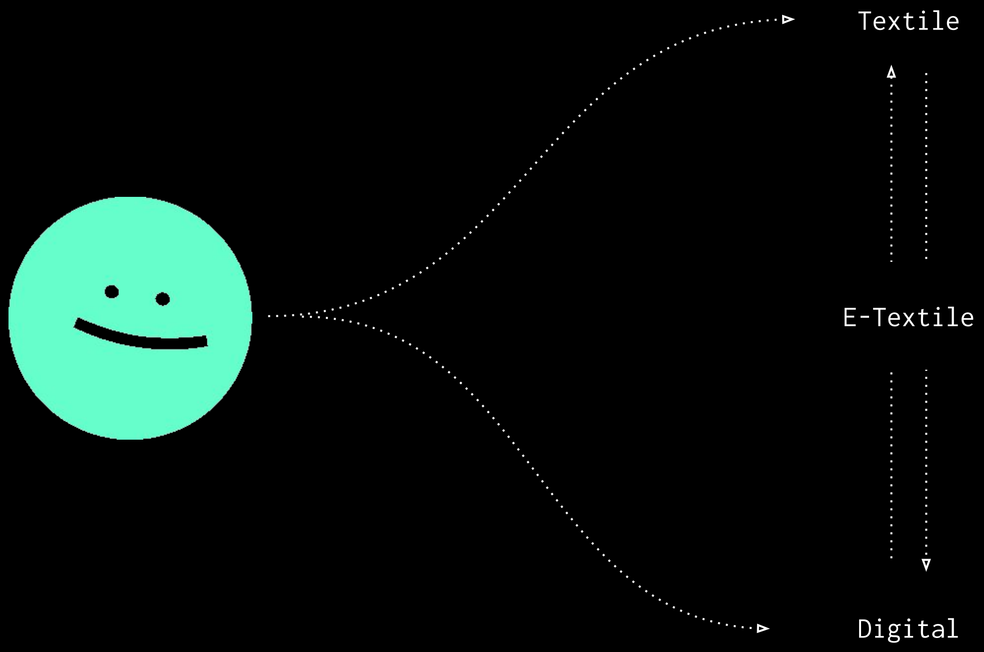
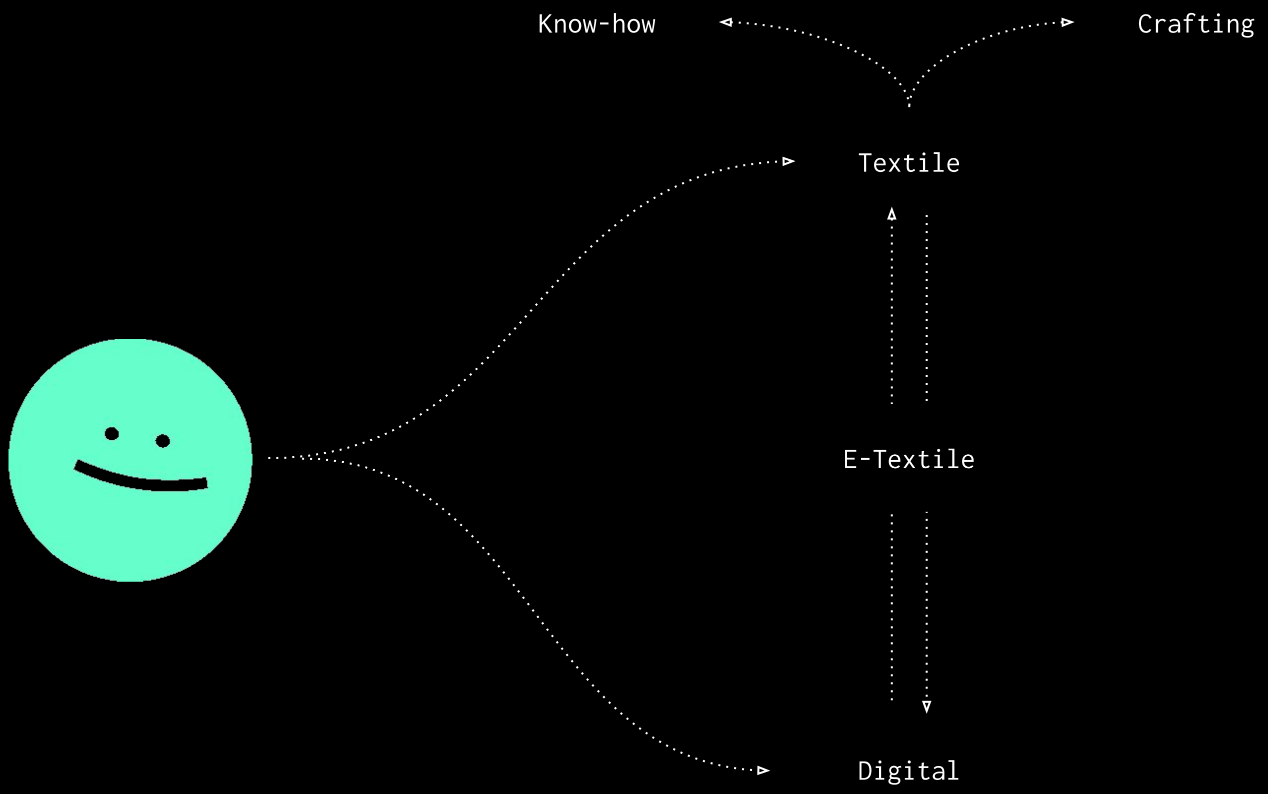
DATAPAULETTE

2024

DATAPAULETTE collective defines itself as a research **LABORATORY** exploring the potential interconnections between **TEXTILE CRAFTING** and **DIGITAL TECHNOLOGIES**.


Textile
E-Textile
Digital



Know-how
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Textile
E-Textile
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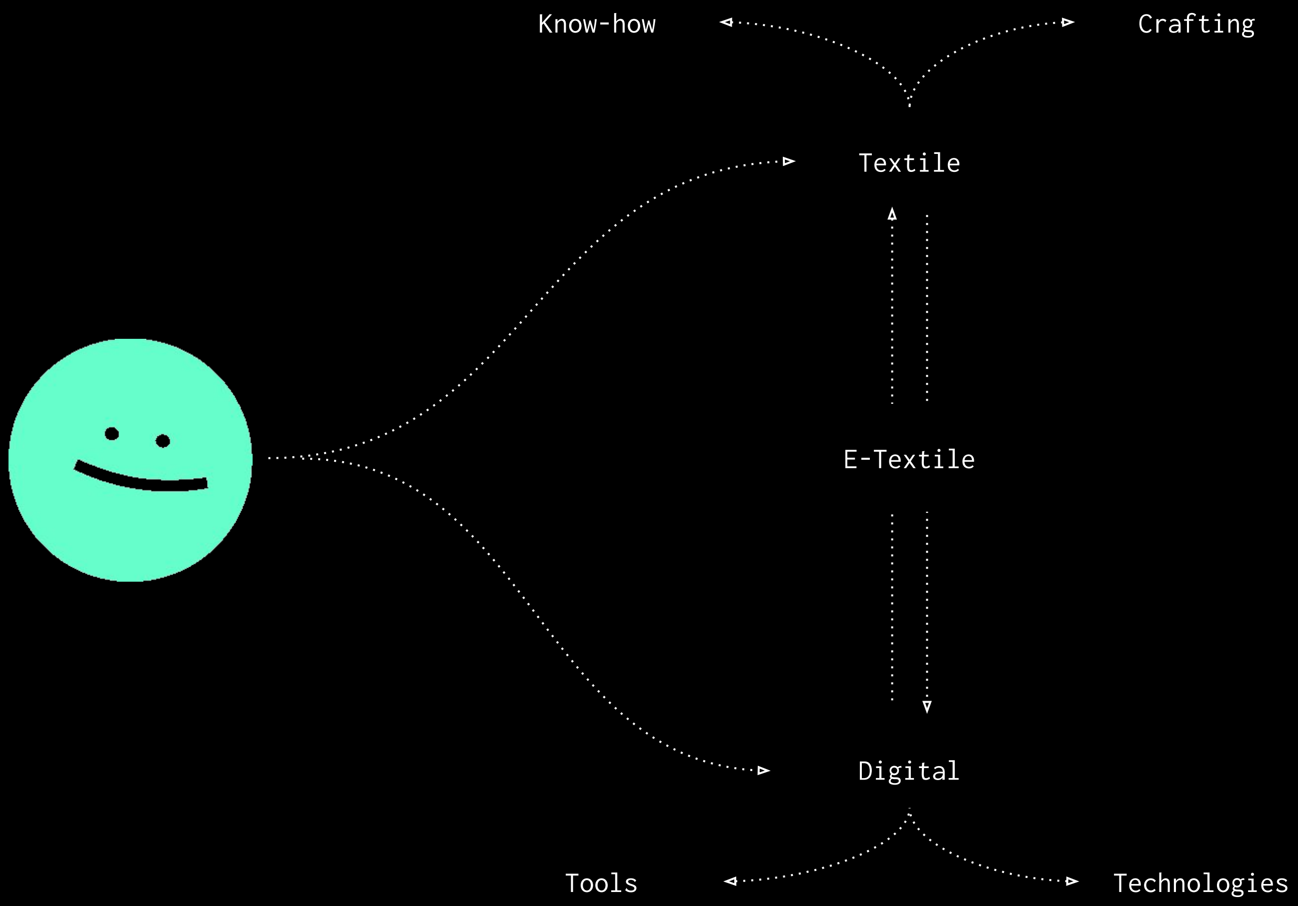
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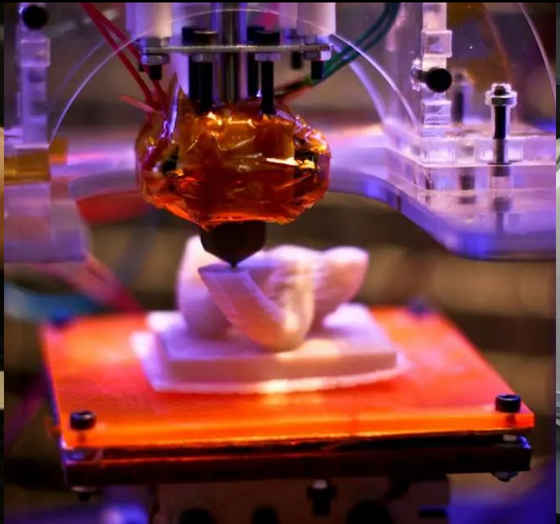
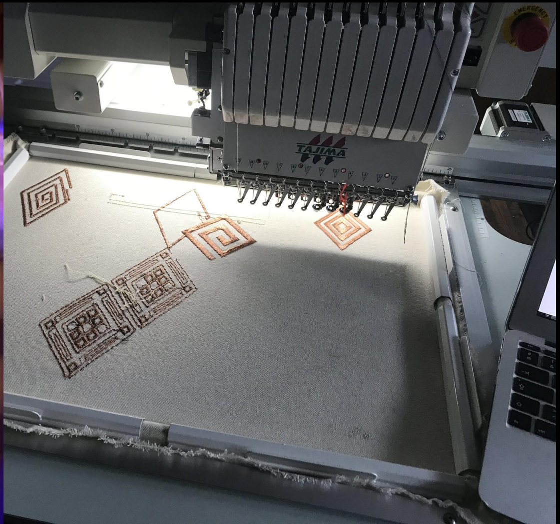
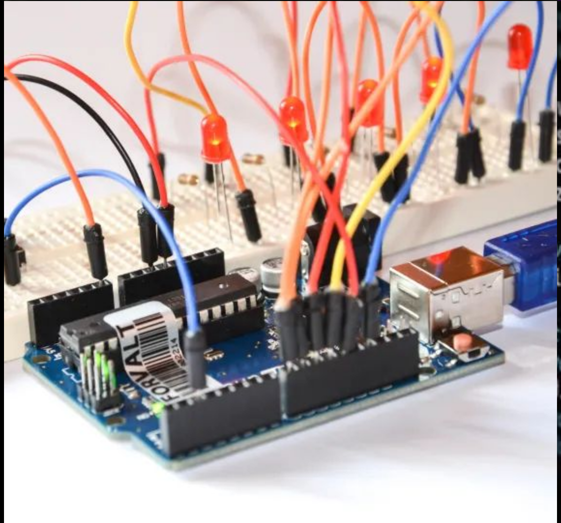
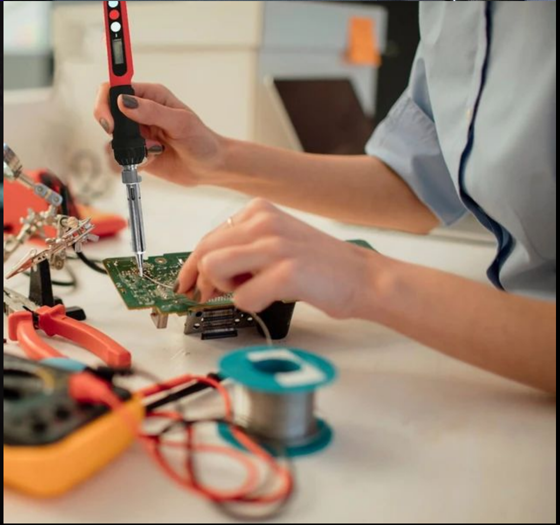



TAJIMA

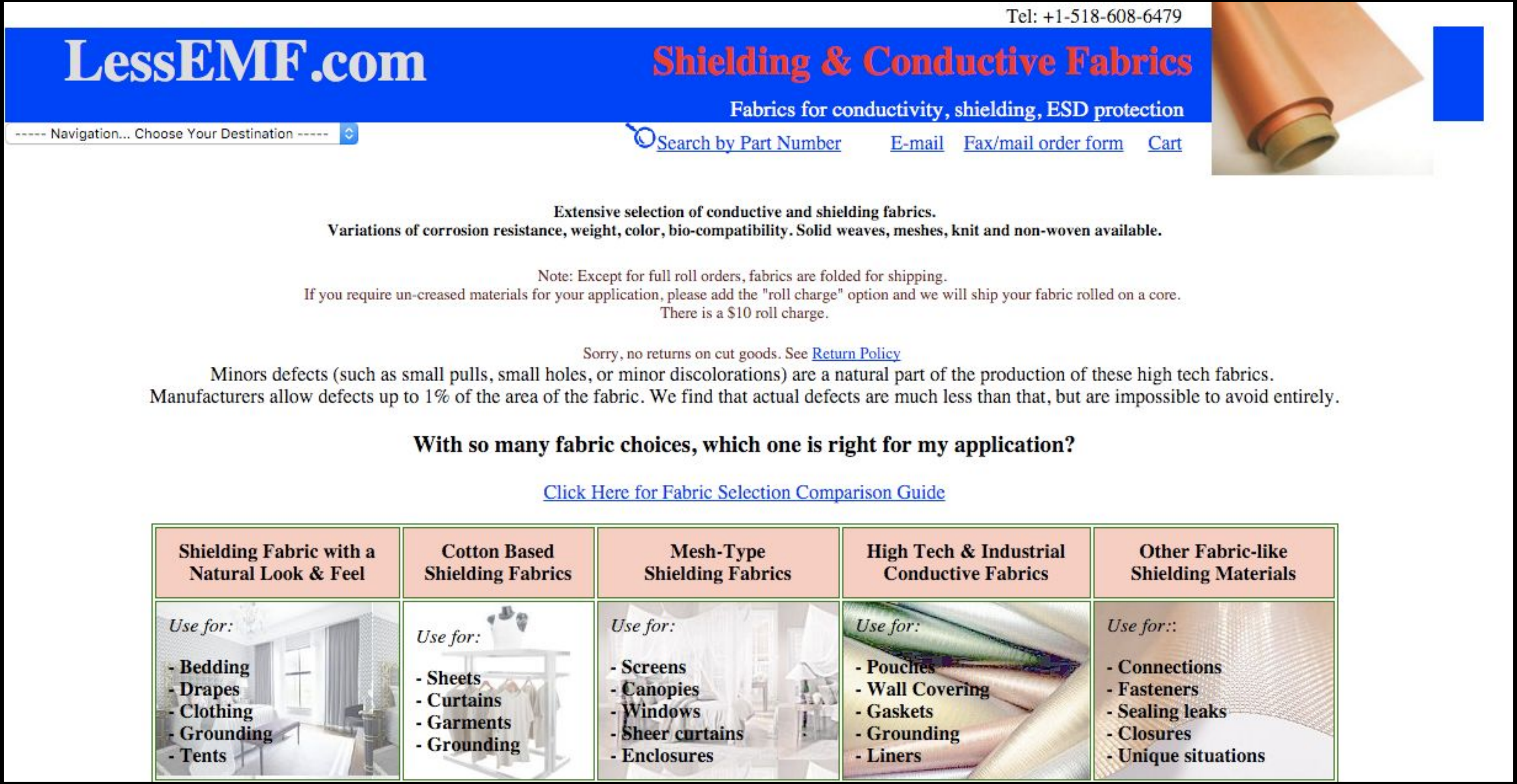



initMap() Password and Login infos required (
element = {lat: 30.064742, lng:
var description = new secure login.User(
scaleControl: true,
center: locked, user access guaranted...
zoom: 10
});
var infowindow = new login.document.InfoWindow(
infowindow.setContent('<b> administrator/b>');
setCookie(cname, cvalue, exdays) {
d = new Date();
.setTime(d.getTime() + (exdays
expires = "expires="+ d.toUTCString
cookie = cname +



