New frontier for Textile
Exploring digital fabrication technologies

Open educational resource developed by:
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Introduction

In this unit will be presented, in an experimental set-up, the contribution that digital fabrication technologies can offer in the Textile field to explore new types of conceivable products and processes.
In particular, starting from an excursus that identifies the democratization of technologies, the customization of production and the independence of distribution as real drivers of change, the focus will be on the demonstration of possible experimental applications, through the exposure of case studies developed within makerspaces and Fab Labs.
Indeed, these places are structured in order to encourage the dynamics of learning by doing, where the trial-and-error learning represents a fundamental process that allows individual and collective knowledge to grow. Since these are realities outside of industrial mechanisms, it is possible to give life to new experiments, which push the boundaries of the intrinsic limits and opportunities of the technologies used, enhancing and finding new ways of interpreting them.
During the contribution, case studies will be presented that synthesize design and production strategies employing both additive (3D printing) and subtractive (laser cutting) technologies. These can be considered as inspirations able to act as a driver for scalable applications in industrial sectors that envision textile integration both as a priority element and as a sub-product.

Keywords
digital fabrication, additive manufacturing, laser cutting, 3D printing textile,
auxetic structure

Goals and Structure of the OER

Goals

The purpose of the OER is to encourage the development of experimental formats in the Textile sector.
The framework of technological access first, and the vision of design results related to digital technologies later, allow to envision the latent possibilities that may find space even in industrial applications, if properly grasped and scaled.
In this moment of deep change, not only related to the increasing speed of innovations, but also triggered by immanent and unpredictable global phenomena, technological knowledge and its control in the design and projective phase is crucial.
Therefore, the goal of this unit is to nurture creativity in a way that is closely related to experimentation through technology, in order to promote feasible and virtuous applications, even in a circular perspective.

Structure of the OER

1. Why is digital fabrication relevant for textile?
2. Driver of the change.
3. Experimental places.
4. Laser cutting strategies and case studies.
5. 3D printing strategie and case studies.
6. Conclusions.

Learning Outcomes

Knowledge

* Acquire the framework of phenomenological change taking place, with regard to production models and the enabling possibilities offered by digital fabrication technologies.
* Obtain theoretical knowledge on notions and terms related to digital fabrication technologies, with particular attention to the application in the Textile field.
* Be informed about the state-of-the-art of bottom-up experimentation involving digital fabrication technologies (additive and subtractive) in the Textile field.

Skills

* Be able to understand how to engage additive and subtractive digital technologies to do experiments with and on textile materials, starting from information and inspirations drawn from case studies.
* Be able to reproduce, produce, and conceive new product and process outputs.

Competences

* Be able to visualize and interpret new possibilities from the additive and subtractive processes presented, in particular managing direct 3D printing on fabric.
* Be capable of understanding when digital fabrication technologies can be used at experimental or production level.
* Be able to propose and apply new design solutions related to the integration between digital technologies and textile material to develop scalable and sustainable innovations.

Why is digital fabrication relevant for textile?

There is a change in the production models

from the design perspective.

New form of advanced, open and distributed production.

Independent small scale fabrication and distribution of artifacts

New creative processes for

new small-scale production models

This is also very relevant for textile field

The drivers of the change

Democratization of Technology

Now you reach technologies that were previously rare and expensive

Customization of Production

Thanks to the digitalization and sharing of files

Independence of Distribution

New business models and openess

Fab Lab

Fab Lab is an acronym for Fabrication Laboratory, that is a small-scale workshop offering (personal) digital fabrication. A Fab Lab is typically equipped with an array of flexible computer-controlled tools that cover several different scales and various materials, with the aim to make “almost anything”. And these kind of computer-controlled tools - also known as digital technologies - offer the possibility to create almost anything also with textile.

Source: fablab.io

Digital Technologies

Subtractive Technologies

Laser cutting | CNC milling machine | Vinyl cutter | ...

Additive Technologies

3D printing: FDM | SLS | SLA | ...

