surface.

A new developed robotic clay printing process enables the drawing of fine lines of porcelain and to stop and start these at any point with high precision. Starting with lines the project developed a series of further new topological expressions in clay printing and combines these with the further processing of the raw clay to triple fired glazed porcelain. The project points here at the reality and richness of material processes, the need and ability to refine and highlight the form through color and selective application of reflectivity after an initial 3d print.

The consideration and integration of this material practice into a digital workflow took place in an proven interdisciplinary collaboration of ceramicists and architects (Hansen 2015). The team created an understanding of technology and material processes- through extensive prototyping, which led to a set of innovations on material, robotic and process level. Finally, a series of up to 70x80cm sized ceramic objects was created, which challenge the traditional size of porcelain.

The objects emancipate themselves from their origin in the digital craft. Their presence and expression is grounded in the interplay of the filigree of the ornamented ceramic object with light and shadow.

ACKNOWLEDGEMENTS

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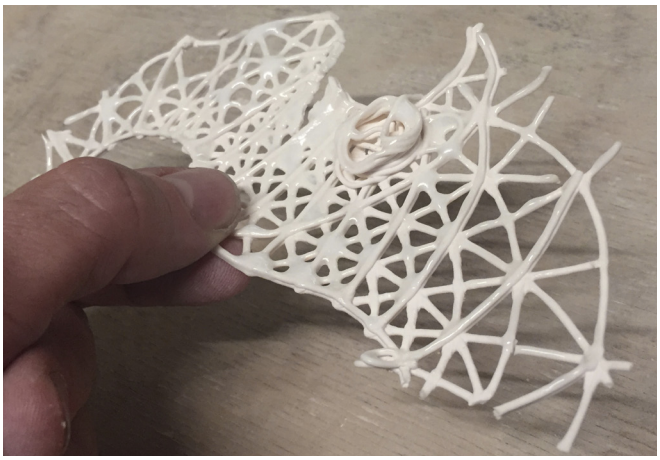
REFERENCES

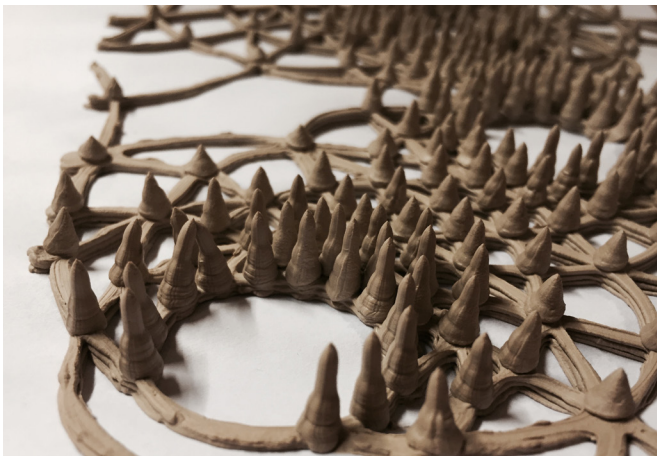
Tvede Hansen, F., Tamke, M. (2015) Interfacing design and making of Ceramics Expansion of ceramics practice through technology. In

The use of industrial components allows to use non-continious toolpaths.

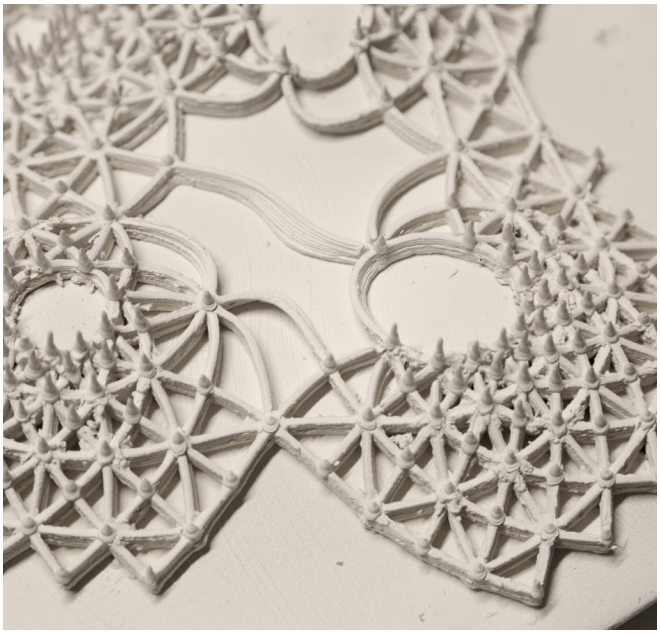
The 3D print takes place on a three dimensional surface.