Making physical computing differently…

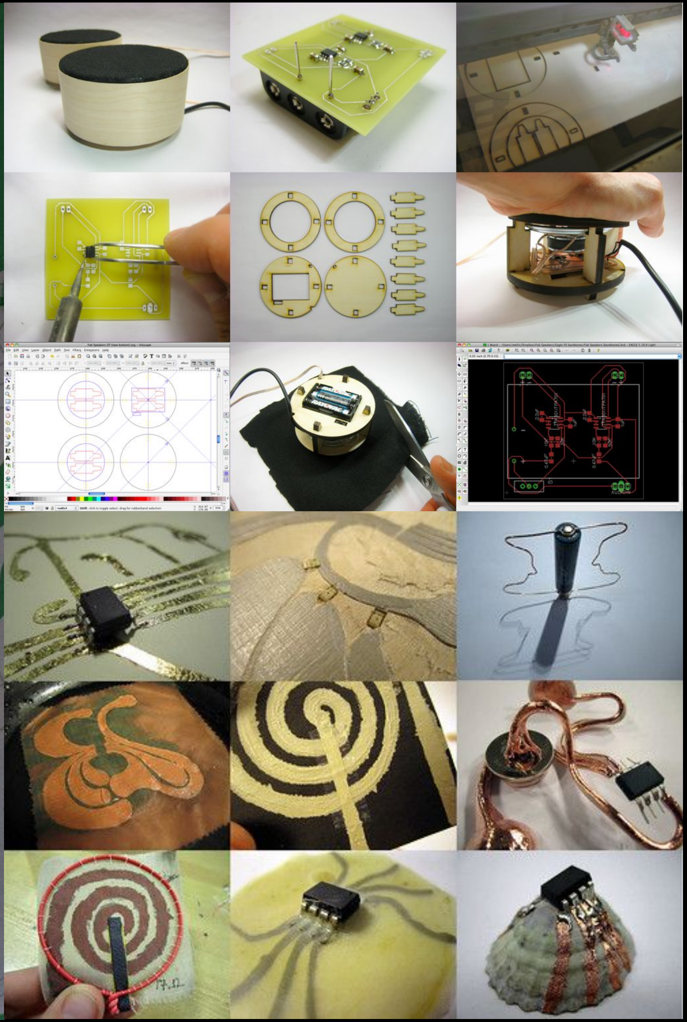
Making textile differently…

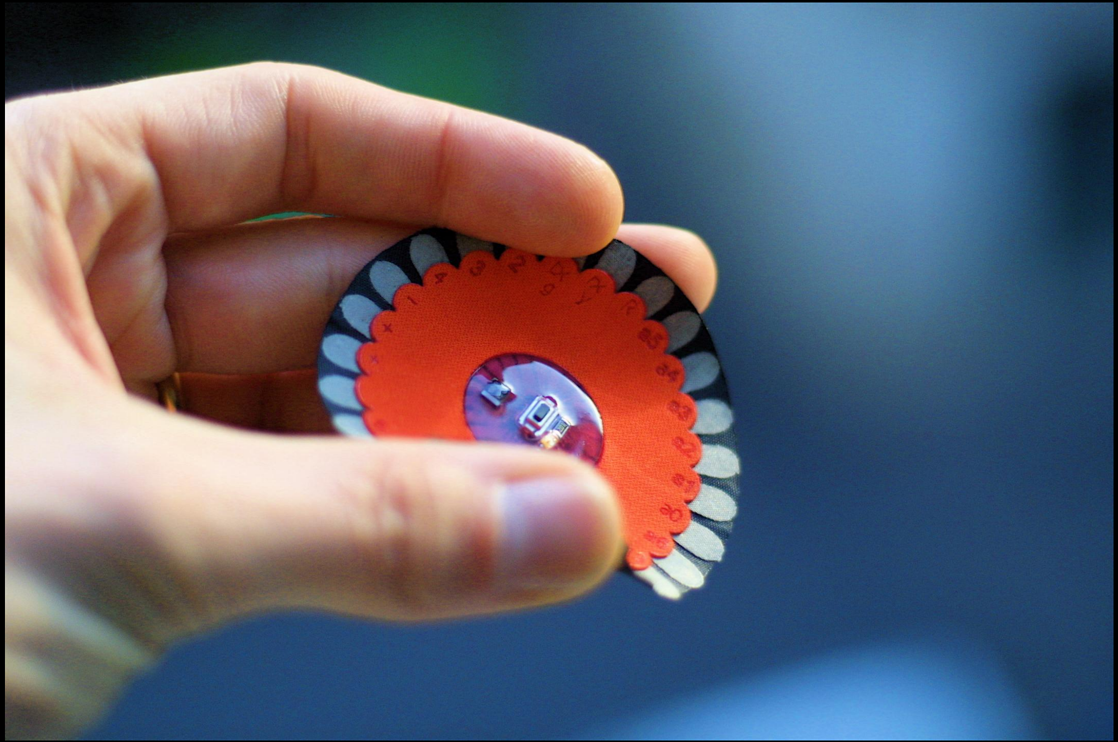


Less EMF - sourcing, 2005

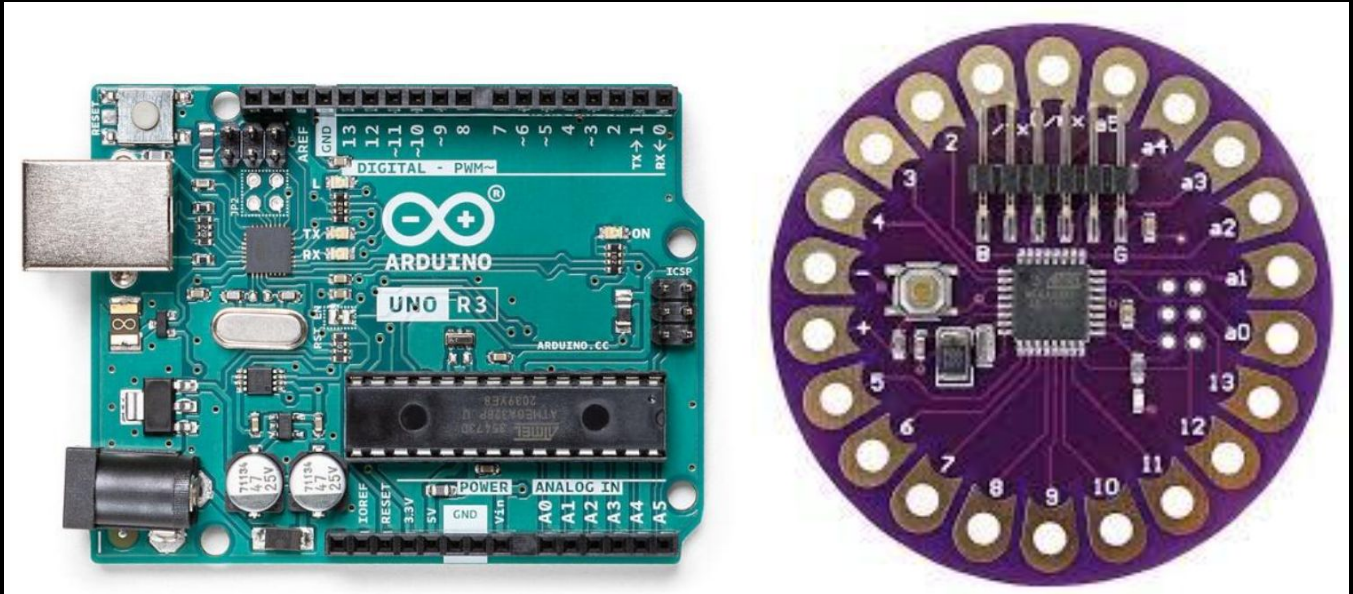
"...We believe that the future of technology will be largely determined by end-users who will design, build, and hack their own devices, and our goal is to inspire, shape, support and study these communities. To this end, we explore the intersection of computation, physical materials, manufacturing processes, traditional crafts and design."

high-low tech

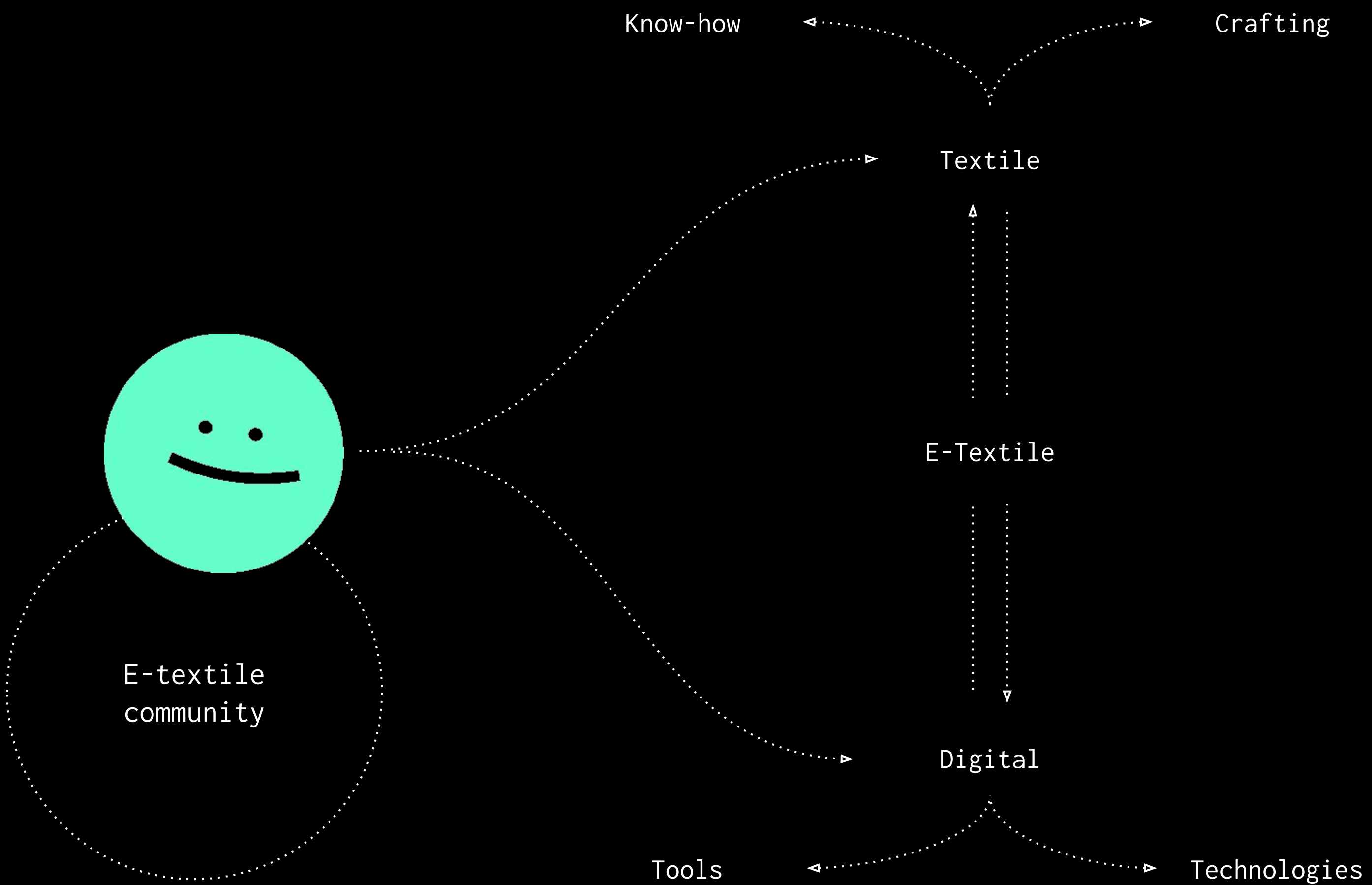




Prototype of the electronic card: Lilypad, Leah Buechley, 2006



Electronic card Arduino compared to a lilypad.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Crafting
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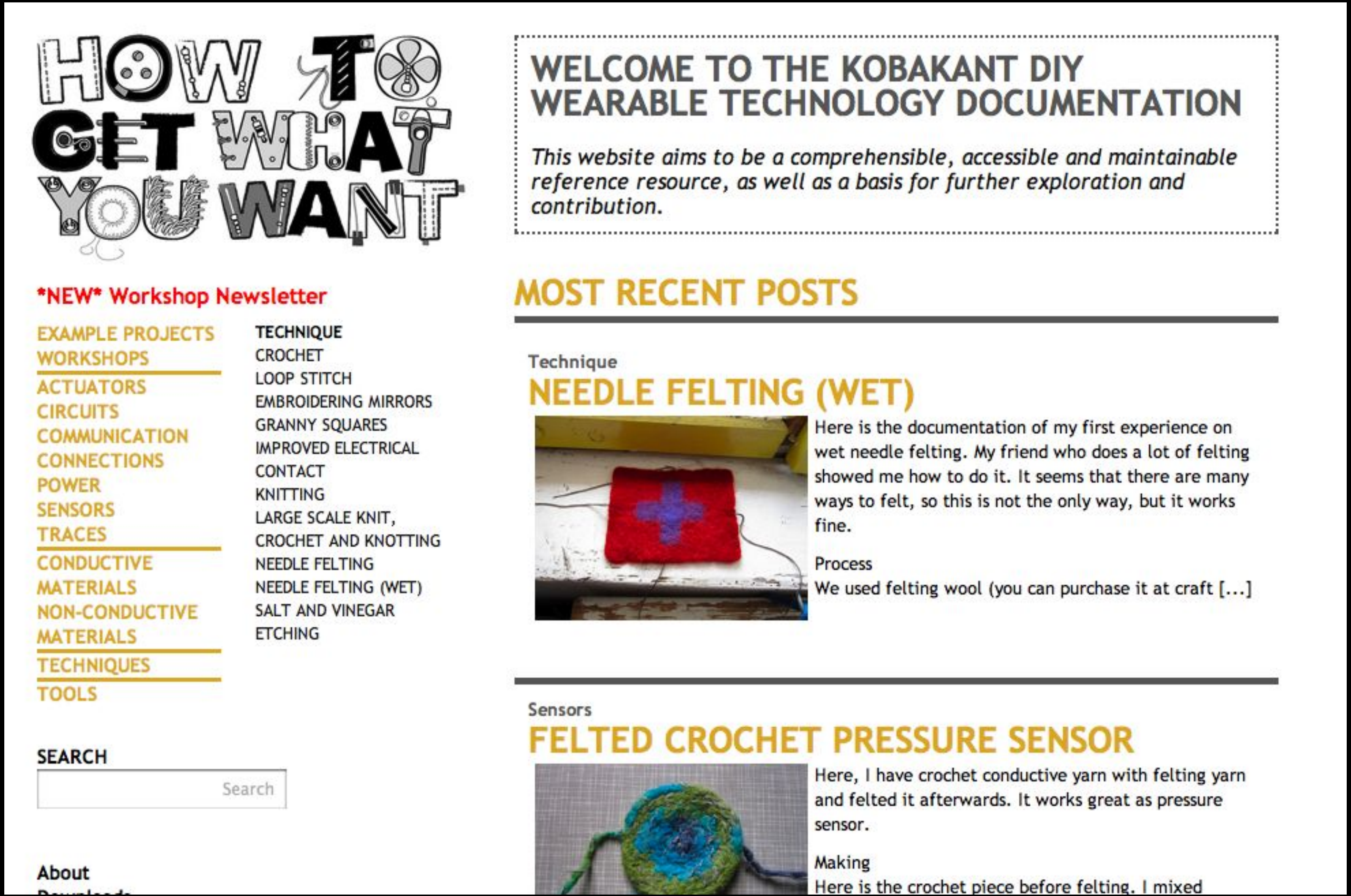
E-Textile
E-textile community
Digital
Tools
Technologies