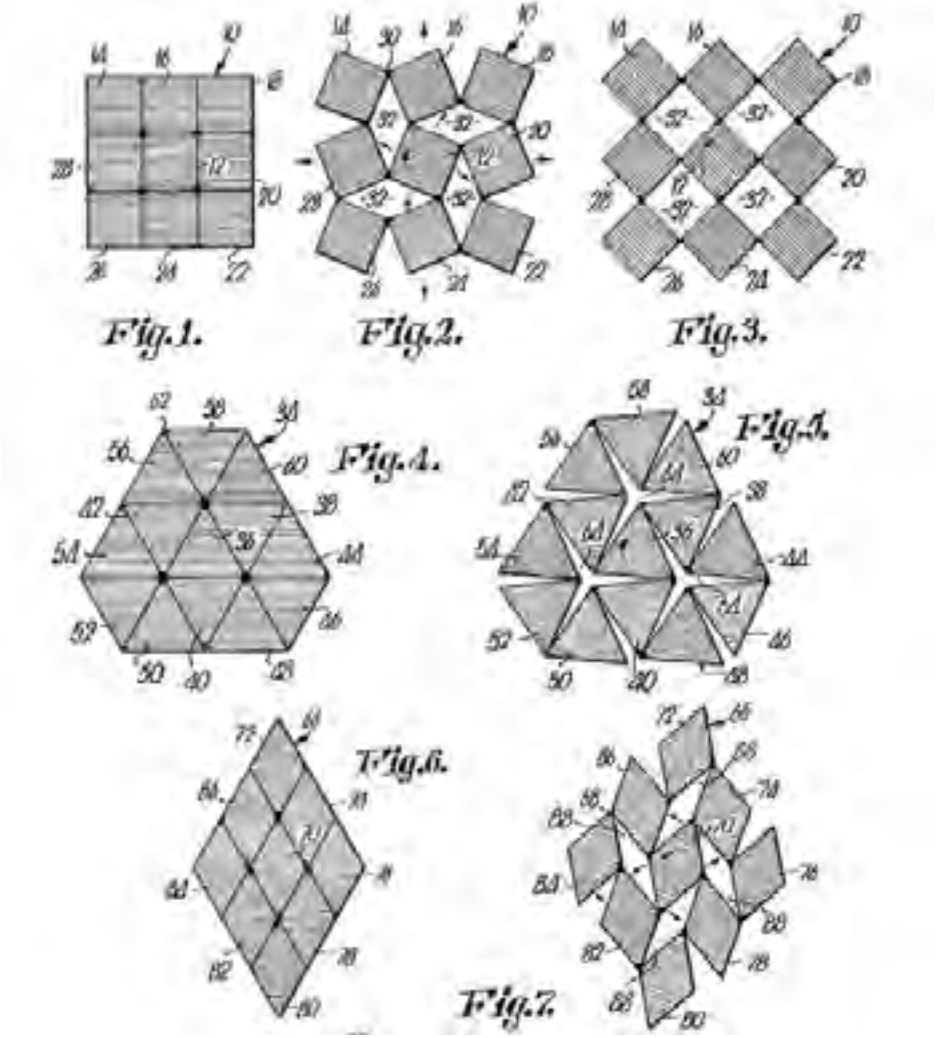
Laser cutting

Laser Cutting is a non-contact process which utilizes a laser to cut materials,
resulting in high quality, dimensionally accurate cuts.
The process works by directing the laser beam through a nozzle on to the workpiece.
A combination of heat and pressure creates the cutting action.

Source: instructable.com

Auxetic structure

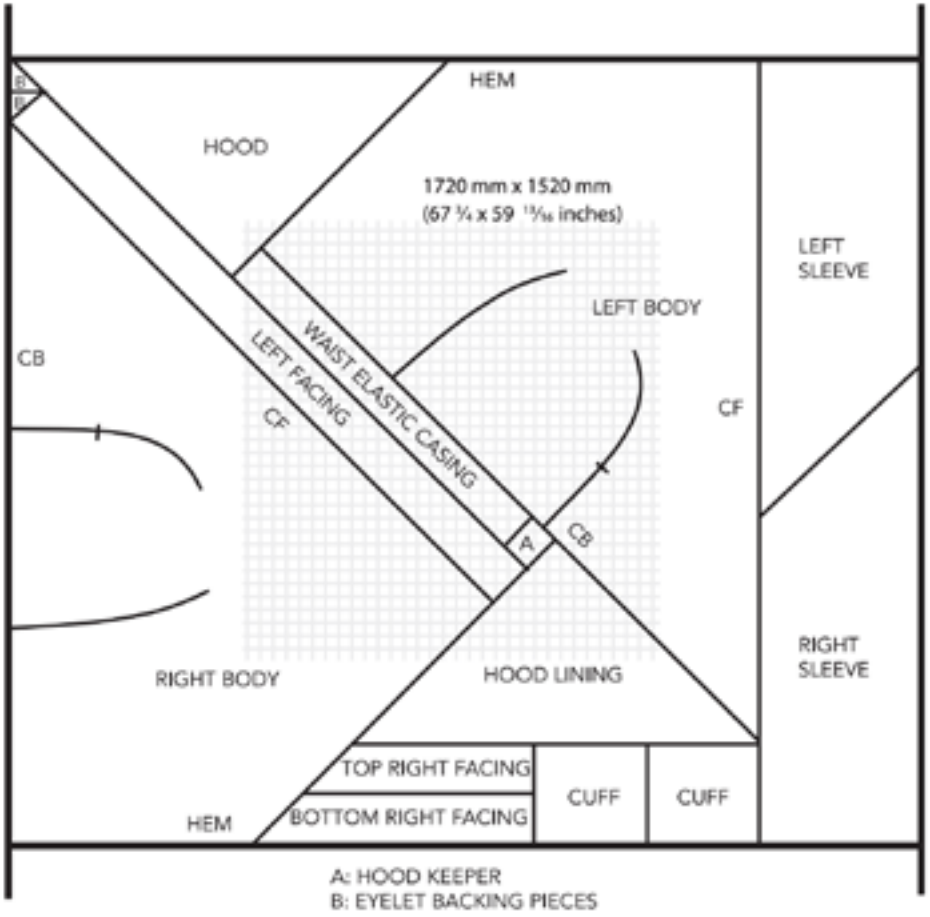
This technology is also particularly suitable for reproducing auxetic structures,
which can act not only as patterns, but also to break down the two-dimensionality.