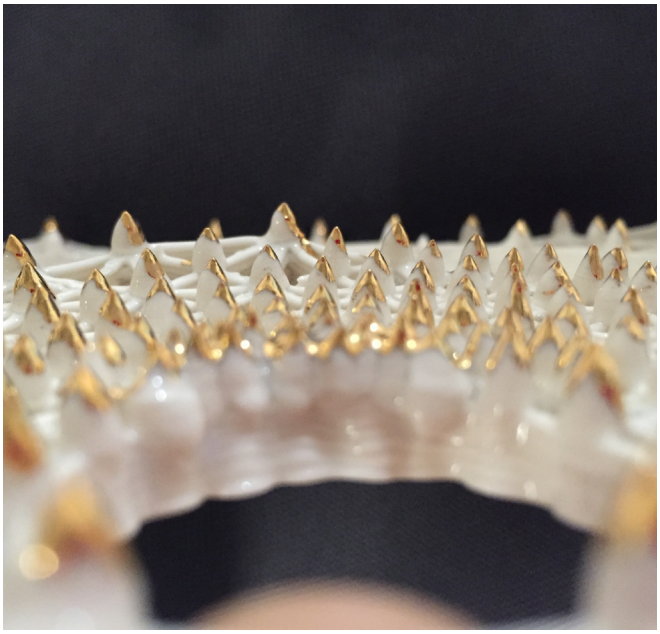
The projects takes into account the complexities, which emerge through the many steps in teh making of porcelain. Mastering these allows for filigree parts in porcelain.



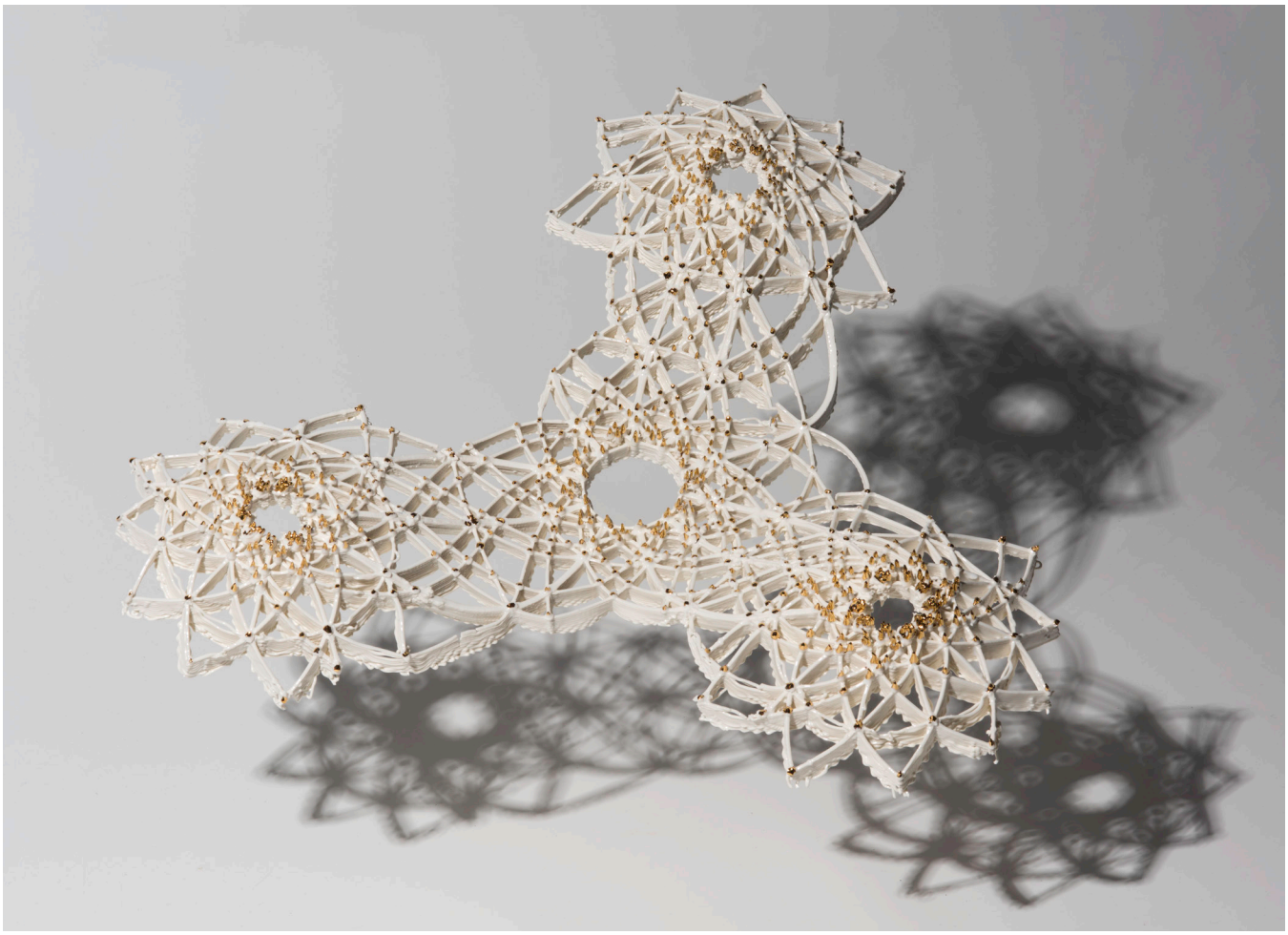
A high precison of dlow in the 3d print process allows new expressions in clay.