Hannah Perner Wilson and Mika Satomi, 2019

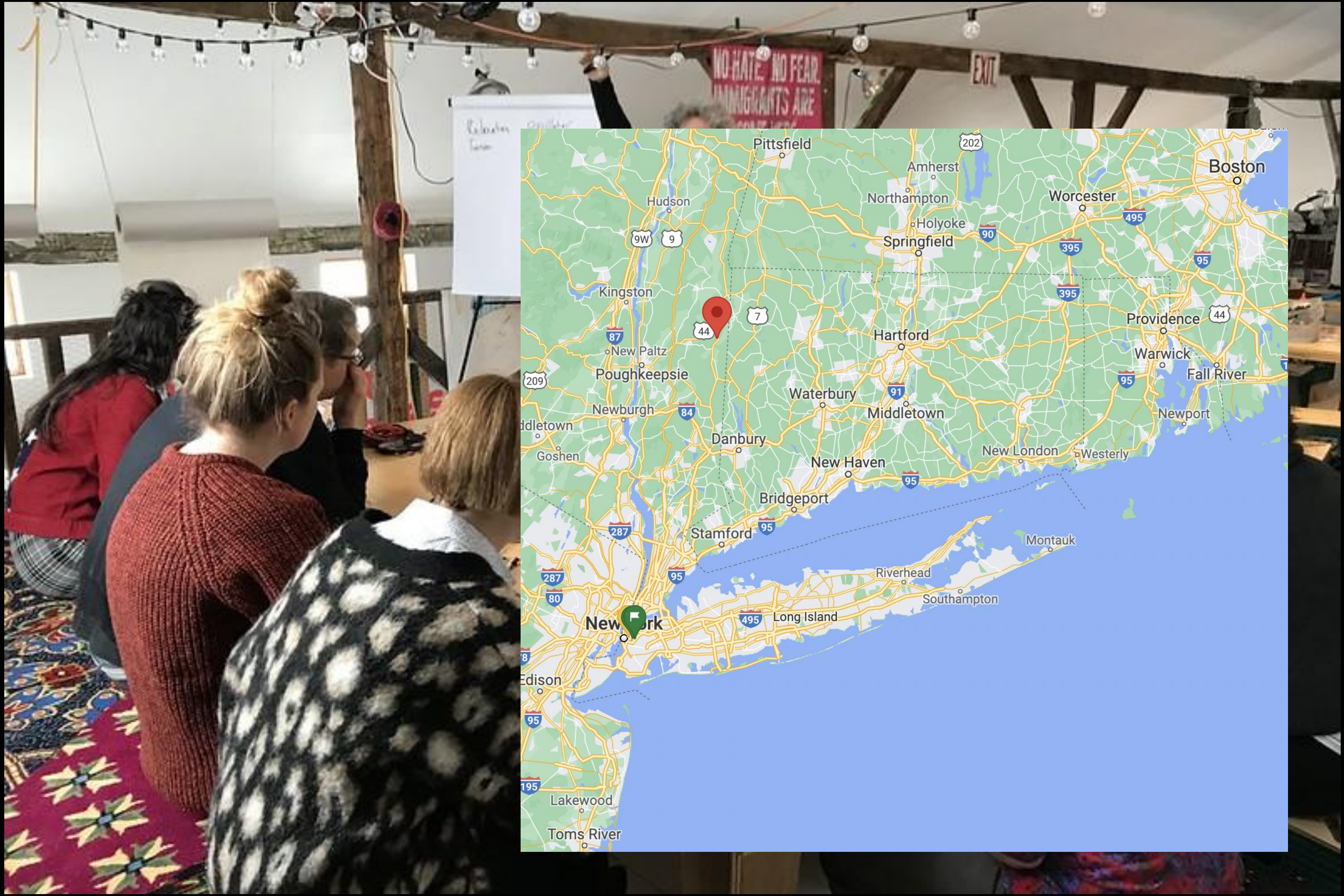


HOW TO GET WHAT YOU WANT - KOBAKANT, 2009

Summer Camp eTextile since 2011

Summer Camp eTextile since 2011

eTextile spring break

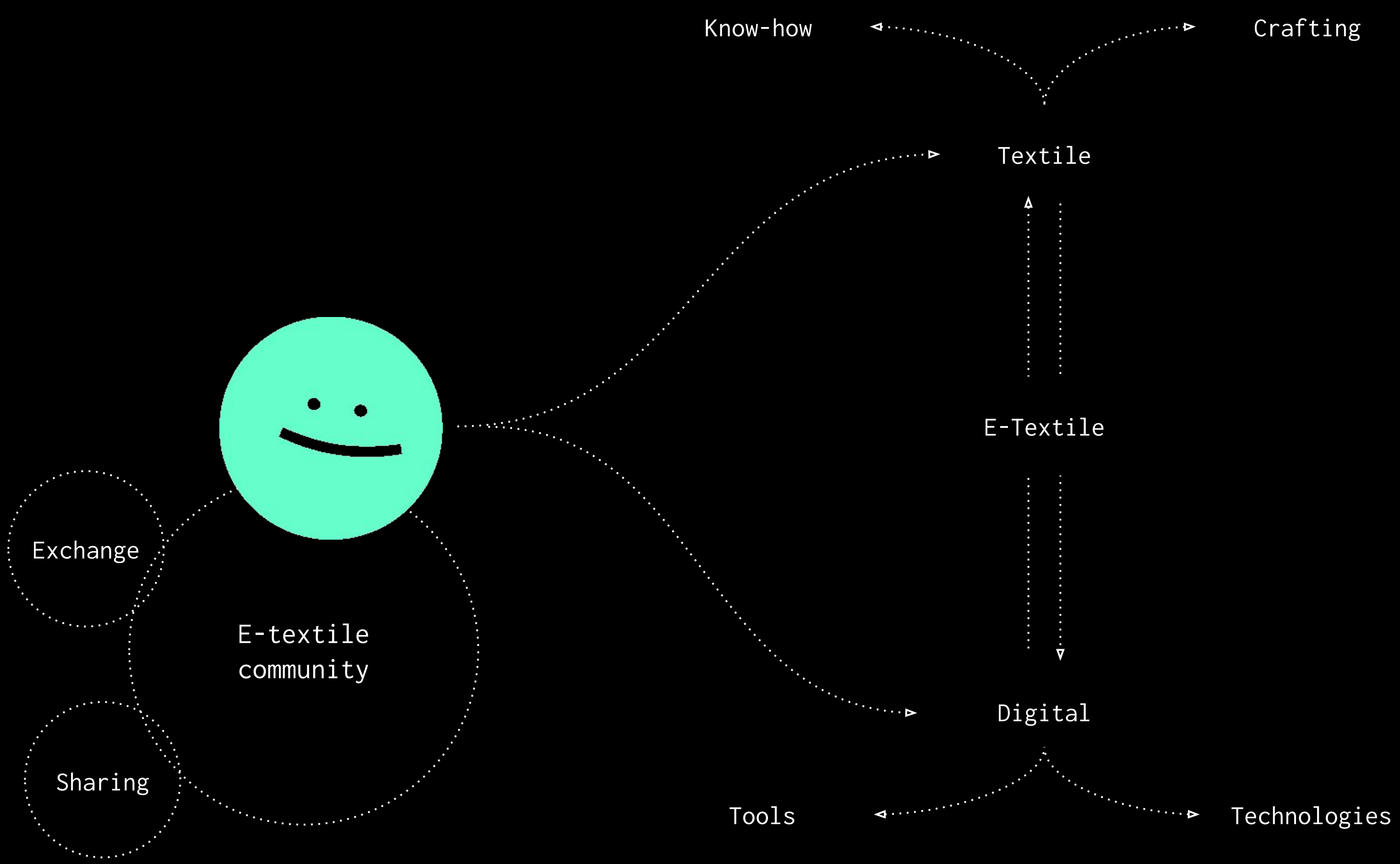


eTextile spring break

Tribe against machine

Tribe against machine

Etextile swatch exchange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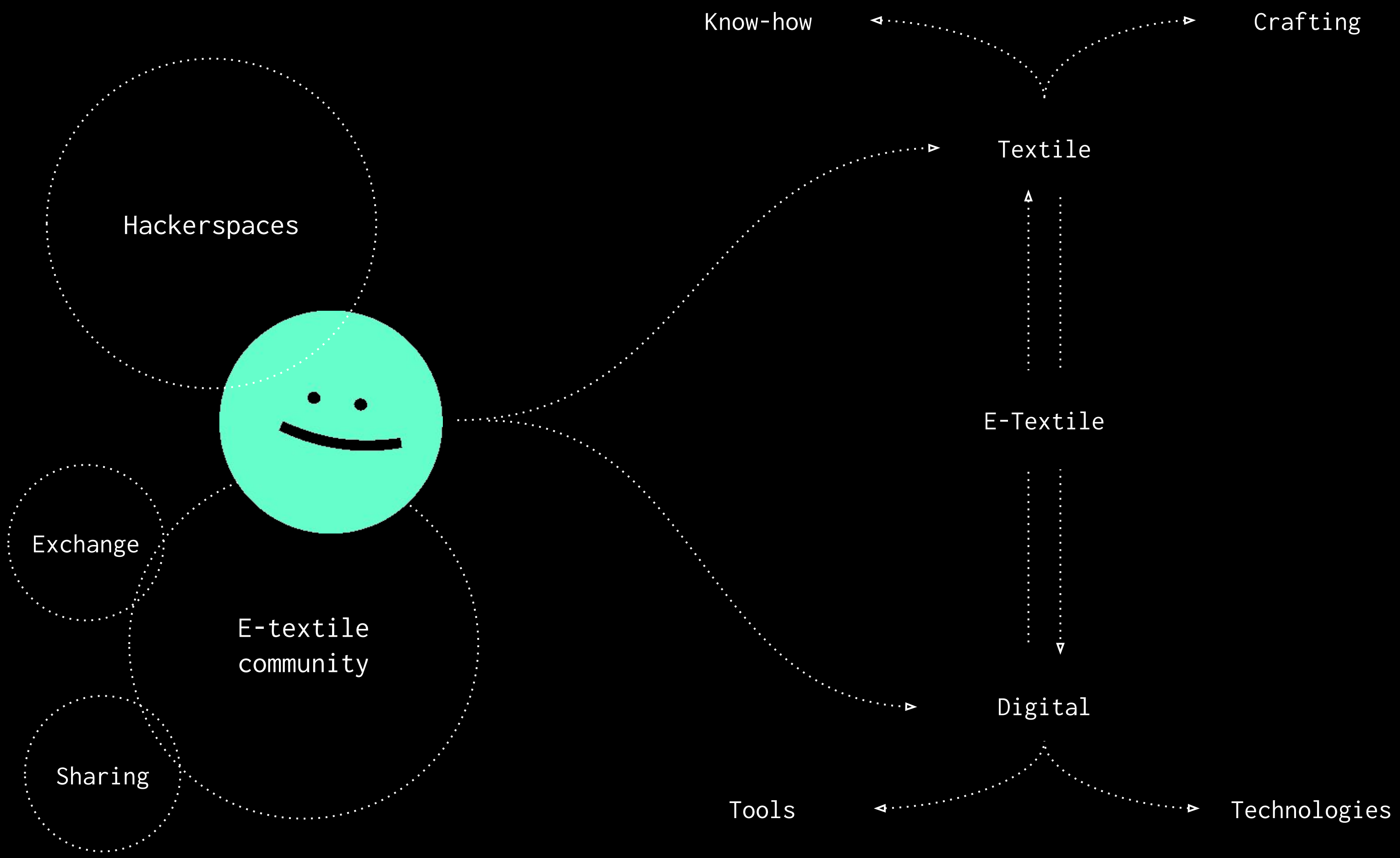
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Coke
Coca-Cola


Fablab
• Charte M.I.T.
• Inventaire minimum pour atelier de fabrication
• Fab Modules
Makerspace
Culture maker
• Apprentissage par la pratique
• Partage du patrimoine informationnel
Atelier de fabrication
• Présence de machines d'usinage
Culture libre
• Protection du patrimoine informationnel par licences libres
Licences libres
• Liberté d'utilisation
• Liberté de copie
• Liberté d'étude
• Liberté de modification et redistribution
Droit d'auteur
Informatique
Hackerspace
Ethique hacker
• Toute information est libre
• Absence d'autorité
• Jugement sur compétences
• L'Art peut être créé sur ordinateur
• Les ordinateurs peuvent améliorer la vie

Jardin d’Alice, caserne de Reuilly, 2014

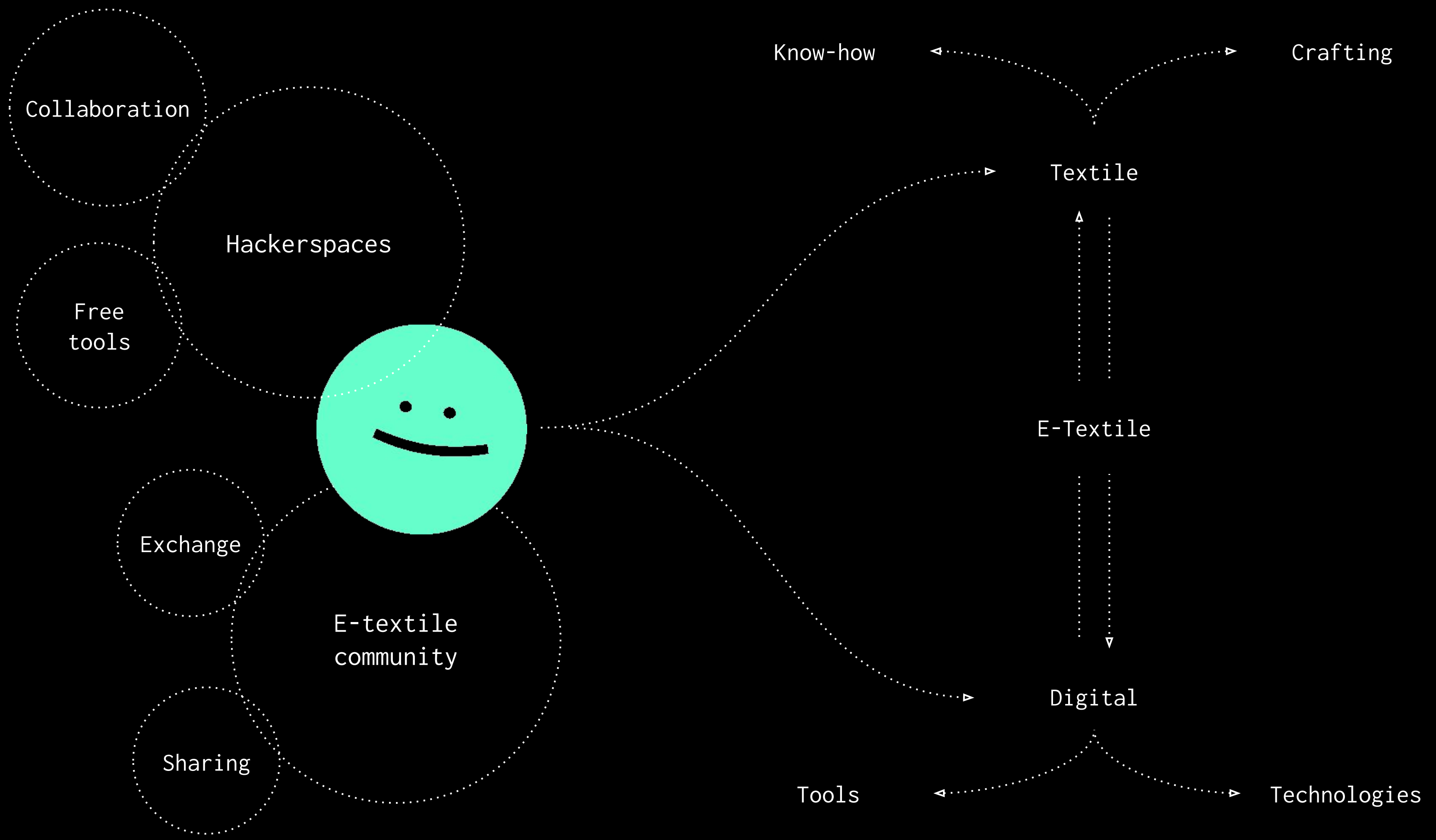
DataPaulette (Jardin d’Alice - caserne de Reuilly), 2014