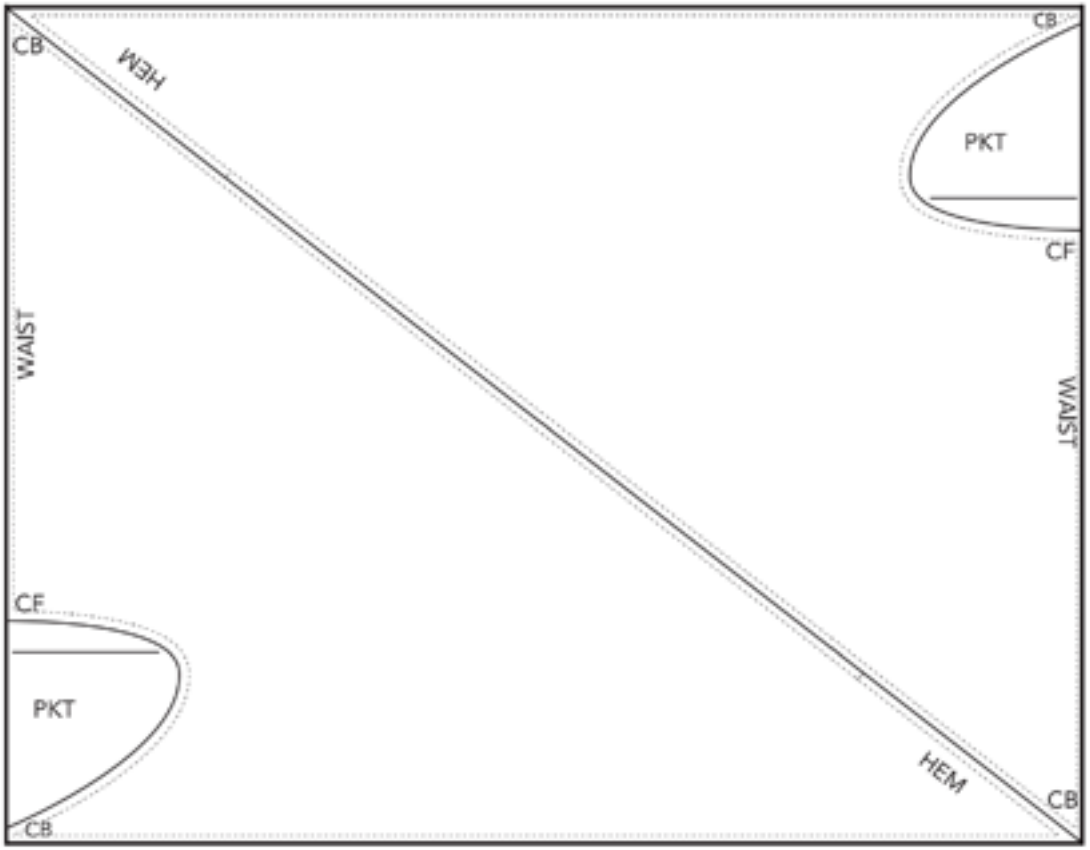


Visit https://www.polifactory.polimi.it/polifactory/fabcare/
to see the rest of the intellectual outputs of the project

Zero Waste design approach

Laser cutting can be used to cut the paper pattern directly onto fabric, paving the way for a zero waste design approach.
With the heat of the laser, in fact, the edges of fabrics based on synthetic fibers will be automatically welded, and the pieces will be usable without creating hems.