3D printed clay pattern before firing.



Fired and glazed 3D print.



50x50cm porcelain 3D print after firing and glazing.

Proceedings of the EKSIG Conference, Tangible Means - experiential knowledge through materials , 25-26 November 2015.Design School Kolding,

Bio Martin Tamke Martin Tamke is Associate Professor at the Centre for Information Technology and Architecture (CITA) http://cita.karch.dk in Copenhagen. He is pursuing a design led research in the interface and implications of computational design and its materialization. He joined the newly founded research centre CITA in 2006 and shaped its design based research practice.

Bio Flemming Tvede Hansen This is Appendix Body Text. Please limit each bio to 100 words maximum. Sintiun tiatem iliquatiorio volecte core, si officaborat lam doloraerum faces volor asseque saepro cus et audam es quatus non est, omnis di dolore non eum hitas eos verum rectinu stemporuntur adi sequi velesent inis ullorati ideste velitia porestrum quae nobit ditatas dia eum, omni. Lum volupta nus voluptata nat aut auta velibustorem eles pore occusandit, idelignis simintibus arum comni aut hiciis del exped ea nos rerro bearchil et esto iliquat perum re, quam qui

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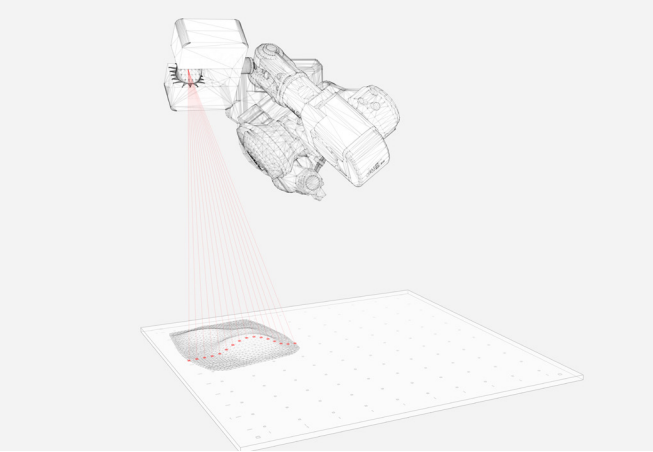
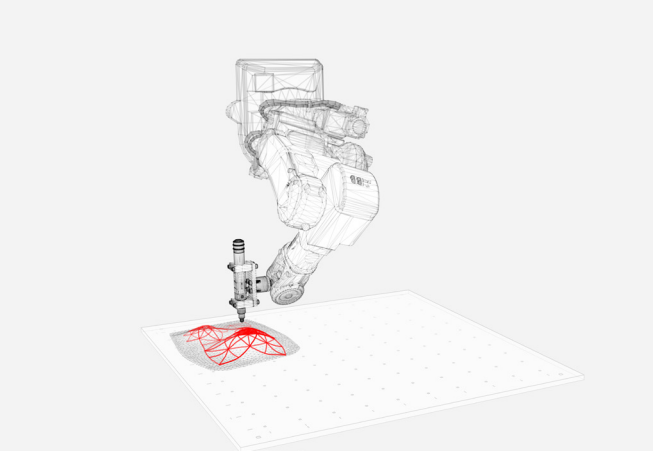
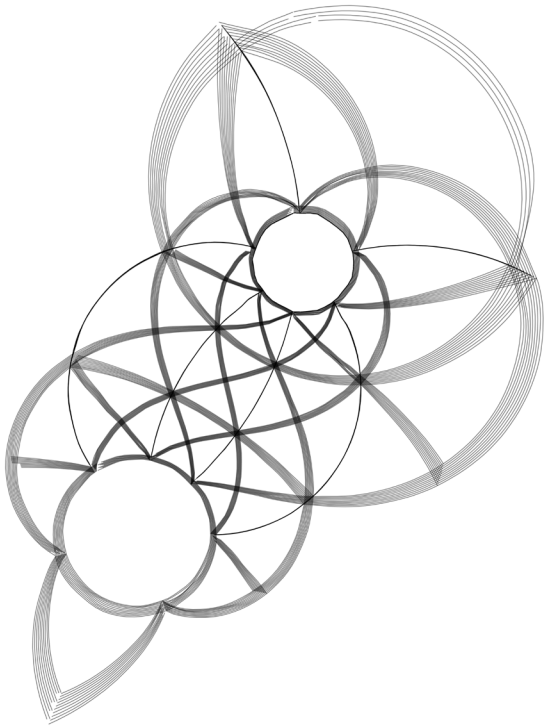
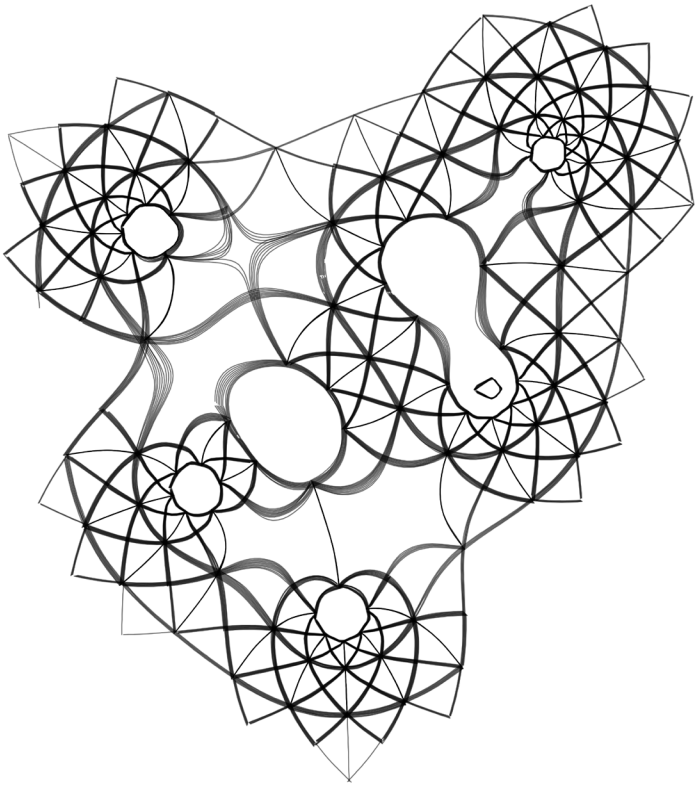


The process behind Filigree Robotics consists of two steps. In the first the topology of the shape is captured with a 3D scanner.



The captured surface is analysied and a toolpath for the 3D print of the clay is generated, refined and finally eecuted wth a robot arm.





An algorithm creates the toolpathes based on automatically surface features, such as borders, high- and low points