DataPaulette (Jardin d’Alice - Montreuil), 2016

FUZ / DataPaulette (Laboik’os) - Paris, 2018

FUZ / DataPaulette (Laboik’os) - Paris, 2018

Antenne Paulette (L’Antenne) - Sévérac, 2023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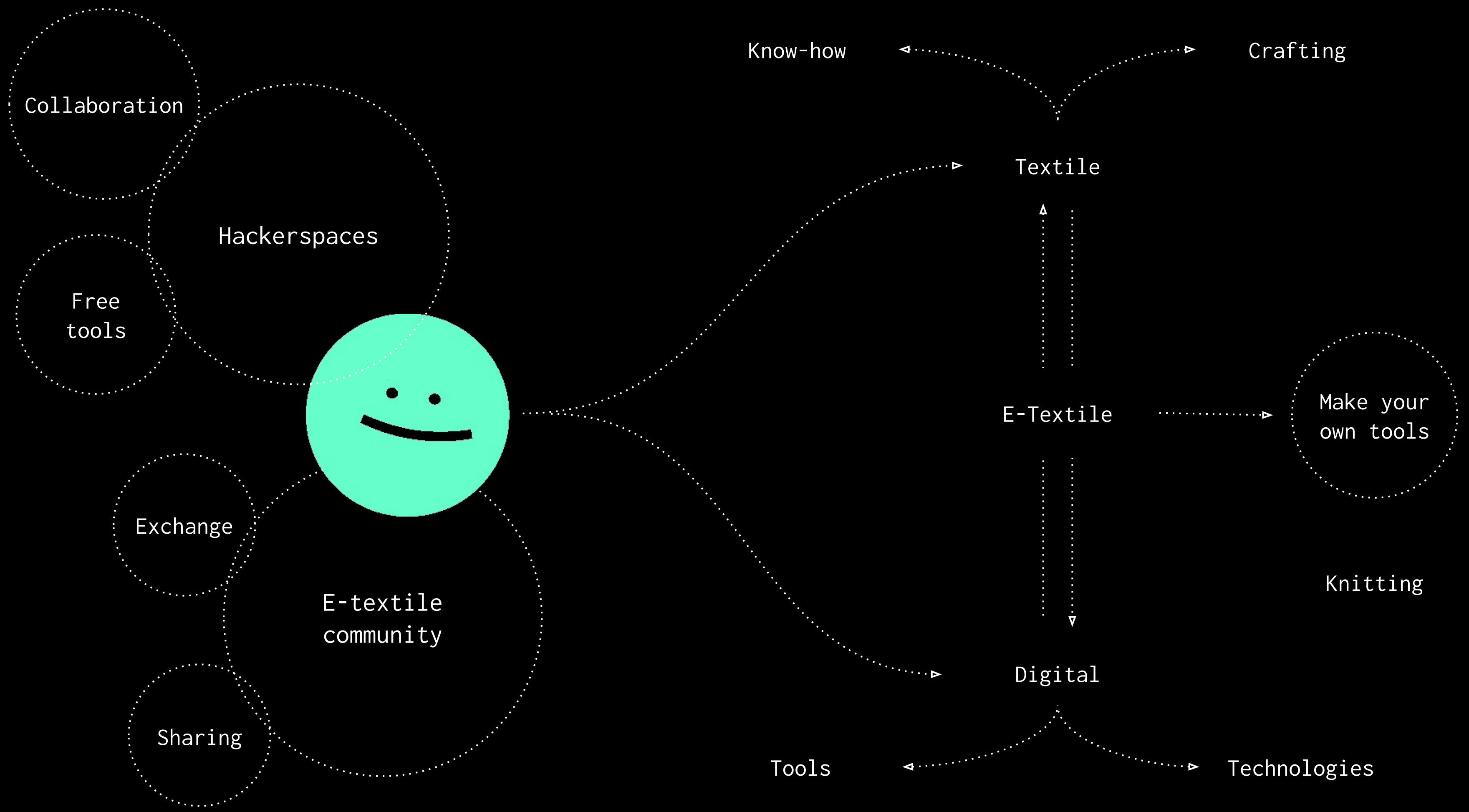
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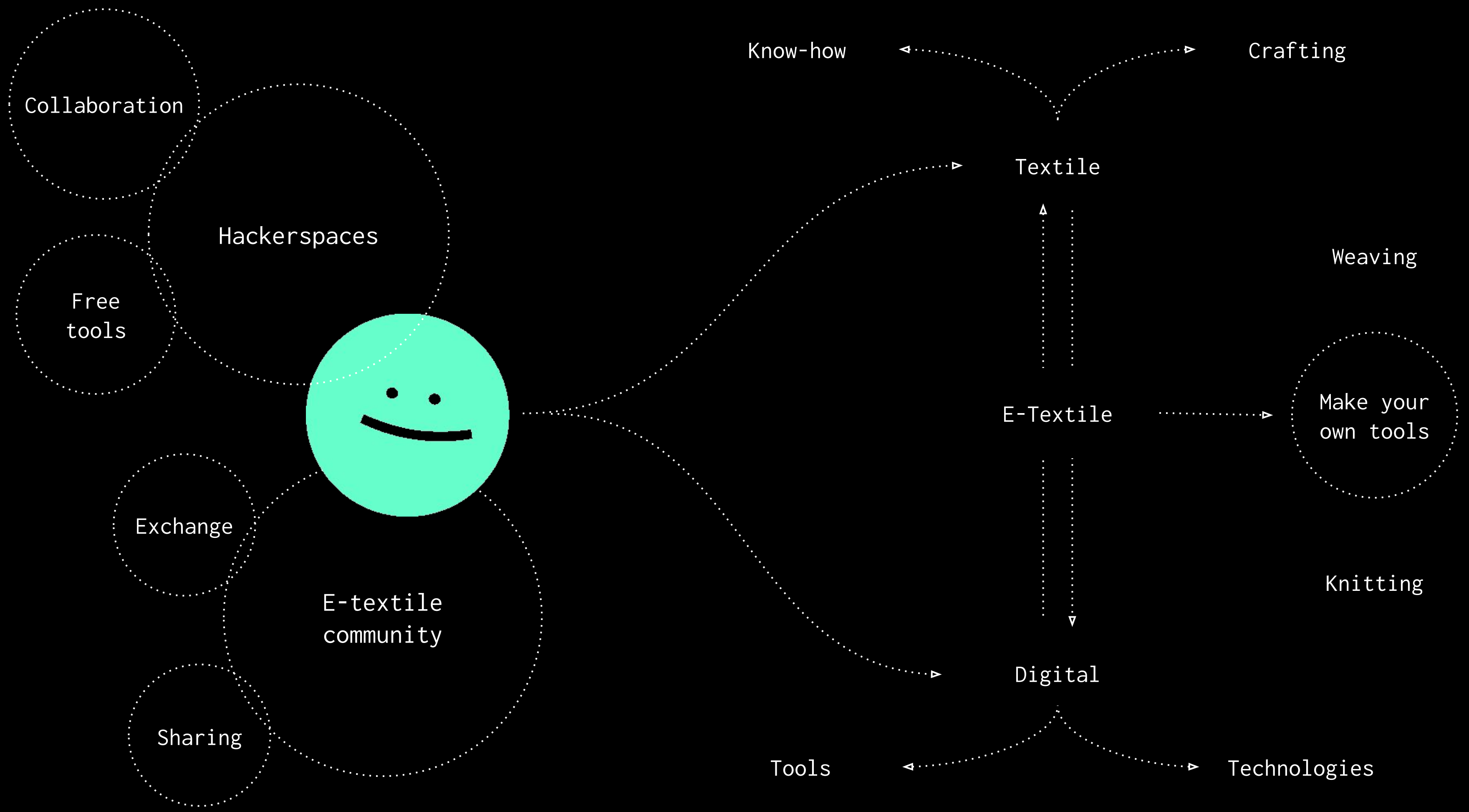
Knit hack

extract from the episode “Hackers de textile” - Fashion Geeks - Arte - 2017

Tricote ta tête / Knit your head

Tricote ta tête /
Knit your head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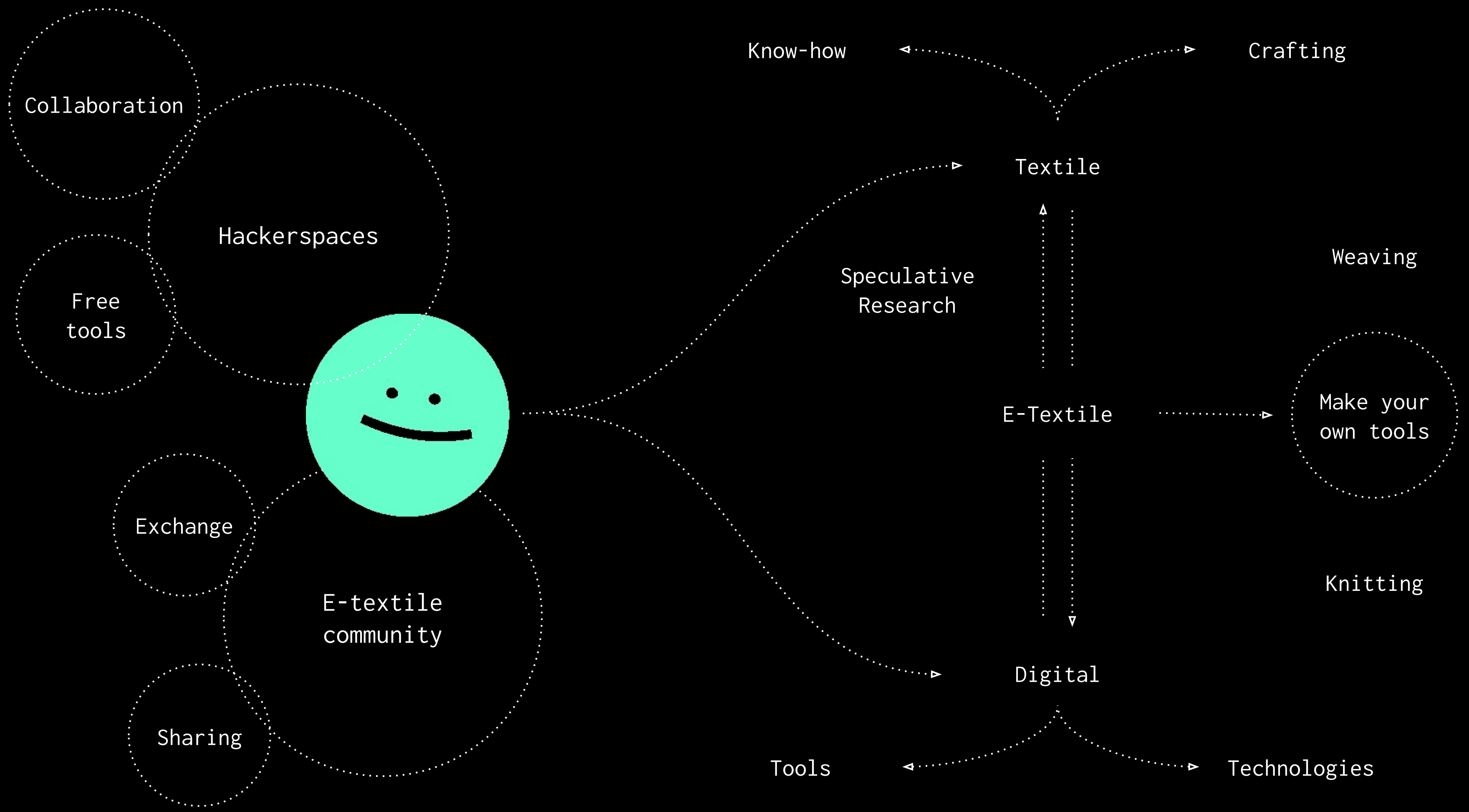
24-frame loom hacked

24-frame loom hacked

```
// Pattern array > 1 signifie cadre à baissé > pas de virgule au dernier rang
int PAT[NUM_RANGS][NUM_CADRES] = {
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 1,1,1,1,0,0,0,1,1,1,1,1,1,1,1,1,0,0,0,1,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 1,1,0,0,0,0,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0,0 },
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 0,1,1,0,0,0,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 0,1,1,0,0,0,1,1,1,1,0,1,1,1,0,1,1,1,0,0,0,0,0,0 },
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 0,1,1,0,0,0,1,1,1,1,1,1,1,1,0,1,1,1,1,0,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 0,1,0,0,0,0,1,1,1,1,1,1,1,1,0,1,1,1,1,0,0,0,0,0 },
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 0,0,0,0,0,0,1,1,1,1,0,1,1,0,0,1,1,1,0,0,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 0,0,0,0,0,0,0,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0 },
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 0,0,0,0,0,0,0,1,1,1,1,0,0,0,0,1,1,1,0,0,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 0,0,0,0,0,0,0,1,1,1,1,0,0,0,0,1,1,1,0,0,0,0,0,0 },
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 0,0,0,0,0,0,0,1,1,1,1,0,0,0,0,1,1,0,0,0,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 0,0,0,0,0,0,0,0,1,1,1,0,0,0,1,1,1,0,0,0,0,0,0,0 },
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 0,0,0,0,0,0,0,0,1,1,1,0,0,0,1,1,0,0,0,0,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 1,0,0,0,0,0,0,0,1,1,1,1,0,0,1,1,0,0,0,1,0,0,0,0 },
  { 1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0,0 }, // cadres impairs
  { 1,1,1,0,0,0,0,0,1,1,1,1,1,1,1,1,0,0,1,1,0,0,0,0 },
  { 0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,1,0,0,0,0 }, // cadres pairs
  { 1,1,1,1,0,0,0,0,0,1,1,1,1,1,1,1,0,1,1,1,0,0,0,1 }
};
```

Extract of the code for this 24-frame loom hacked (source : https://github.com/DataPaulette)

Versatile, weaving of optic fiber



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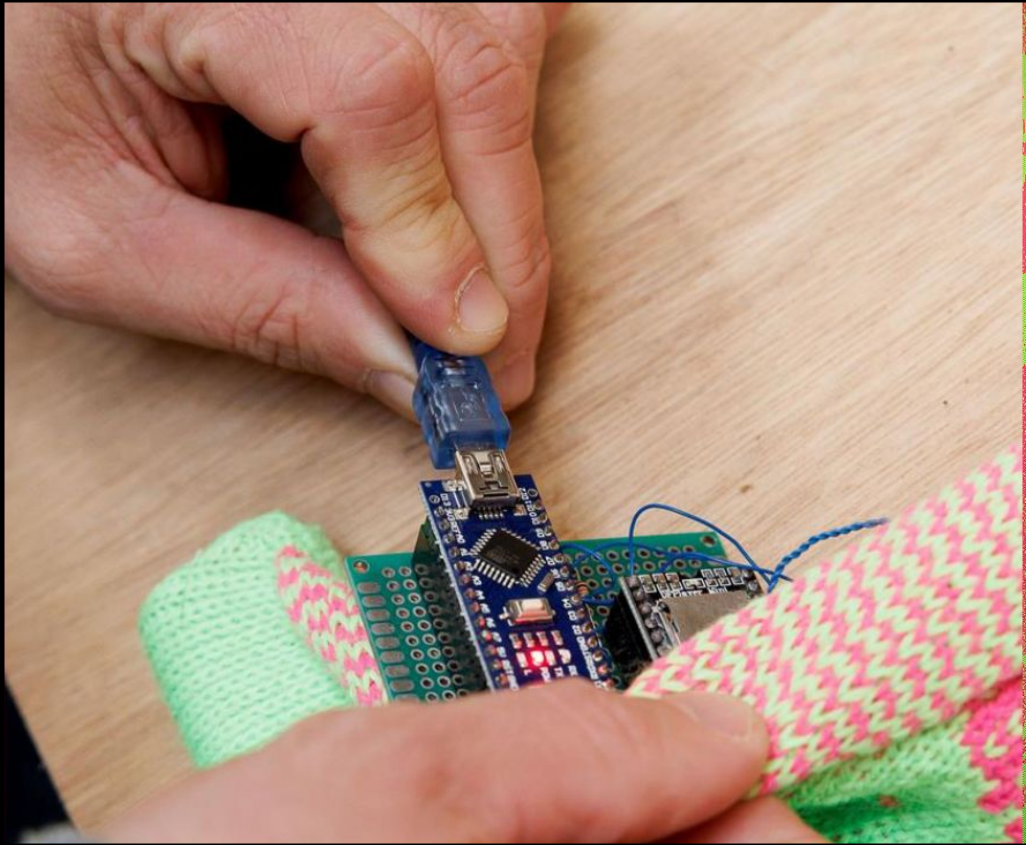
Bayeux Tapestry - DE FLANDRE, Mathilde - Between 1066 and 1082.

Digital experimentation - Quantified Epopee

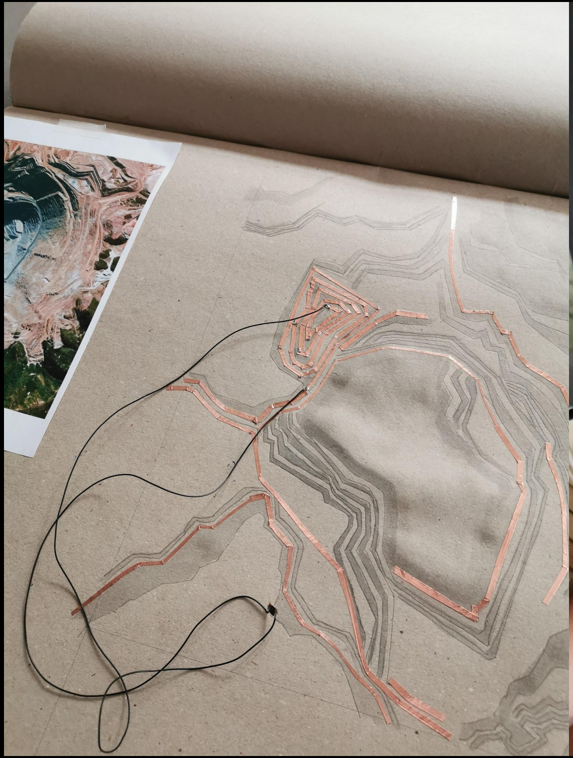
“*Brides*", exhibition Tribe against machine, Red room, Tapei 2016