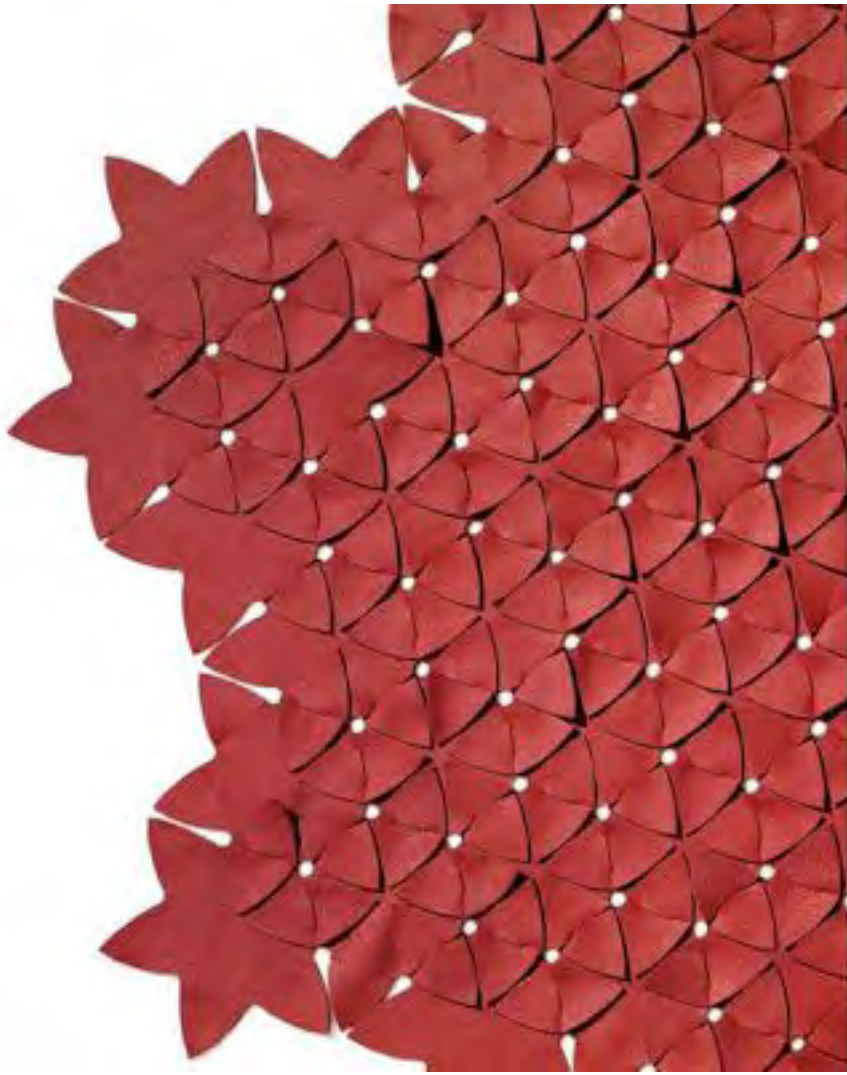




Source: https://opus.lib.uts.edu.au/bitstream/10453/23384/6/02whole.pdf

Modular fashion

Modular fashion is an approach to the production of accessories and garments using vector graphic design of bidimensional lasercut modules.

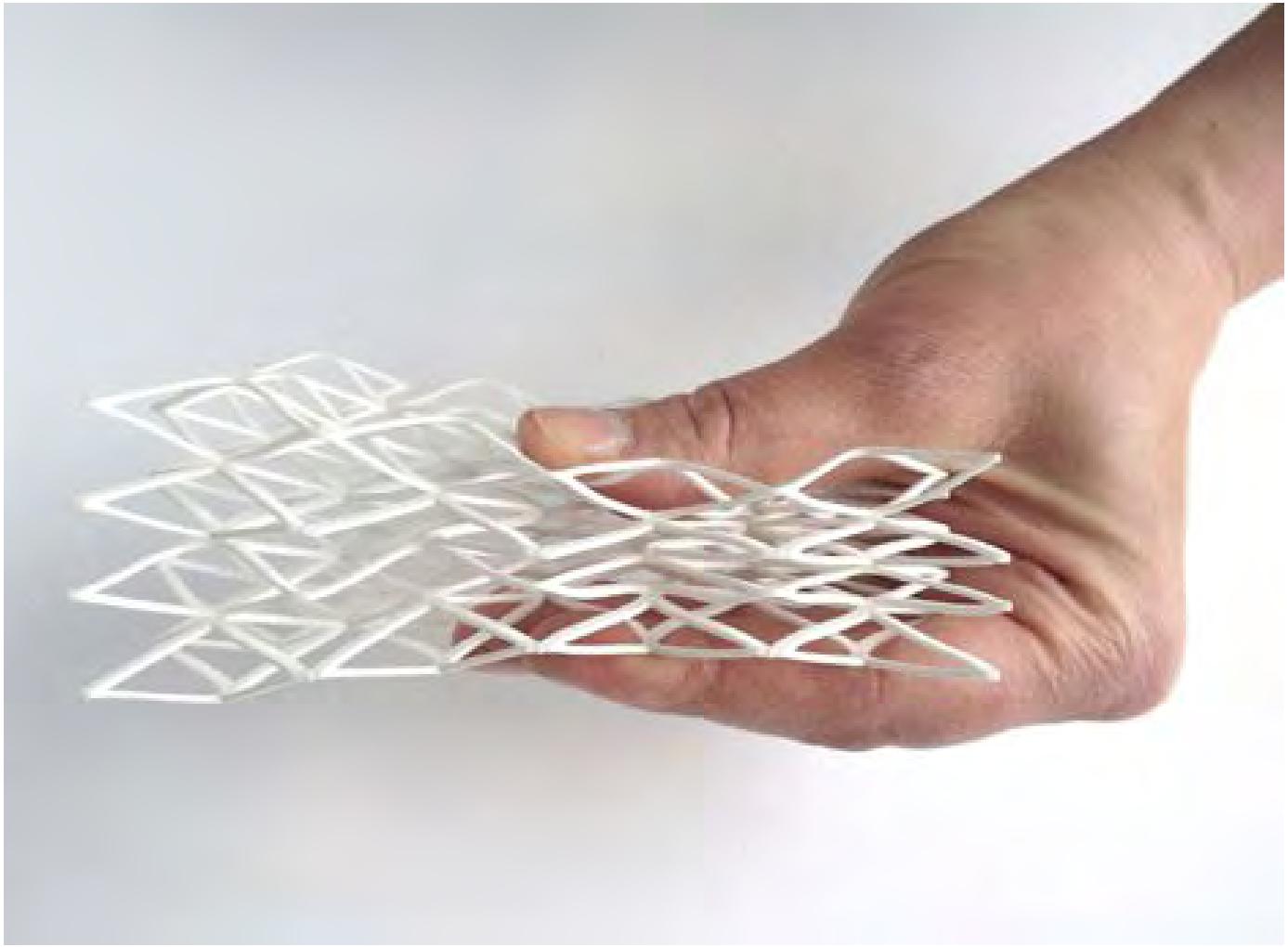


Source: https://www.notjustalabel.com/matija-cop

See the video following the link: https://youtu.be/oTYkTgtZrW8

3D printing

Additive Manufacturing technologies are more commonly known as 3D printing. As designers it is very important to know the potential and limits of the available technologies.



Additive Manufacturing Technologies:

Deposition Processes

FDM | FFF | Paste Ext | Poly/Multi Jet

Binding Processes

SLA | **SLS** | LOM | 3DP

Binding Processes:

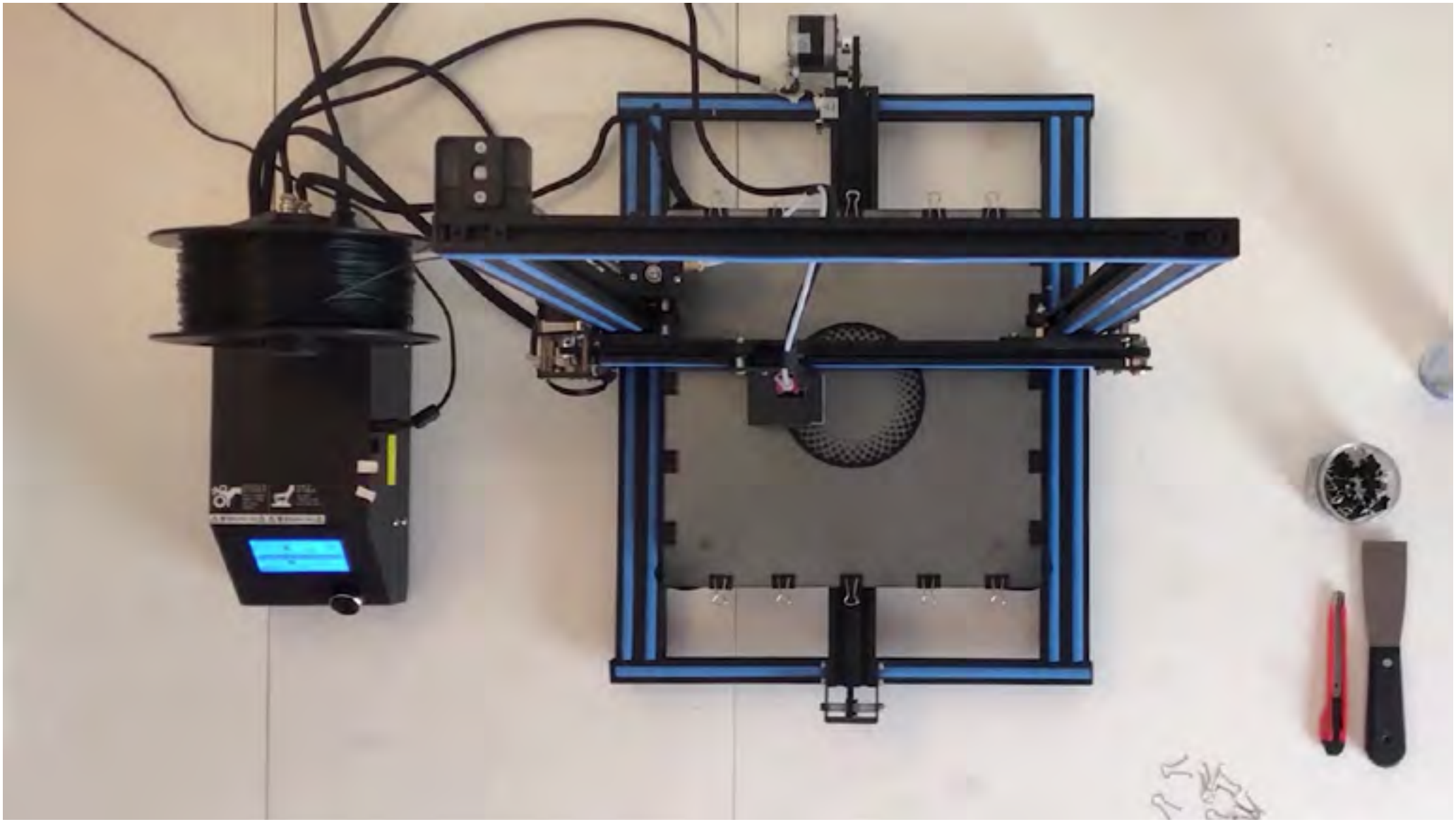
Machines that use this kind of processes, build objects using a printing head which stabilizes different layers of pre-spread material, following the section of the virtual model to be printed.
The binding processes work on the concentration of layer of powder or liquid material (usually resin).