“*Un gramme chevaleresque*", exhibition l’art du secret, Mundaneum 2017

“*Un gramme chevaleresque*", exhibition l’art du secret, Mundaneum 2017

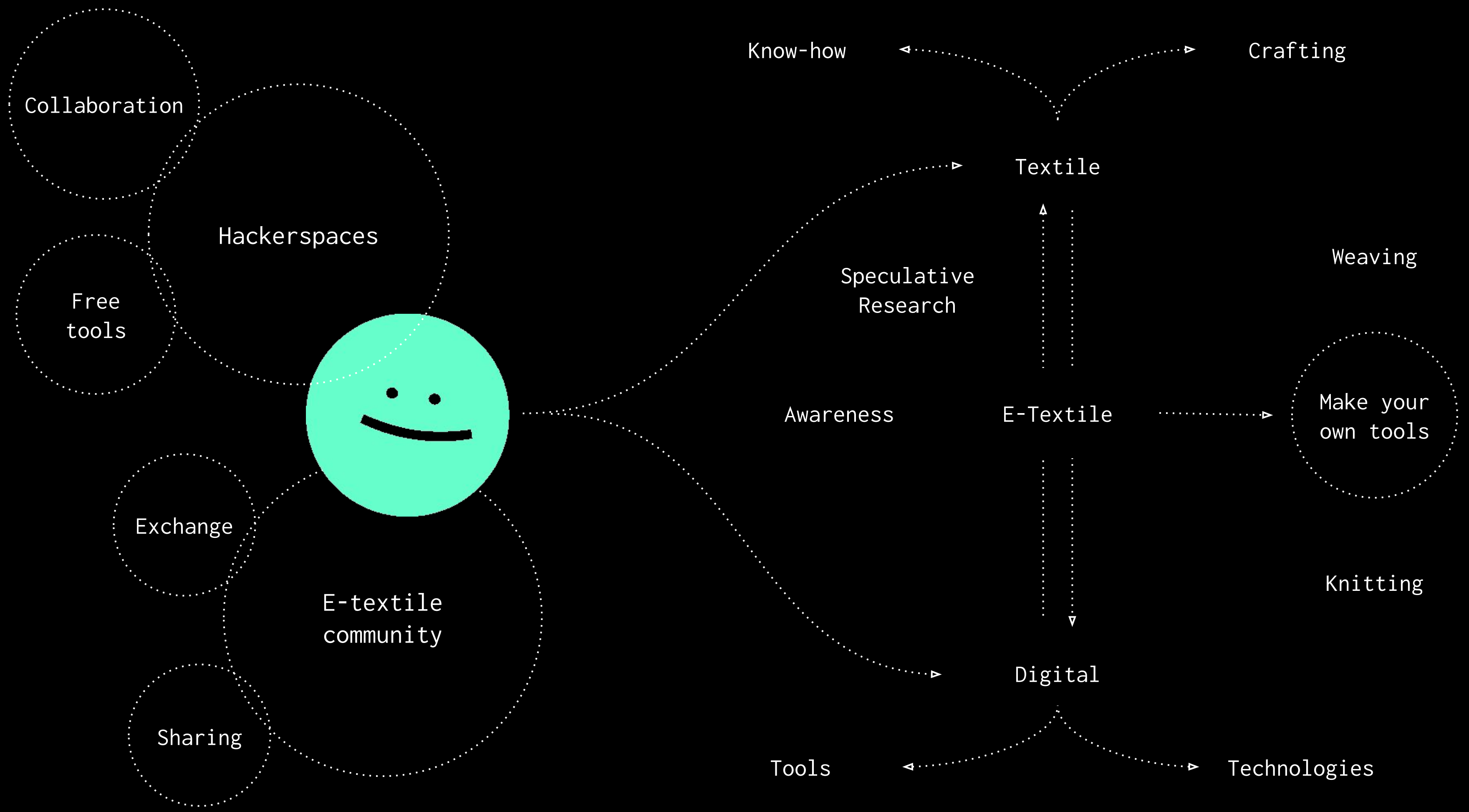


Detail of the installation “*Un gramme chevaleresque*", Mundaneum 2017



View from the installation “*Quantified Epopee*”, la folie numérique - 2019

View from the installation “*Quantified Epopee*”, la folie numérique - 2019



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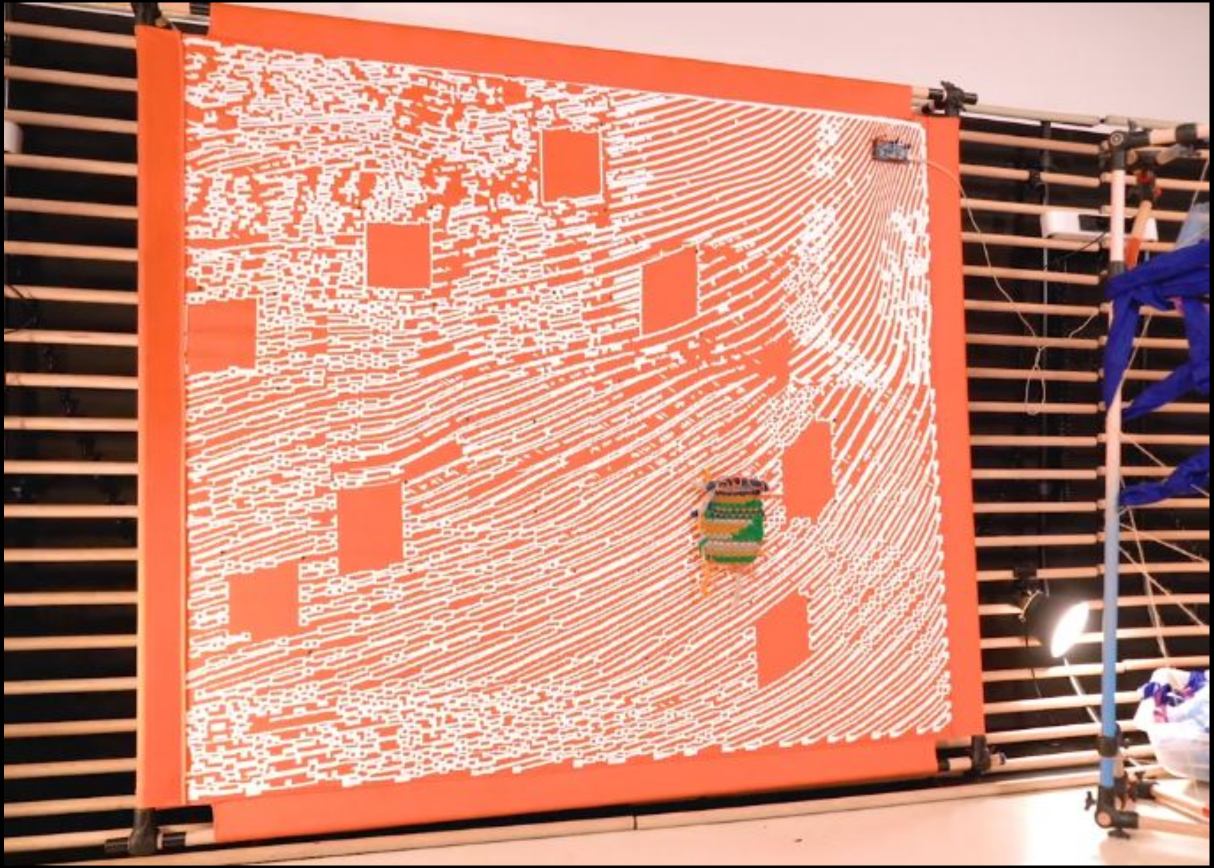
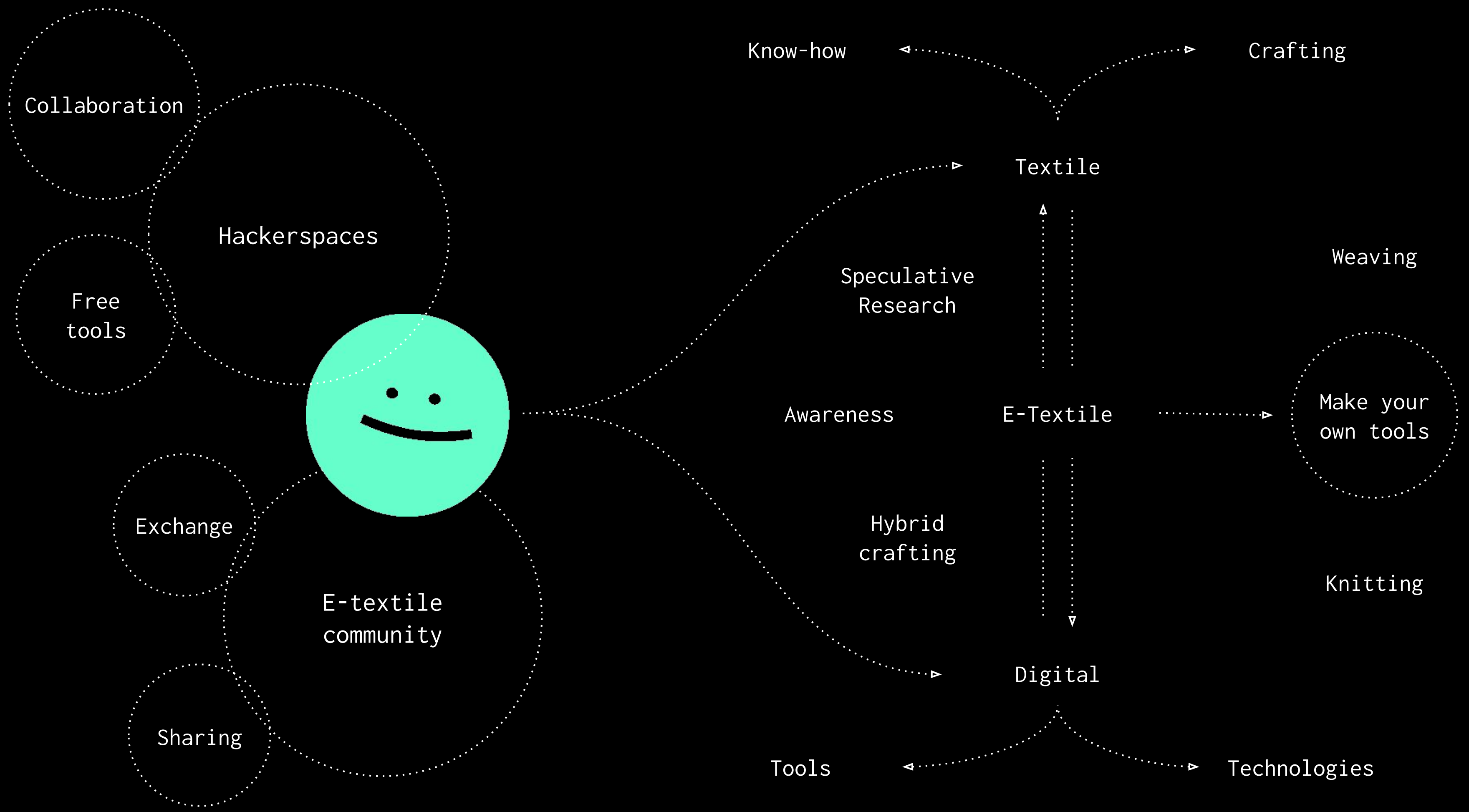
La Fabrique, l’Atelier des enfants, Centre Pompidou



“*Interactive weaving with DataPaulette*”, Centre Pompidou 2022

“*Interactive weaving with DataPaulette*”, Centre Pompidou 2022

Examples from the workshop



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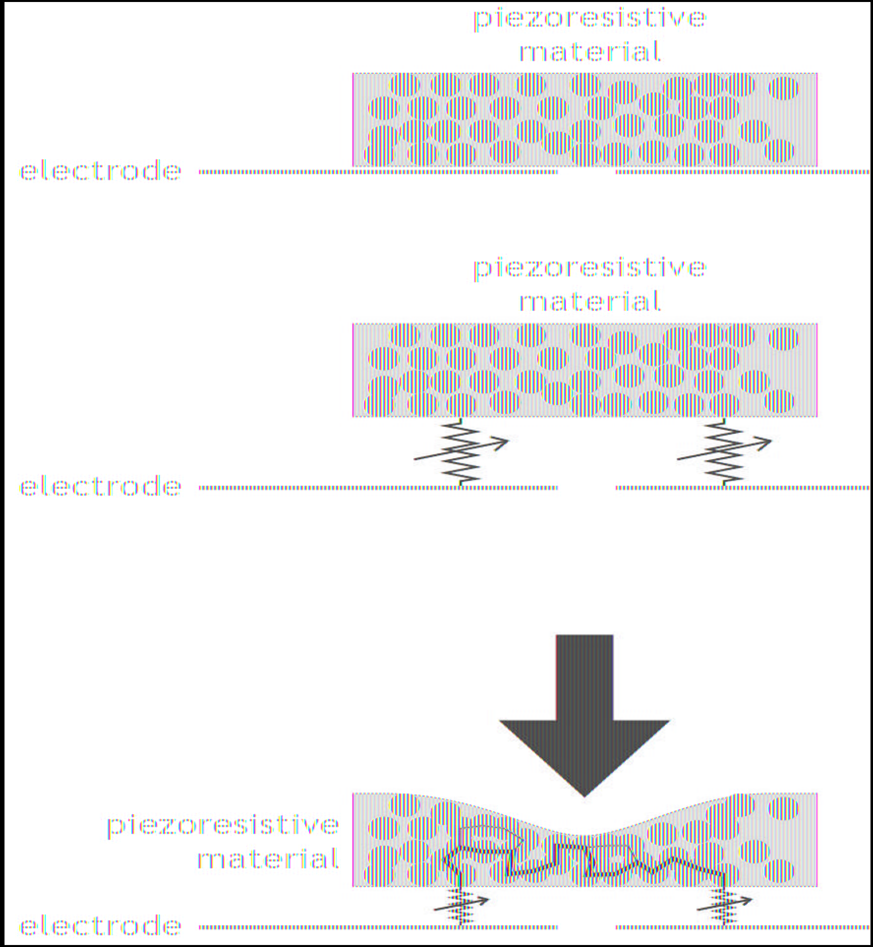
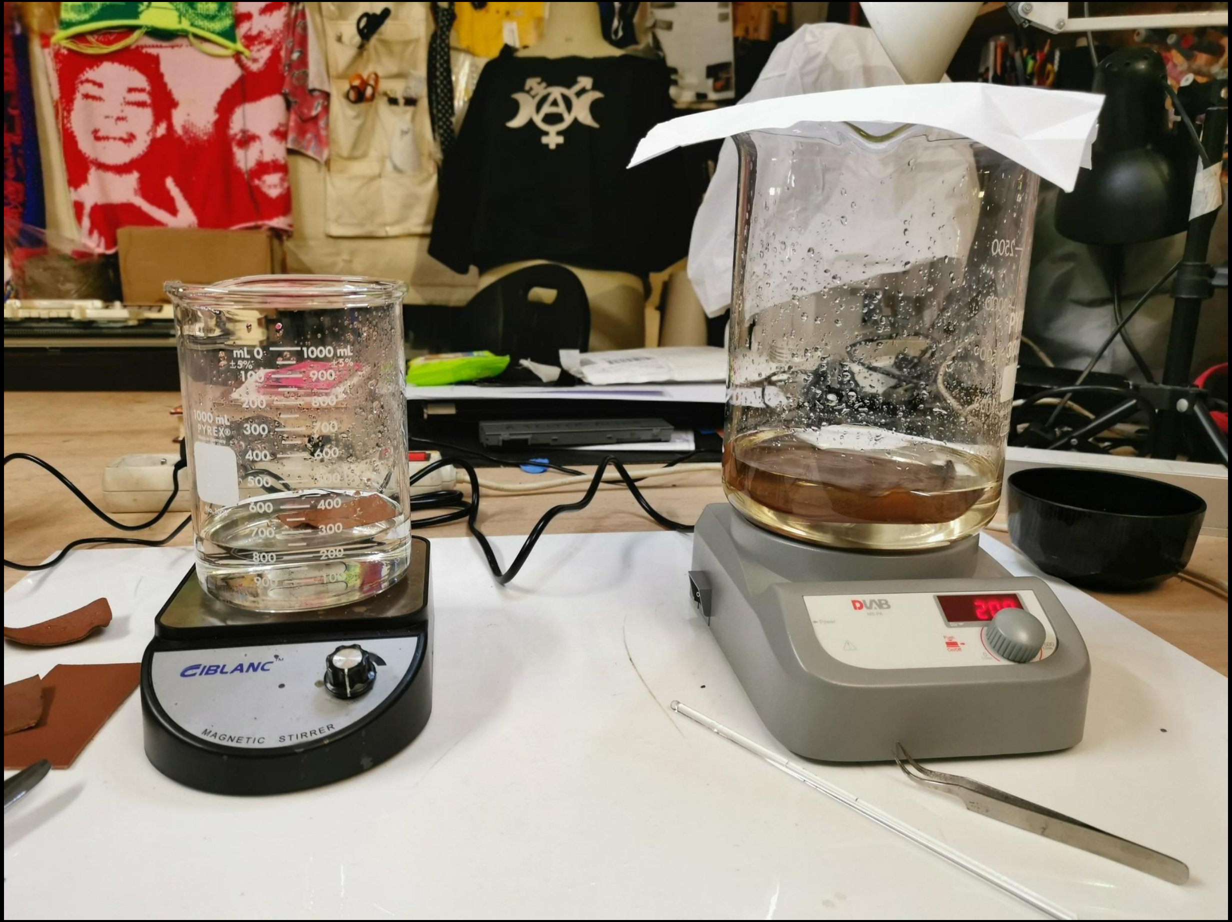
Hybrid crafting
Knitting
Digital
Tools
Technologies

Détail de l’installation “*Topographie digitale*”, Le Signe 2020

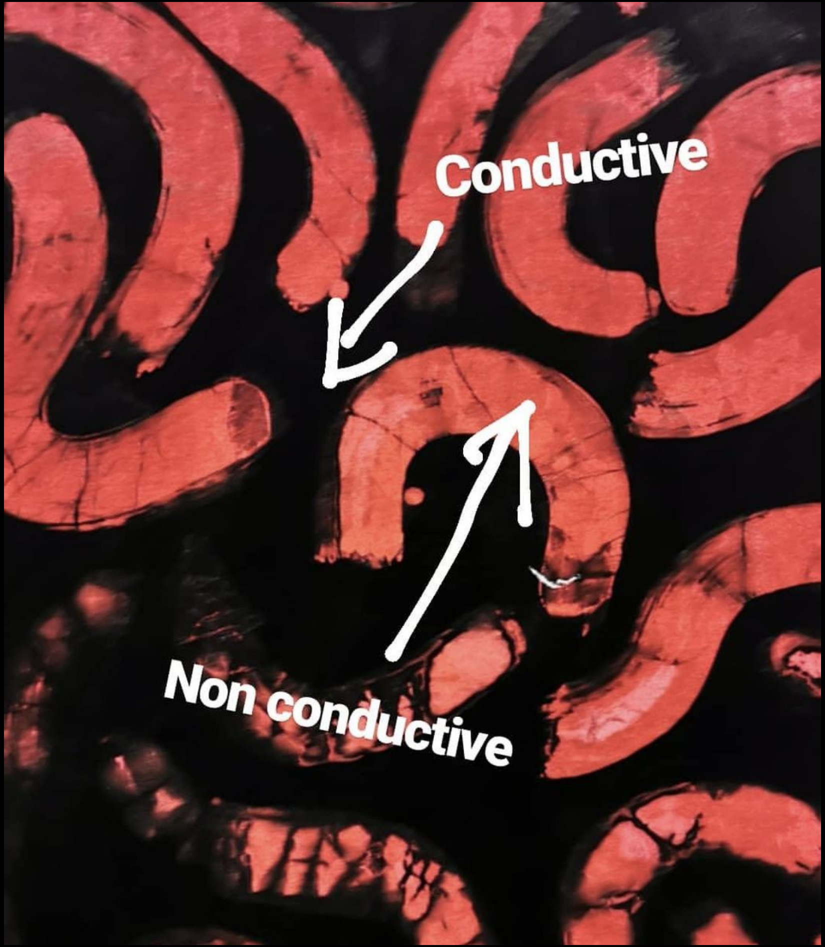
Textile Eonyx (image issue du site d’Adafruit)