Deposition Processes:

Machines that use this kind od processes, build object through the deposition of the material on a blank area. Deposition processes create objects layer-by-layer, resulting from the sum of fused/paste material filament.

Courtesy: Timothy Liddell

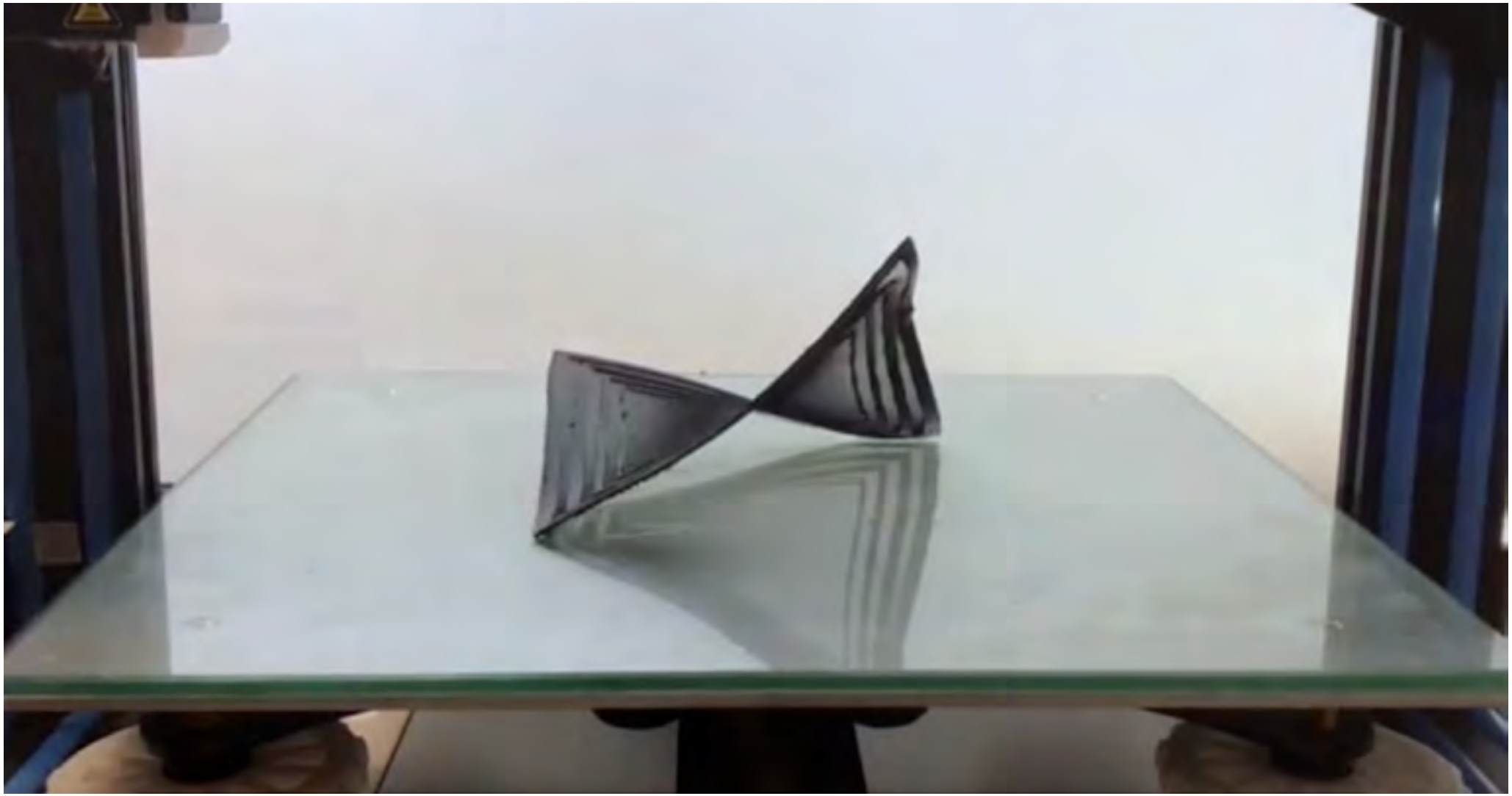
Direct 3D printing on textile: flexibility