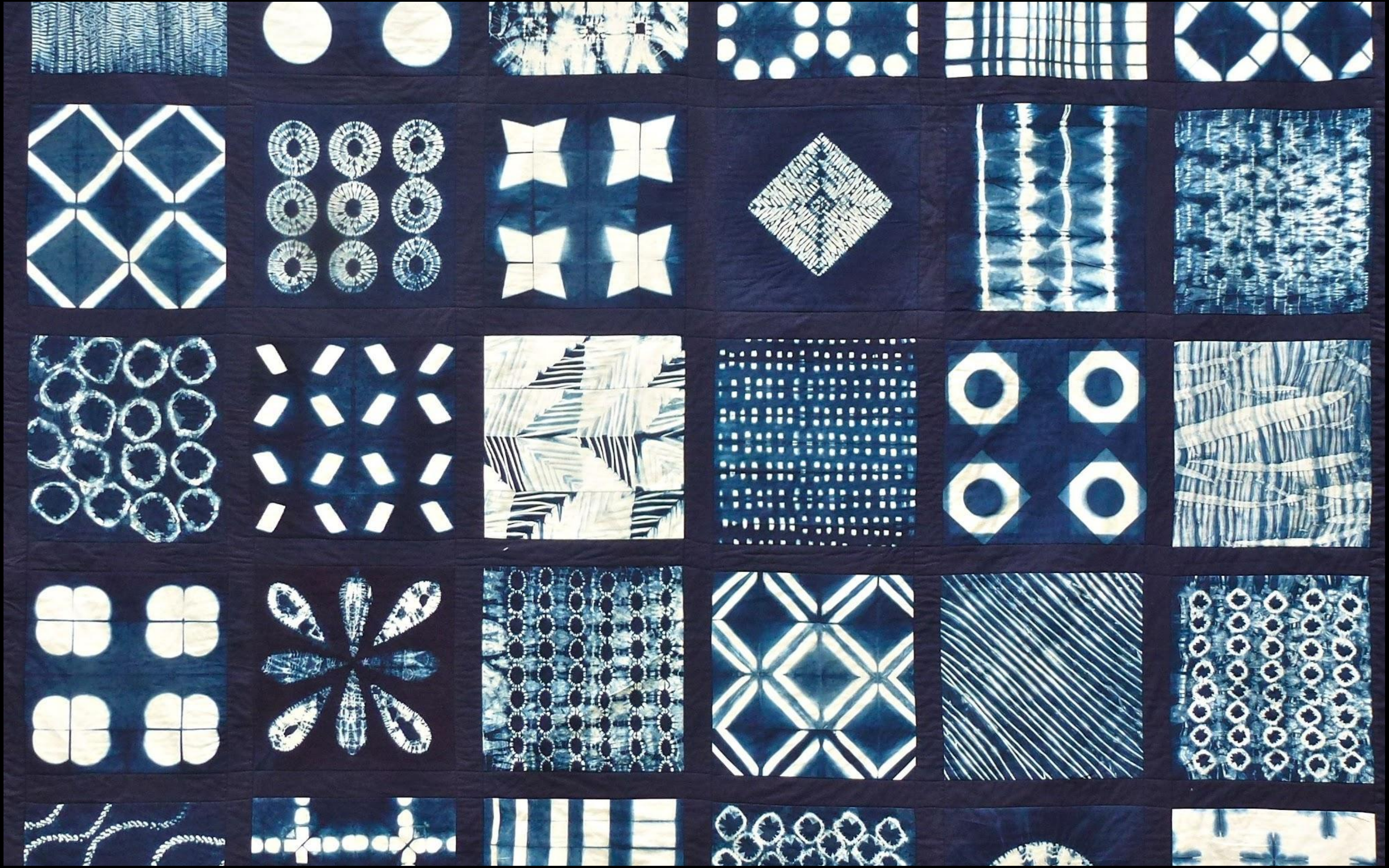
Piezo-résistance



Expérimentation polymérisation



Exemple d’une teinture avec la technique du batik



PolySense: Augmenting Textiles with Electrical Functionality using In-Situ Polymerization

Cedric Honnet[1], **Hannah Perner-Wilson**[2], **Marc Teyssier**[3, 4], **Bruno Fruchard**[4],
Jürgen Steimle[4], **Ana C. Baptista**[5], **Paul Strohmeier**[4]
[1]MIT Media Lab, [2]Kobakant, [3]Télécom Paris,
[5]CENIMAT/I3N, NOVA University Lisbon, [4]Saarland University, Saarland Informatics Campus
[1]honnet@mit.edu, [2]hannah@kobakant.at, [5]anacbaptista@fct.unl.pt, [4]{lastname}@cs.uni-saarland.de

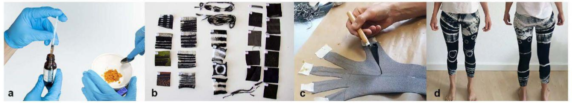


Figure 1. a) Pyrrole (left) and Iron(III) Chloride (right) used for Polymerization. b) Various polymerized samples, of different materials showing tests of batik (left) and tie-dyed traces (middle). c) Traditional manufacturing processes (here Batik) can be use to draw conductive patterns. d) Leggings augmented with polymerization to sense movement.

ABSTRACT

We present a method for enabling arbitrary textiles to sense pressure and deformation: In-situ polymerization supports integration of piezoresistive properties at the material level, preserving a textile's haptic and mechanical characteristics. We demonstrate how to enhance a wide set of fabrics and yarns using only readily available tools. To further support customisation by the designer, we present methods for patterning, as needed to create circuits and sensors, and demonstrate how to combine areas of different conductance in one material. Technical evaluation results demonstrate the performance of sensors created using our method is comparable to off-the-shelf piezoresistive textiles. As application examples, we demonstrate rapid manufacturing of on-body interfaces, tie-dyed motion-capture clothing, and zippers that act as potentiometers.

Author Keywords

eTextiles, Electro-Functionalization, In-Situ Polymerization, Piezoresistive Sensors, Wearables, Personal Fabrication

CCS Concepts

•Human-centered computing → Human computer interaction (HCI); •Hardware → Sensors and actuators;

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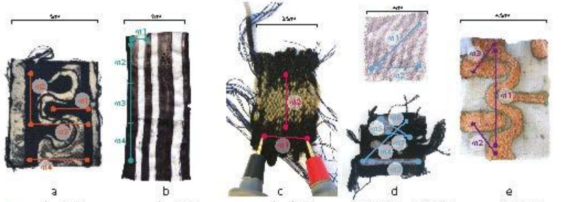
INTRODUCTION

Piezoresistive materials have become an important part of interactive eTextile systems, as they can enable fabric to sense human input, be it pressure, gestures, or motion. They are used in eTextiles for detecting body movements [10], posture [38] or gestures [29]. They are commonly used for soft pressure sensors [40] or soft pressure sensor matrices [9, 52, 31, 37], medical monitoring [20], performing arts [39] and interactive art installations [41]. Piezoresistive sensing is largely robust to the electrical noise introduced by the body [40], and piezoresistive materials are often malleable and flexible. This makes piezoresistive sensing the preferred method for wearable eTextiles, which are, by their nature, soft and conform to the shape of the body.

In this paper, we present a method of creating such piezoresistive materials, through *polymerization* of pyrrole (Figure 1a, left). The method presented allows conductive polymers to form in and around textiles, coating their individual fibers. The process is *in-situ*: polymer chains are formed in, on, and around the fabric [33], at the location where piezo-resistivity is needed.

This supports new ways of thinking about piezo-resistivity in textiles: Currently, if a sensor is to be integrated in an existing piece, the piezoresistive material must be added to the material or garment, and physically connected to conductive traces, or layered in between conductive fabric, altering the mechanical properties and haptic feel of the material or garment. Due to the in-situ nature of the polymerisation process, designers need not add external components, but can instead add piezoresistive properties to the material which they are already working with (see Figure 1b and 1d). Additionally,



	Ω	cm
m1	280k	2
m2	540k	3
m3	2.8M	3
m4	3.8M	3

	Ω	cm
m1	580k	2
m2	8.5M	5
m3	20M	5
m4	40M	5

	Ω	cm
m1	50k	2
m2	1.8M	2.5

	Ω	cm		Ω	cm
m1	0.6k	3	m5	5k	0.8
m2	0.7k	3	m6	230k	2
m3	26.5k	3	m7	180k	1.2
m4	260k	3			

	Ω	cm
m1	0.3k	5
m2	-	2
m3	0.15k	2

Figure 5. Measures of resistance values over several patterned fabrics: (a) Calico (batik), (b) Cotton (tie-dyed), (c) Wool (woven), (d) Bamboo/Silver (polymerized using batik on conductive fabric), (e) Nylon/Copper (etched using batik).

Tie-Dye

The method consists of folding, twisting or applying pressure on the fabric with strings or rubber bands. The selective application of pressure determines if the fabric can absorb the dye, or in our case whether it is polymerized or not.

Tie dying introduces an additional layer of control. Working with folds allows the creation of repeating patterns and embedding objects provides the ability to add specific predefined shapes. By applying a gradient of pressure to the tied object, one can also introduce gradients of resistance into the polymerized areas. For example, the sample shown in Figure 5b was created by wrapping fabric around a plastic tube. The white areas were tied down with thread, so they are not polymerized. The black areas were exposed, however, as it was wrapped, the top end is covered by two layers of textiles and the middle is covered by one layer. Consequently the resistance towards the top is highest, while it increases towards the bottom, as can be seen comparing measures *m2*, *m3*, and *m4*. Measure *m1* shows that the tied-down areas successfully act as insulators, there is barely any conductivity between the stripes.

Compared to traditional batik, tie-dyeing is better for larger areas, as creating large areas of resist is less laborious. However, tie-dying has its own issue with scale, as one needs to ensure that the pyrrole and the oxidizing agent can reach all required areas. This can be a problem if the fabric is too thick or if too many layers of fabric are stacked.

Making Patterns from Yarn

Resist-based selective polymerizing need not be applied to finished textiles. Instead it can also be used for creating a yarn which is piezoresistive in selective areas. Such selectively polymerized threads can later be woven or knitted to create custom shapes and patterns.

As has been demonstrated in previous work, resistive yarn can be added to traditional weaves. However, these yarns need not be restricted to discrete rows and columns. Using patterned yarn, resistive or non resistive areas can be created at will. The woven sample (Figure 5c) shows that the conductance between pre-polymerized yarns that touch is strong enough to form continuous piezoresistive areas. This process, again, is borrowed from traditional textile dying technique and is commonly referred to as ikat.

Combined with the advance of custom thread-spinning technologies[7] which allow dynamic adjusting of thickness and material composition of a yarn, ikat has the potential for enabling the creation of fully customizable functional fabrics.

Using Rapid Fabrication Tools

While traditional hand-craft can provide strong results, we were also interested in creating methods which allowed for a higher level of algorithmic control. Here our best results were based around laser-cut stencils.

We explored two strategies. The first is to create a laser-cut negative and pressure fitting the laser-cut pattern to the front

[7]e.g., Studio Hilo: https://www.studiohilo.com

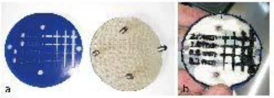


Figure 6. A laser cut stencil (a-left) pressed against a fabric (a-right) can be used to perform selective polymerization (b).

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Vue extérieure du bâtiment du Signe, centre national du graphisme à Chaumont.

Topographie Digitale

Audrey Briot
audrey@datapaulette.org
DataPaulette
Paris, France

Martin De Bie
martin@datapaulette.org
DataPaulette
Paris, France

Alice Giordani
alice@datapaulette.org
DataPaulette
Paris, France

Leon Denise
contact@shaderland.com
Shaderland
Paris, France

Cedric Honnet
honnet@media.mit.edu
MIT Media Lab
Cambridge, MA, USA

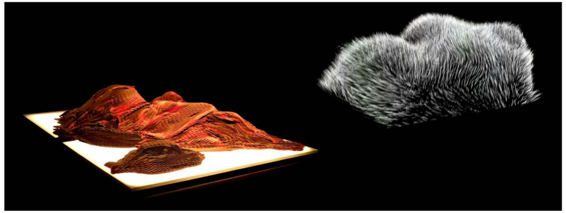

Figure 1: The installation: eTextile Sensing Interface (left) & Touch Visualization (right) - credit: Irene Posch / ARS Electronica.

ABSTRACT

Topographie Digitale is an interactive installation that illustrates a hybridization between science and traditional textile craftsmanship. It uses electrically functionalized and pleated textiles as touch sensitive surfaces for interacting with a video-projected visualization. The pleated fabric, augmented by our custom chemical process, and the electronic sensing system give birth to a material with a mixed heritage that is both technological and traditional, and prefigure an emerging craft. The combination of craft and technology, which gives a creole technique, is an alternative way of thinking about the place of digitalization in our society in a more resilient way.

CCS CONCEPTS

• **Applied computing → Media arts.**

KEYWORDS

Interactive installation, Material Functionalization, Traditional Crafts, eTextiles, Artistic Visualization, Media Arts; E-textiles; Tangible Interaction; Digital Craftsmanship

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https://doi.org/10.1145/1122445.1122456

1 INTRODUCTION

Electronic textiles (eTextiles) are not only a medium but a domain to explore. The name of this practice reveals the complexity and the juxtaposition of different fields. The combination and hybridization of craft, science and art, give birth to research projects with a mixed-heritage that is both technological and traditional. It encourages us to rethink the physicality of the digital and its place in our society in a more resilient way.

Figure 3: The chemical products used to functionalize our textile, Pyrrole and Iron Chloride (left). After functionalization, the textile is conductive, except where it was tied (right).

3.1 Textile

3.1.1 Functionalization. A 20 meter length of burgundy polyester fabric was carefully tie-dyed using our polymerization technique [9]. During the dyeing process the prior manipulation will give shape to contour lines. The textiles are immersed in water in which pyrrole and iron (III) chloride are added. This process gives electrical properties to the textile except where the fabric has been tied: some areas will become conductive and will be insulated from one another by the undyed textile (see Fig. 3).

3.1.2 Pleating. The dyed and treated textiles have been pleated by the historical pleating house Maison Lognon. The selected pattern, mimicking a peacock's tail, offers a great number of possibilities of manipulation: it can be squeezed and unfolded at any point on its surface. The polymerised textiles are then compressed between two cardboard molds (see Fig. 4 and 5-bottom) and placed in a heat chamber.

Figure 4: This cardboard mold is used to create the Peacock Pattern (credit: Anne Combaz, *Ateliers Lognon*).

3.2 Electronic

The textile combines specific conductive areas and a passively haptic texture effect. It is pinned on a polystyrene surface, creating eTextile capacitive sensors which emerge from the surface of the artwork. To animate the "algorithmic clone" of the textile, an Arduino detects capacitive touch events using an MPR121 sensor board. This touch information is then sent to a Unity application, in which the projected animation is controlled.

3.3 Visualization

The Unity app listens to the Arduino and attributes each measurement to a zone of the animation. A configuration file allows calibrating the sensitivity of each zone to their mechanical and electrical characteristics. The animation is composed of a swarm of particles, mapped over the virtual 3D surface, which is a digital representation of the fabric landscape. The particles fly away when their zone is activated by a sensor, and come back when another zone is touched, or after some inactivity. When two zones are touched in sequence, all particles between the two are "disturbed" and create a dynamic movement on the video-projected surface. This virtual twin diffuses through several layers of dark veils that give it an impression of depth (see Fig. 5-top).

4 CONCLUSION

Topographie Digitale stands between the tangible and the virtual worlds. This artwork, taking part in electronic textiles research, incarnates the meeting point of high tech and low tech, without any depreciation of the one against the other. It is the result of a creole creation process that explored possible connections between digital and textile craftsmanship. *Topographie Digitale* is a metaphor of these moving territories of creation that are constantly changing, as much as nature and human life, modifying our environment and landscape to unpredictable rhythms.

Publication pour la conférence TEI (Tangible Embedded Interaction) - 2021

DataPaulette : Martin De Bie, Audrey Briot

Le textile électronique, un savoir-faire créole

Le 12 janvier 1995, est publié dans le magazine *Wired* un article de Nicholas Negroponte et Neil Gershenfeld intitulé «Wearable Computing». Les auteurs imaginent un futur où les technologies ont embrassé notre quotidien. Celles-ci prennent alors place dans les substrats textiles de nos vêtements, de nos chaussures ou bien dans les bijoux que l'on porte. Deux ans plus tard, lors de la Conférence *Human Factors in Computing Systems* (CHI), les chercheurs Maggie Orth, Rehmi Post et Emily Cooper publient un article intitulé «Fabric computing interfaces» dans lequel ils présentent leurs premières expérimentations mêlant textile et électronique. Ces deux écrits établiront les fondements de la pratique, alors encore embryonnaire, du textile électronique. La discipline s'est développée depuis, notamment grâce aux échanges et aux liens qui se sont tissés entre les praticiens, formant une communauté qui partage une méthodologie propre. On peut constater qu'aujourd'hui, l'intégration du textile électronique dans notre quotidien est loin de la vision portée par Nicholas Negroponte et Neil Gershenfeld. Elle reste une pratique en marge qui se détache des premières spéculations invasives et technologiques qui lui avaient été prêtées, pour se rapprocher plutôt de la définition d'un nouveau type d'artisanat.

Cet article expose en quoi notre pratique du textile électronique peut être définie comme un savoir-faire créole. À travers un exemple précis, l'installation *Topographie digitale*, nous proposons de détailler nos méthodes de travail au sein de DataPaulette, consistant dans l'hybridation de pratiques variées et des outils qu'elles comprennent, allant de l'électronique à la programmation informatique, en passant par les savoir-faire textiles et la science des matériaux. Cette installation est la mise en application d'une recherche spécifique par le collectif et existe consécutivement dans deux univers, l'artistique et le scientifique. En ce sens, nous discuterons les croisements de différentes cultures qui s'opèrent lors de sa conception et la pertinence de l'emploi du concept de *créolisation* dans le cadre plus large de l'artisanat hybride qu'est le textile électronique.

La notion de *créolisation* a été définie et théorisée par Édouard Glissant, écrivain et philosophe martiniquais, tout au long de sa carrière. Il la qualifie à partir de 1997 comme étant «la mise en contact de plusieurs cultures ou, au moins, de plusieurs éléments de cultures distinctes, dans un endroit du monde, avec pour résultante une donnée nouvelle, totalement imprévisible par rapport à la somme ou à la simple synthèse de ces éléments» (1997, p. 37).

Dans ce contexte, il établit les fondements d'un concept qui va au-delà de l'explication de la formation des langues créoles dans les Caraïbes. Comprendre le terme de *créolisation* comme un croisement attendu de cultures aux résultats inattendus, c'est ouvrir le terme à un champ plus large, permettant de caractériser certaines techniques ou processus de création. On retrouve cette idée dans l'activité de bricolage décrite par Nicolas Nova dans son article «Démonter, extraire, combiner, remonter. Commodore 64 et créolisation technique», dans lequel il explique que l'on peut considérer ces opérations de combinaison d'une autre manière, en s'appuyant sur la notion de *créolisation* et sortir d'une terminologie coloniale pour rouvrir le débat sur cette notion (2017, p. 130).

Techniques *high* et *low*

a. Techniques créoles

En 2017, l'historien des techniques, David Edgerton, propose le terme de *technique créole* qu'il décrit comme un procédé faisant appel à «un ensemble d'usages originaux en dehors du temps et du lieu où ils ont été initialement utilisés» (2017, p. 49). Dans ce cadre, Edgerton circonscrit le terme technique créole à un détournement ou un remploi de techniques originelles d'un monde riche par un monde pauvre. Il explique également qu'il est préférable d'englober ces deux types de technologies — high-tech (techniques de pointe) et low-tech (techniques simples, populaires, traditionnelles) — plutôt que de favoriser l'une en remplacement de l'autre, dans l'objectif de développer une compréhension des fondements matériels de l'existence humaine. Une technique créole, selon Edgerton, est une technique mêlant *high* et *low*. Ces notions de high-tech et de low-tech se retrouvent dans la pratique du textile électronique, ne serait-ce que par cette appellation conciliant deux univers diamétralement opposés, tant par leurs pratiques que par leur histoire. Pour autant, il serait faux de classifier le textile dans une case et l'électronique dans l'autre. En effet, le textile n'est pas forcément low-tech (traditionnel), il peut également être considéré comme high-tech lorsque l'on parle de textiles techniques. De même que pour l'électronique qui, selon les pratiques dans lesquelles il s'inscrit, peut faire appel à l'une ou l'autre des notions. Le *circuit bending* n'appelle pas les mêmes ressources que le circuit électronique d'un smartphone. D'ailleurs, les industries du textile et de l'électronique sont respectivement les industries la plus ancienne et la plus significative dans le commerce de produits finis, ce qui témoigne de la difficulté de valoriser l'une au détriment de l'autre (Heinzel *et al.*, 2018). Le détournement est une pratique que l'on retrouve dans les *techniques créoles* de David Edgerton et également dans la pratique du textile électronique. Par exemple, les matériaux sur lesquels cette dernière s'appuie sont des textiles ayant pour fonction première de bloquer les ondes électromagnétiques, notamment dans le domaine de l'aviation.

b. High-low-tech

Si l'on souhaite parler de la relation entre techniques *high* et *low*, on se doit de parler du formidable travail mené de 2009 à 2014 par les membres de l'équipe de recherche high-low-tech créée par Leah Buechley au MIT Media Lab. Pour ces chercheurs, les notions de *high* et *low* font appel respectivement à des procédés technologiques innovants et savoir-faire traditionnels dont ils expérimentent ensuite les croisements. Les membres du Media Lab ont su explorer le potentiel de la confrontation de ces techniques en prouvant, à plusieurs reprises, les richesses qui peuvent en résulter. Par ce biais, leur ambition était de démocratiser l'accès à la technologie et d'offrir la possibilité d'en repenser les paradigmes. Ils ont notamment créé des kits d'apprentissage aux rudiments de l'électronique, offrant aux utilisateurs l'opportunité de déterminer eux-mêmes la conception, l'esthétique et l'utilisation qu'ils feront des objets technologiques[1]. La traduction d'une

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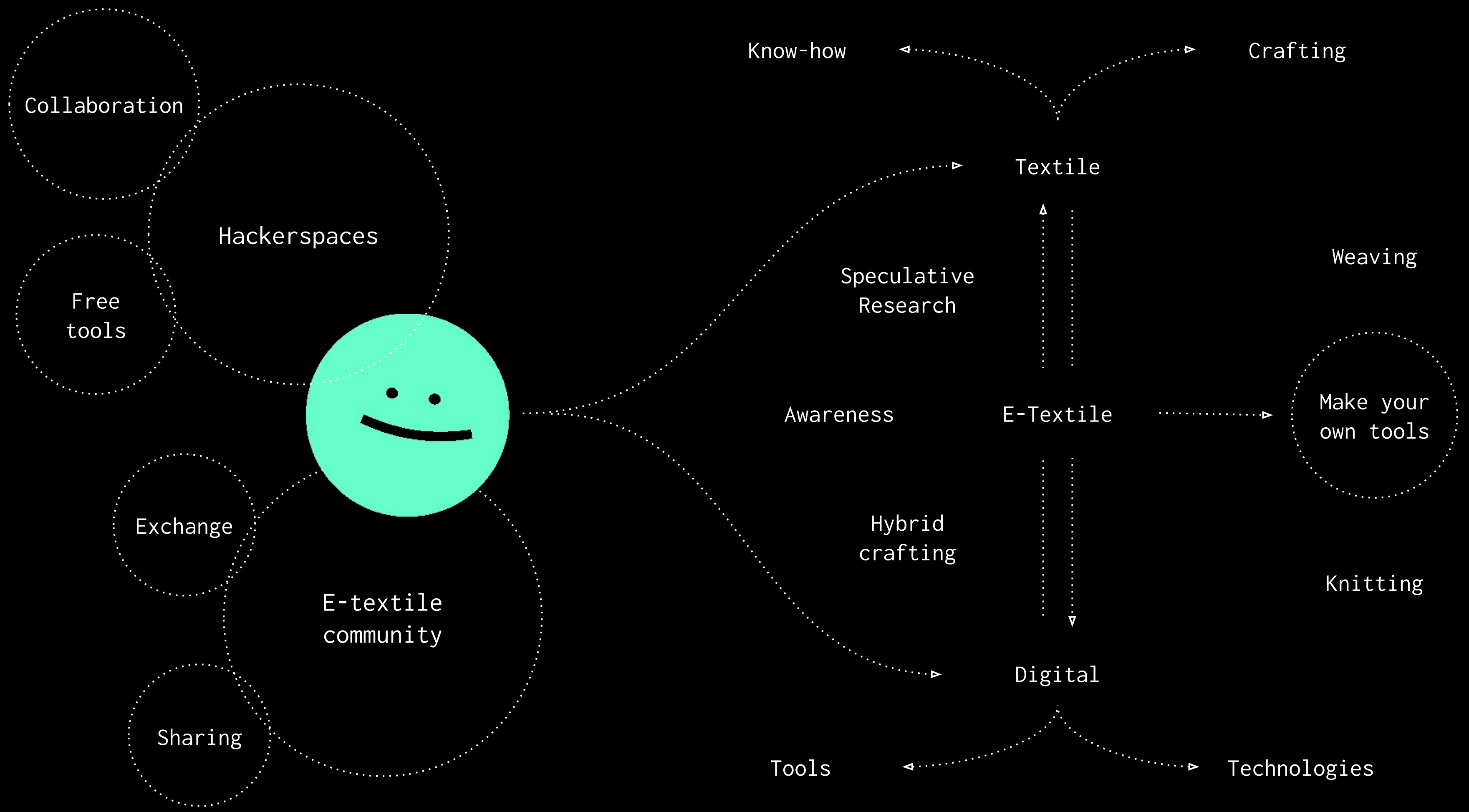
Collaboration
Hackerspaces
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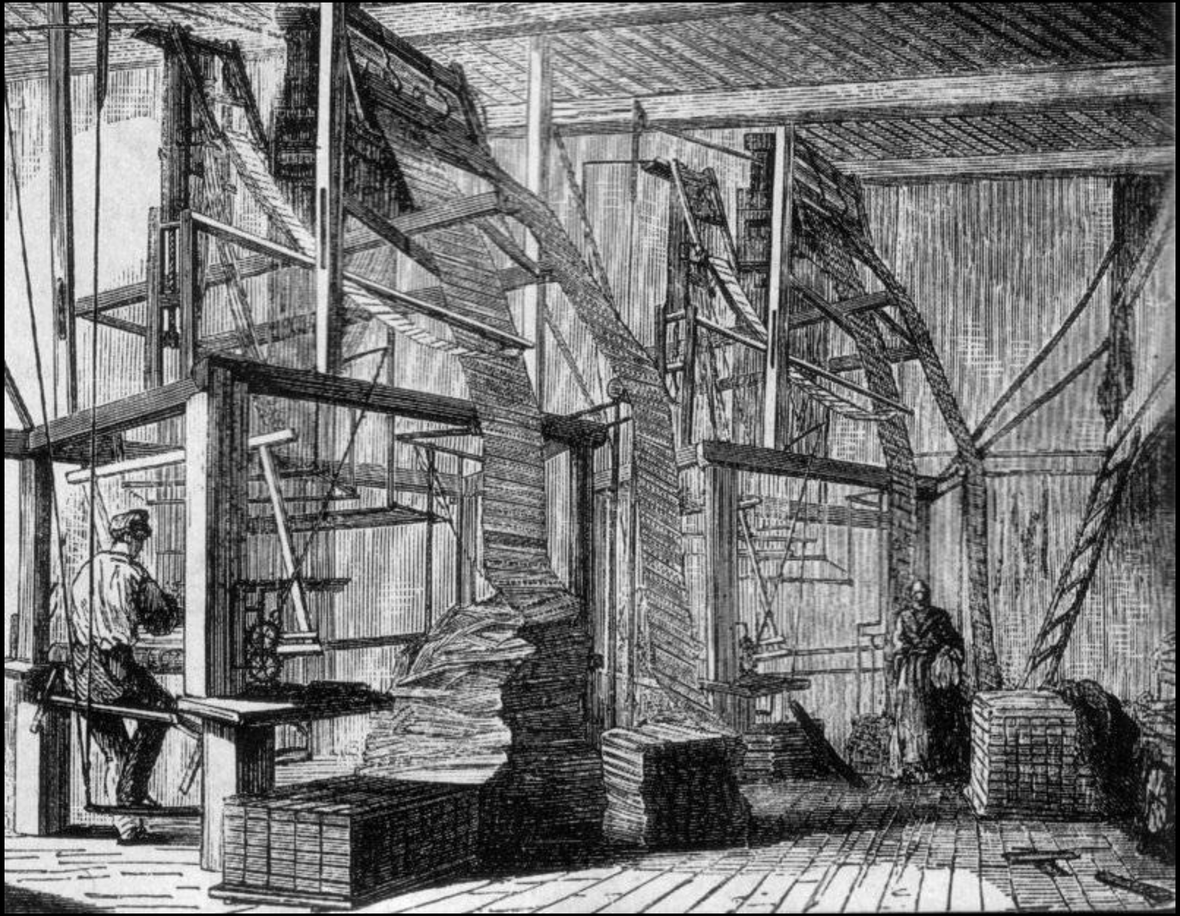