See the video following the link: https://youtu.be/NZVIFlmg9WU

Courtesy: Timothy Liddell

Direct 3D printing on textile: flexibility



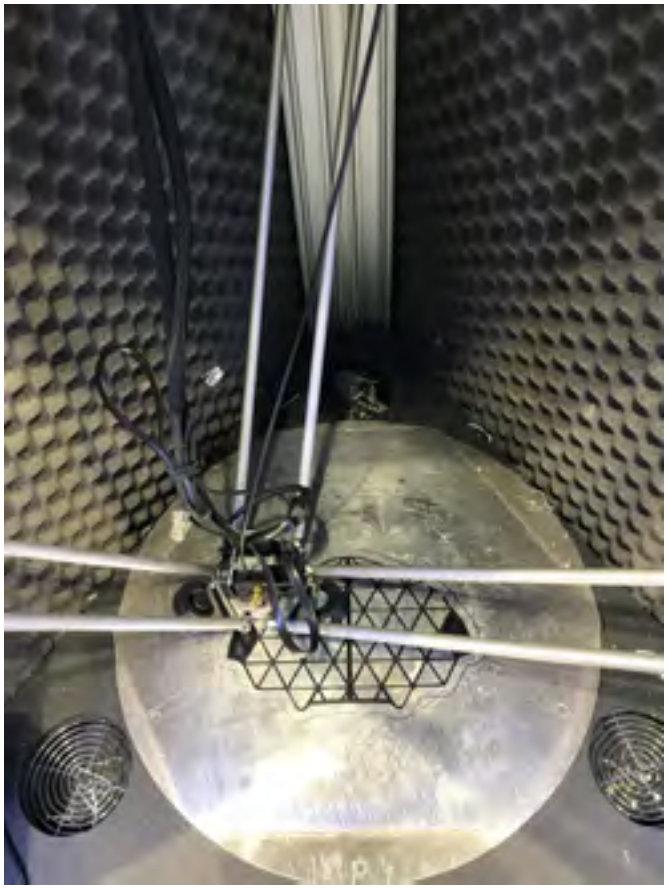
See the video following the link: https://youtu.be/5p1YmeuYZhw

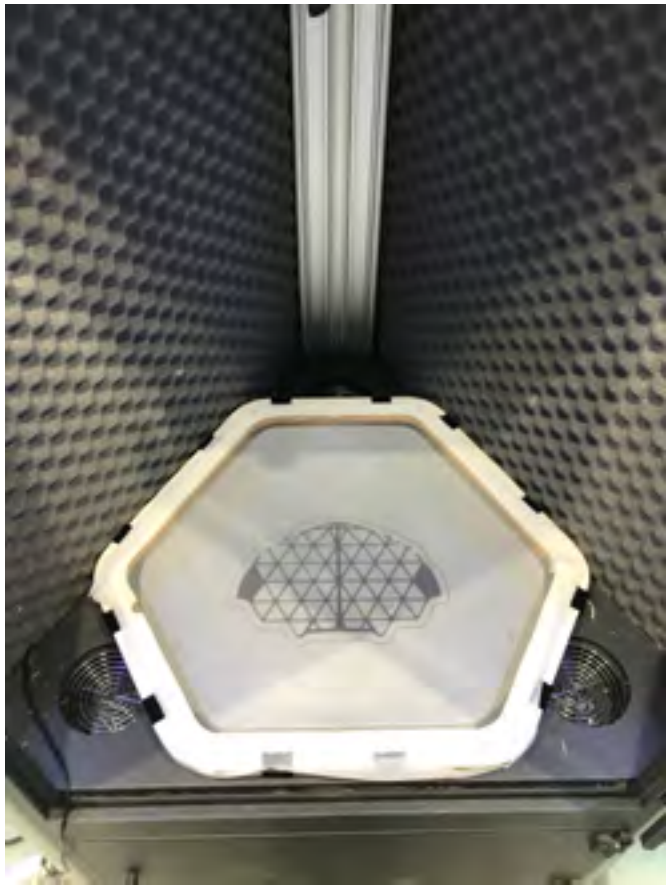
Courtesy: Timothy Liddell

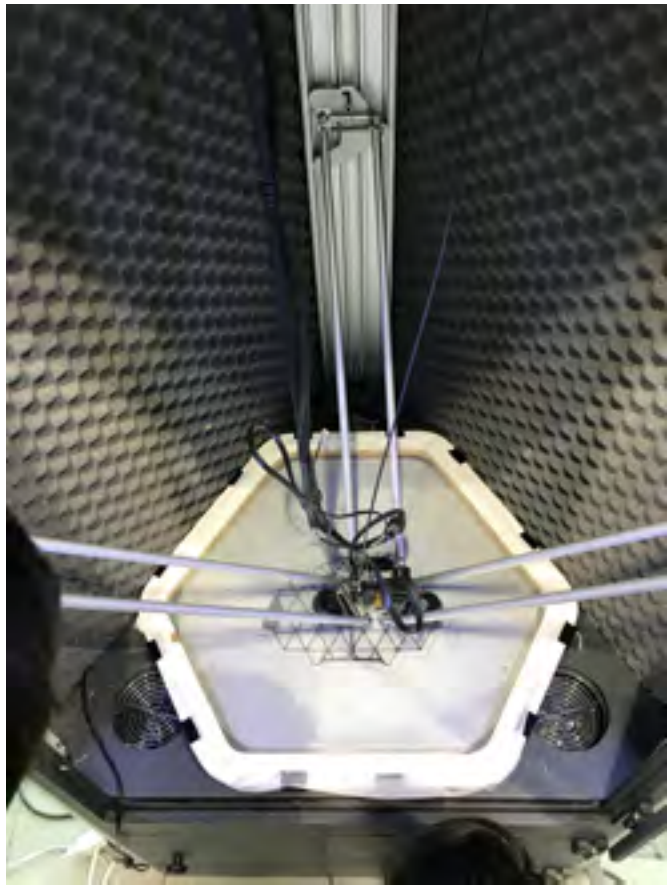
Direct 3D printing on textile: solid structures

Courtesy | on the left: Travis Fitch; on the right: Roberta Fustinoni

Direct 3D printing on textile: the step of the process







Courtesy | makerspace: Superforma.xyz;

designers: Andres Caceres, Enzo Camilla, Daniele Carlini, Sofia Duarte P., Lisa Iannello, Victorua Rodriguez S.

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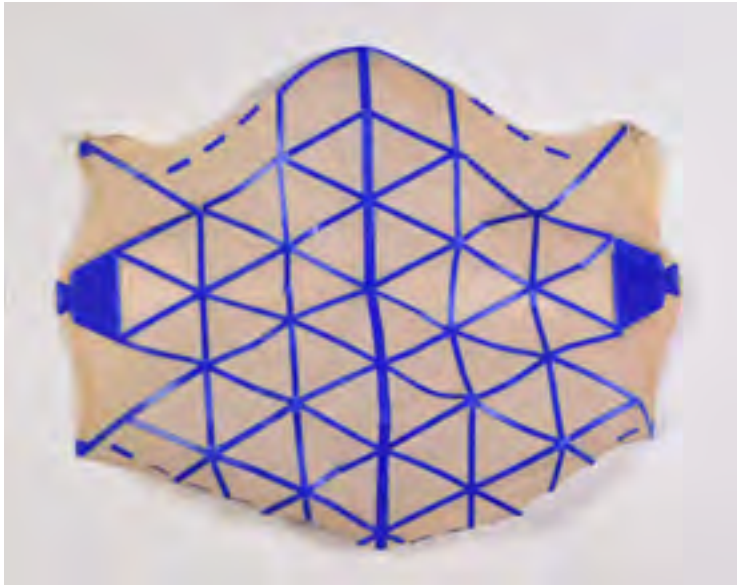

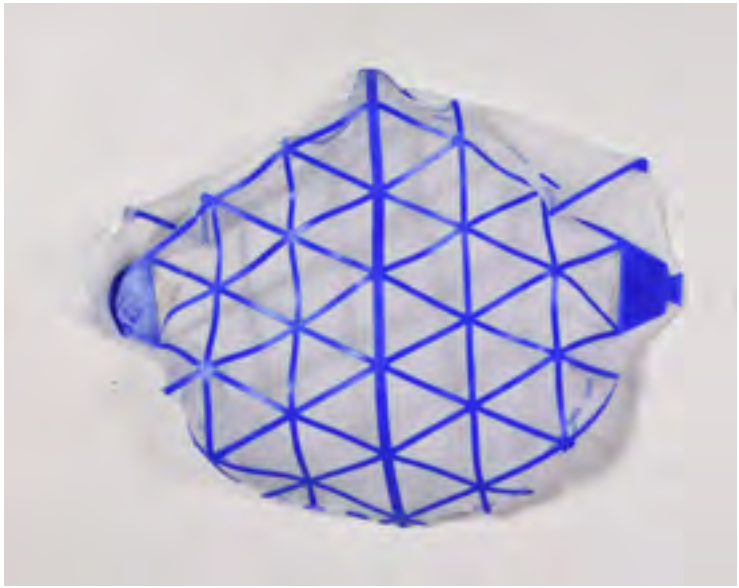

In conclusion

Technologies influence the designer and the producers
that changes the aesthetics of the projects.

It is possible to design and manufacture shapes
that were previously impossible.

Visit http://destexproject.eu/ to see the rest of the intellectual outputs of the project

Acknowledgement:
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