Jacquard loom - Joseph Marie Jacquard, 1801


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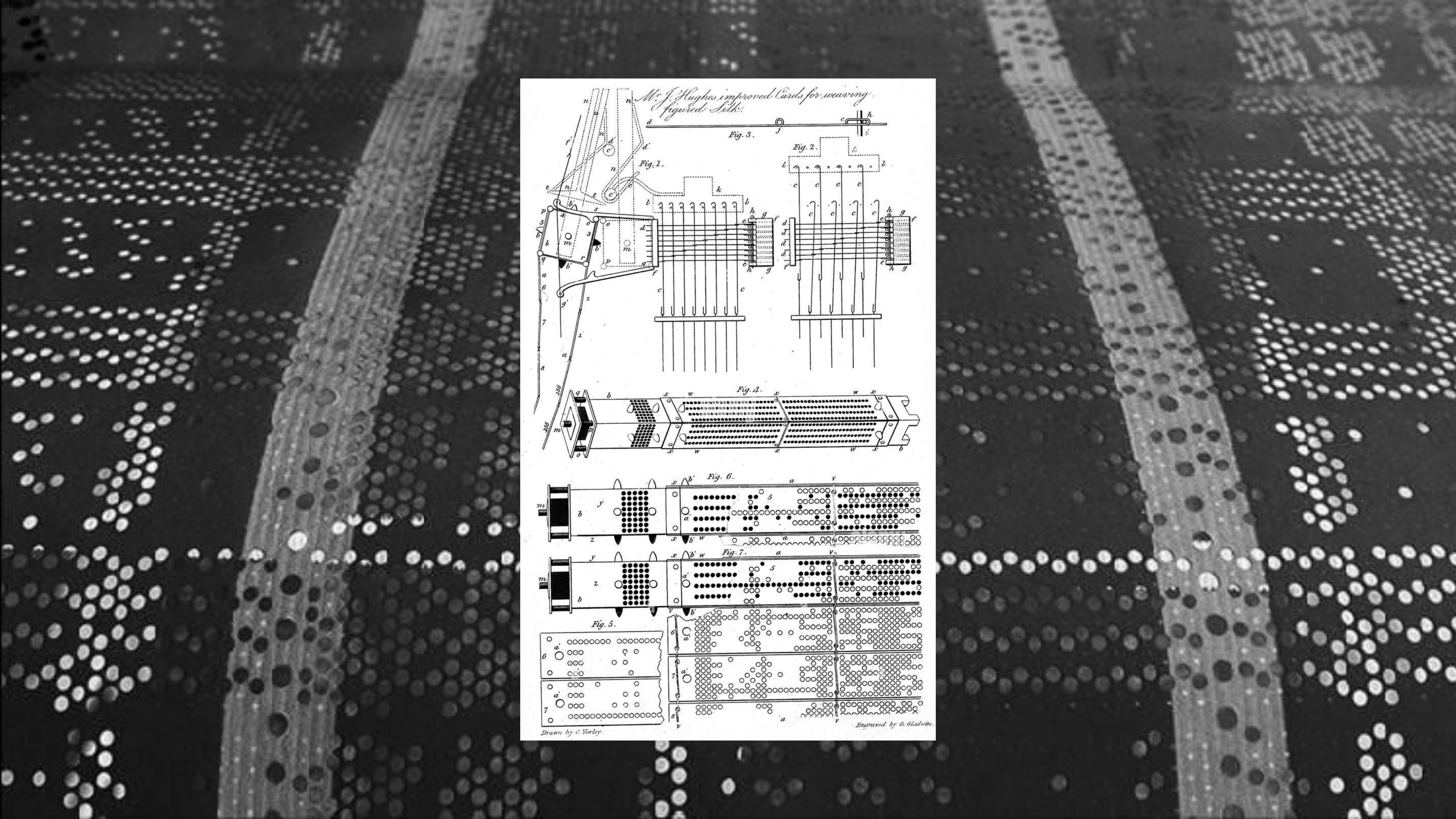
Mr. J. Hughes improved Cards for weaving figured Silk.
Fig. 1.
Fig. 2.
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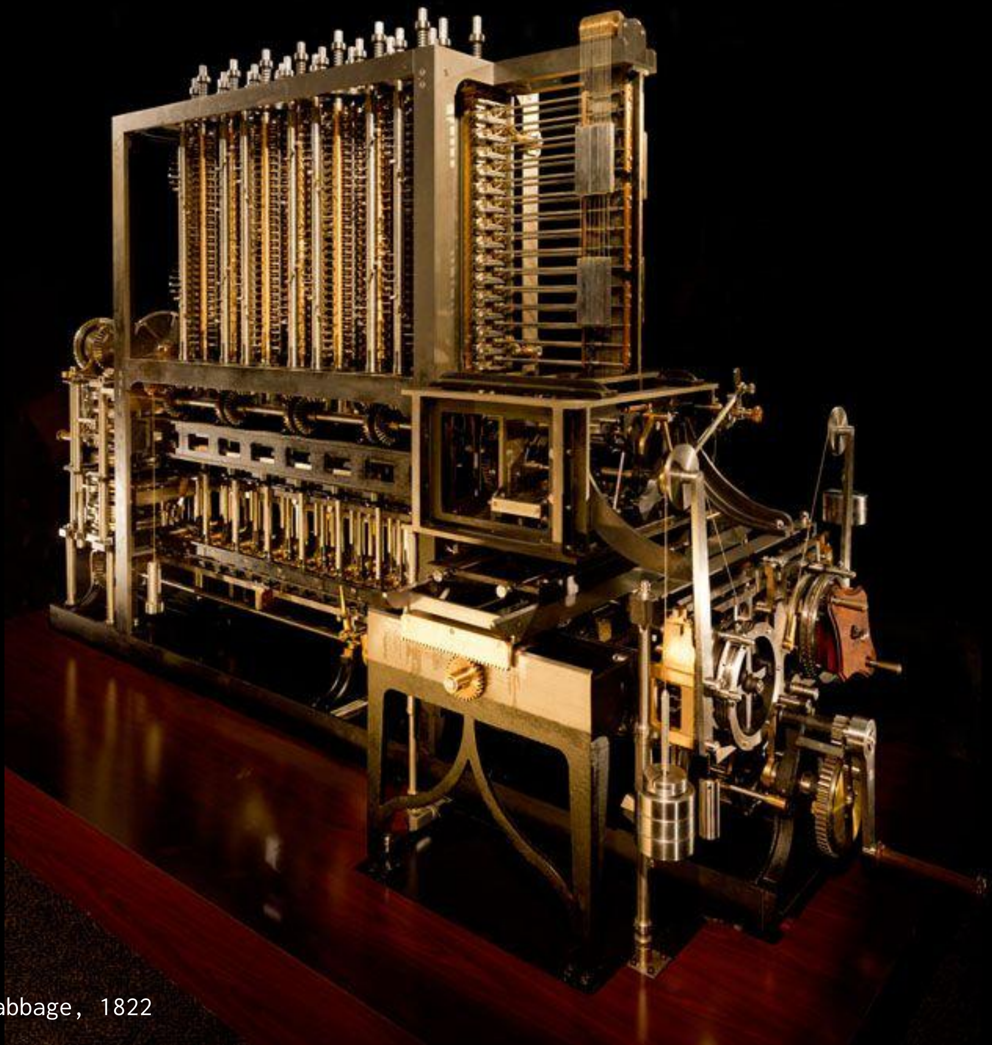
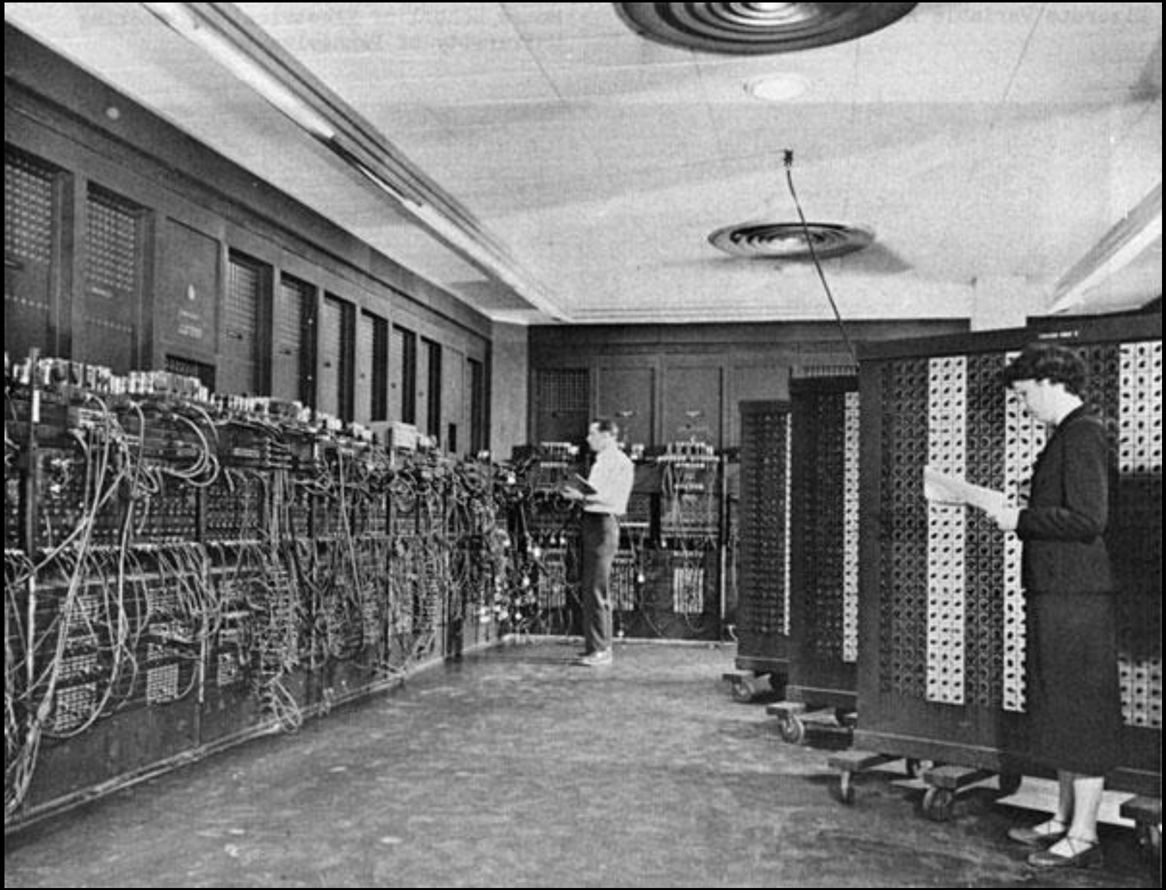
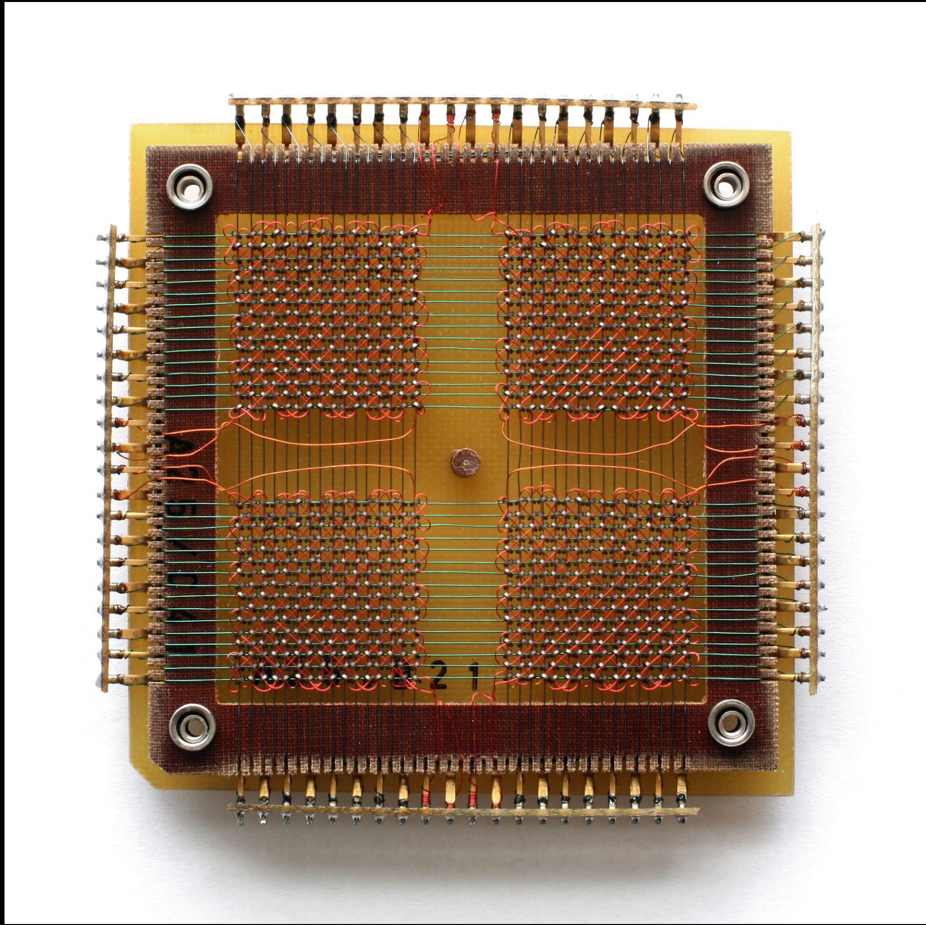
Drawn by C. Varley.
Engraved by G. Gladwin.



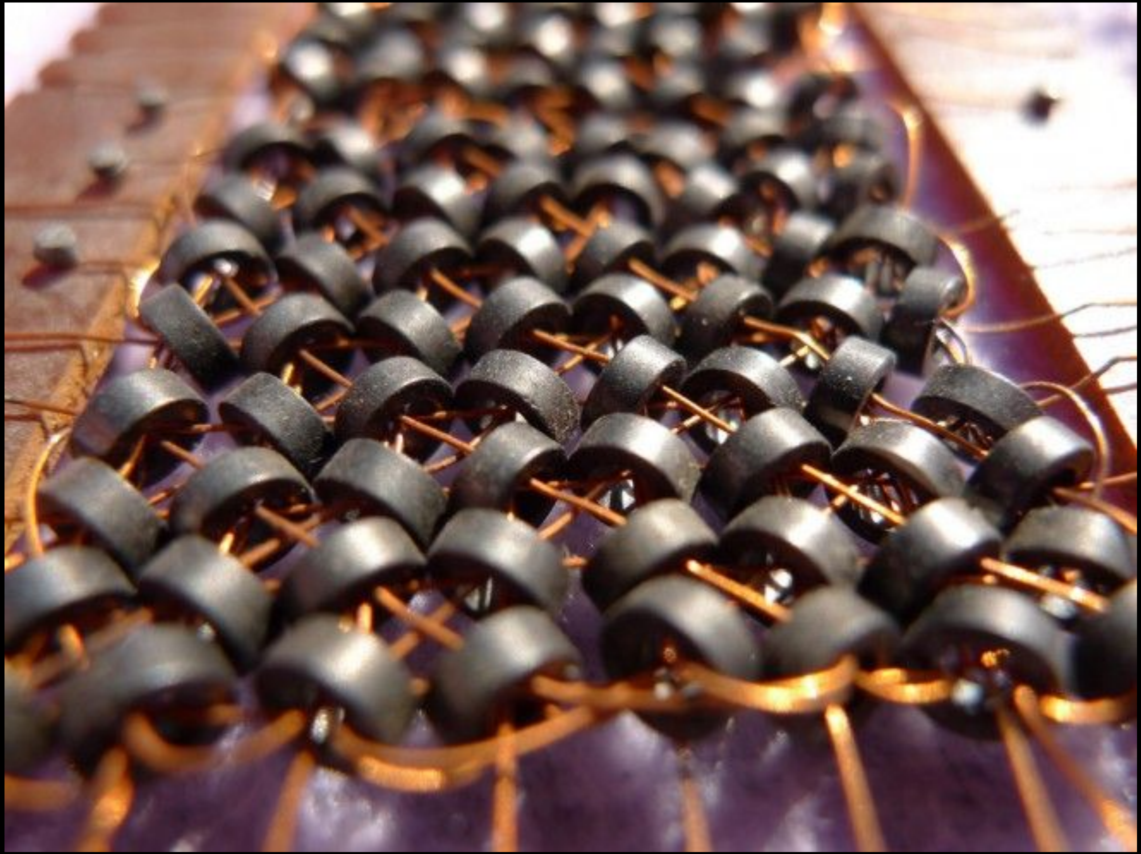
Difference engine - Charles Babbage, 1822



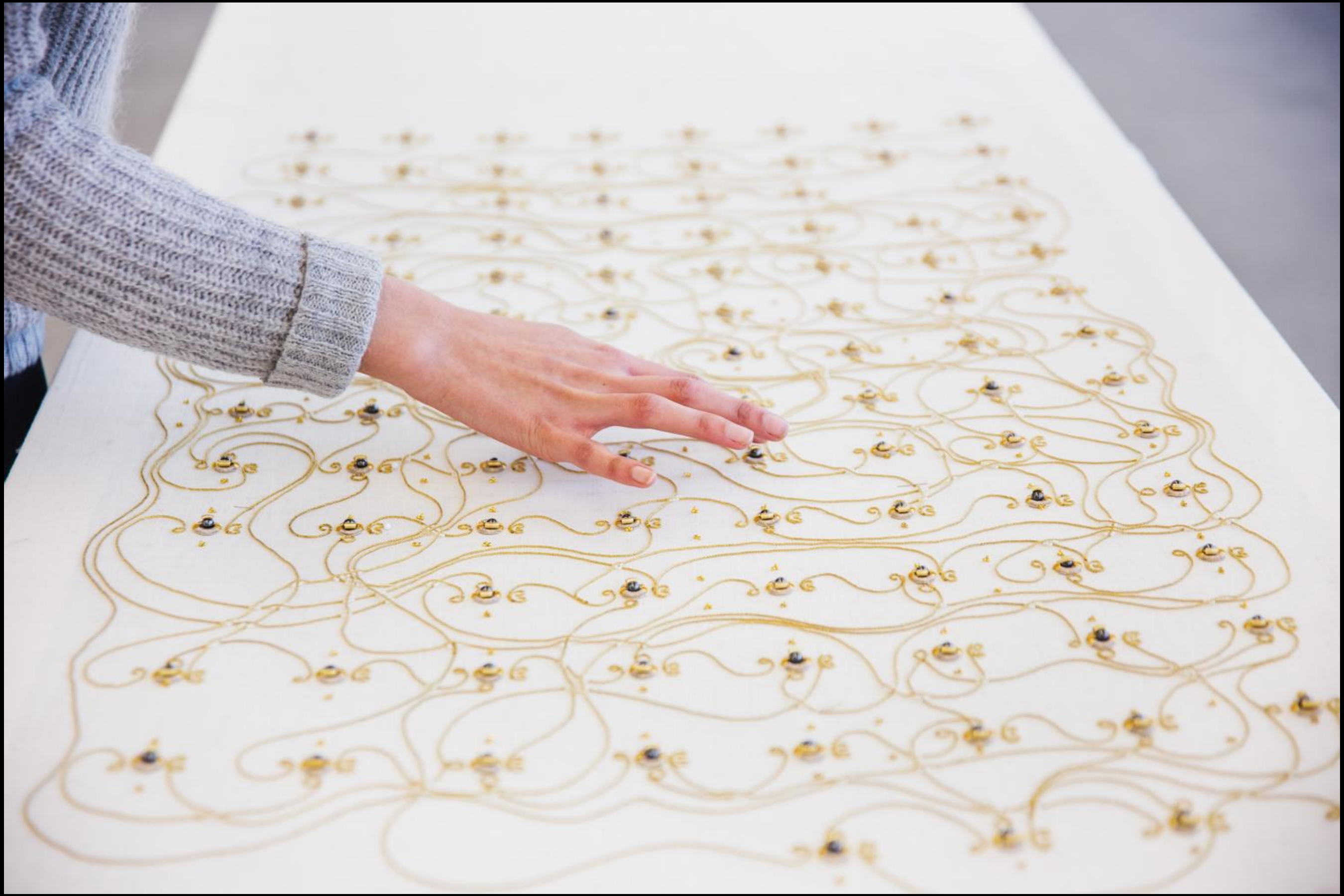
ENIAC (Electronic Numerical Integrator and Computer) - J. Presper Eckert et John Mauchly, 1943-46



32 x 32 core memory module 1024 bits (or 128 bytes).



Détail d’un module de mémoire à tores magnétiques.



The embroidered computer - Irene Posch et Ebru Kurbak, 2016

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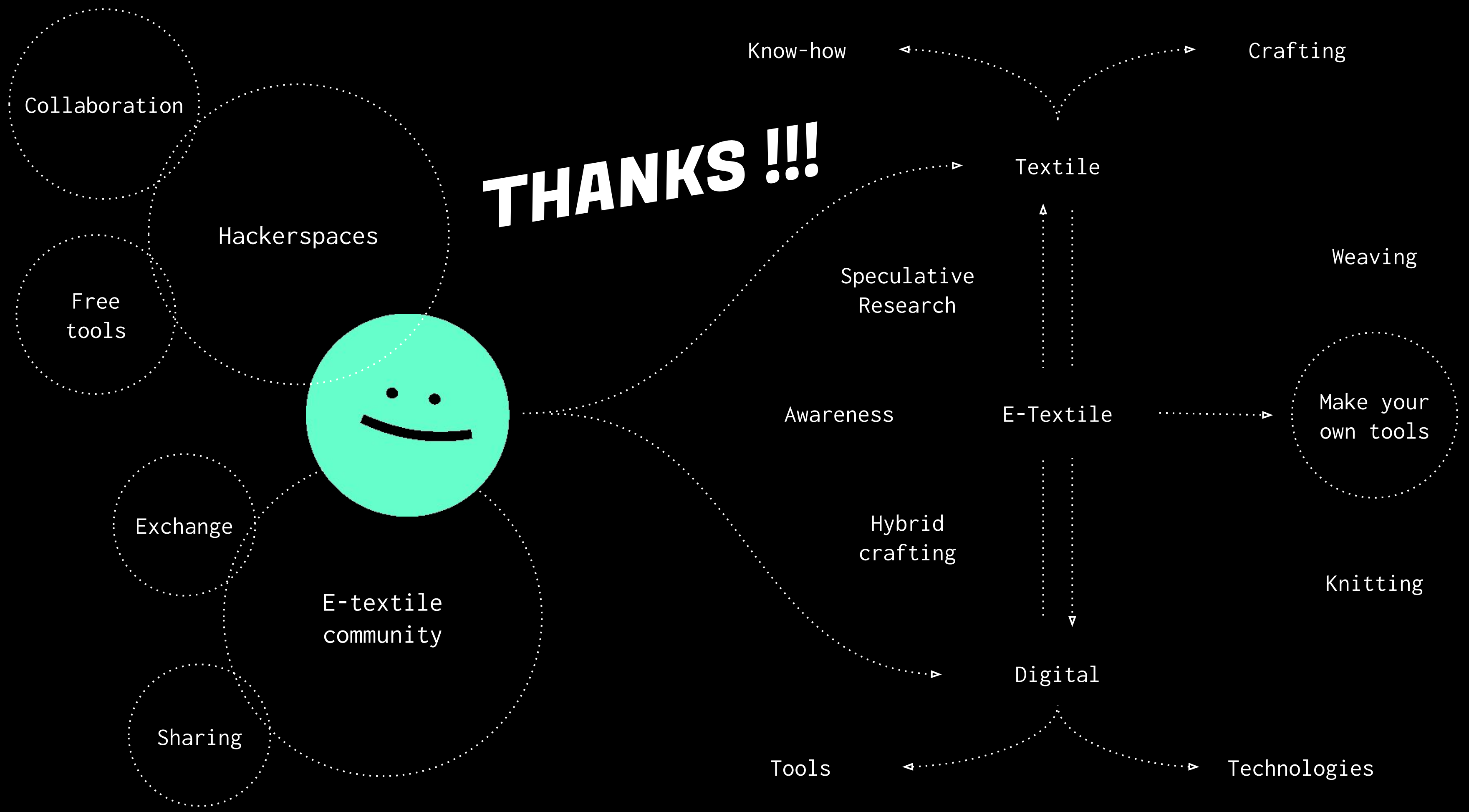
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