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Abstract

The following report is composed of three inter-related segments. The first section introduces and follows through the thinking pattern of a philosophical perspective in the contemporary art practice, that utilises the technique of "following the material", brought forward by Gilles Deleuze and Felix Guattari¹. Using my own and other designers' work as an example, the section articulates the suite of design tactics and approaches that allow for this form of symbiotic development in the creation of HCI artifacts.

The second section starts by exploring the process of non-linear thinking using readily available materials and how one might find form, function and hybrid influences from these practices. (Tragi-comic, linear/non-linear)

The last section documents the methodology and the interactivity explored when creating resistive and capacitive touch sensing for this artifact. I introduce various conductive materials and their electrical properties, and show how we can create interactivity using a range of textile techniques (weaving, knitting, crocheting, embroidering, felting...), and finally read them with a microcontroller.

Author Keywords

Proposal: Hybrid/composite, blooming, human centered, skin response, DIY

Prototype : Technical exploration, limits of materiality, design opportunities, gift economy

Final: Non-linear, assemblage; making as a mean for storytelling

Opening: [affect-as-interaction](#) biosignals on materiality in conceptual design, social studies

I. Current State / Artistic Statement

Non-linear, intuitive approach, becoming (Deleuze reframed p.45)

Haptic : "haptics is that subsystem of nonlanguage communication which conveys meaning through physical contact".

To fidget: make small movements, especially of the hands and feet, through nervousness or impatience.: "the audience had begun to fidget on their chairs". synonyms: move restlessly

¹ Making Sense of Sensor, Discovery through craft practice with an open-ended sensor material

I.II Conceptual Research

First was the idea of using conductive materials with textiles, to upcycle and rediscover my current practice of costume and performance wear creation. Then came the need to intellectualise what I had been doing instinctively throughout my career. This was an ironic practice, as I was essentially searching for academic cohesion with my subjective perspective of craftsmanship. I found the form and meaning of my artistic exploration of this artifact was best represented in libraries of Deleusian philosophy. It portrays the non-linear thinking in the creation of art as a cyclical process that requires heavier experimentation and is best demonstrated and defined by its peaks in cohesion rather than its finalized form. The product is the journey, the journey will reveal a product.

... It has neither beginning nor end, but always a middle (milieu) from which it grows and which it overflows...(it) operates by variation, expansion, conquest, capture, offshoot...it has multiple entryways and its own lines of flight. (Deleuze and Guattari, 2004b: 23) "²
Cultural motifs such as 'non-linear' thought, for example, can be traced back to Deleuze's work with Guattari. Following 'the logic of the AND' in contemporary art practices; a pragmatics that is not a 'localisable relation going from one thing to the other and back again', but a 'transversal movement that sweeps one and the other away, a stream without beginning or end that undermines its banks and picks up speed in the middle' (Deleuze and Guattari 1988: 28).³

As the artifact wasn't the process of a technical product design meant for manufacturing or mending, it took longer to reveal these intermediary states of cohesive artistic representation. Thus in the development of this handmade process, devoid of an exterior supply-chain, its artistic relevance maintained its esoteric properties and use paradigms as it cannot, for now, be mechanically reproduced⁴. I used the mind map technique to frame as many keywords as I could about wearable technologies, making a story by associations starting from anywhere on the map. In doing so, the artifact can hold in a single moment multiple truths in its purpose, allowing an artist designer to select the distinct archetype they are willing to portray. As my material-driven practice pursued, I segmented the predominant identity structures in this work and grouped the elements related to its functionality and materials resonance.

'It is always coming-into-being, a never-ending project of becoming ... This has occurred through the philosophy's central usefulness as an interpretive strategy – its ability to help us understand how hierarchies of identity and essence are constructed and resisted. To appreciate

² https://www.researchgate.net/publication/329653915_Toward_a_New_Nomadism_Feminist_Deleuzian_Tracks_or_Metaphysics_and_Metabolism

³ https://the-eye.eu/public/Books/Bibliotik/D/Deleuze_and_Contemporary_Art_-_Ed._Stephen_Zepke.pdf

⁴ "The Work of Art in the Age of Mechanical Reproduction" (1935), by Walter Benjamin

becoming as a fact of life, a stage of critical self-awareness, or even an ethical response is to appreciate how identity itself is formed through opposition, alterity and difference. ⁵

An approach to problem solving: mindmap Material_Adventure The Boardgame @ <https://www.plusea.at/?p=6605>

Usage: Community building and fabric swapping potluck gift economy activity

II. Advancement, Development, Implementation

II.I What am I actually observing over time and periodicity & Understanding what is taking shape

It is the *why* of the material and the material is the *what* of the form.

(Flusser)

Deleuze understands the ongoing differentiation of co-implicated selves as necessary for the creative evolution of life. Although repetition and sameness are what humans are mostly attracted to, and depend on, in the mundane existence of our everyday lives, it is openness to the not-yet-known that Deleuze argues they must dare to forge. ⁶



To say that the electrical grid changed our way of life would be an understatement, but to see how it led quickly to the internet leaves me speechless. Back in the early 1900 Circus, you could have a tour of the generator to see electricity for a small admission fee. ⁷ Most of it was probably just trickery but the attraction to the unknown developed into social science of its own, where the sheer abstraction of an idea became its absolute identity. A little bit like the internet today, and how it is portrayed and sold to the unknowing. When a carnival was in town, it would break the everyday agrarian economy routine and hand dribblets of confusion for a coin. Today we could speak of show business as an overwhelming out of control distraction tool for global capitalism/colonial violences, but this identity could not have existed without it's manipulation through the self-interest of individual creators and designers correlating reactions.

⁵ [Deleuze Reframed pdf online](#) p.45

⁶ https://www.researchgate.net/publication/273890989_Deleuze_and_Collaborative_Writing_Responding_toWith_IKSB

⁷ <https://www.everydaysociologyblog.com/2018/11/taking-sociology-to-the-circus.html>

Circus and acrobats was for a time about giving a moral boost to the troops, it was also about being able to have a laugh when things got chaotic. The meaning and absolute definement of an act in public spaces, in theater or in life, is interpreted from the audience's point of view and the personal experience and expectations they carried with them, or as Proulx puts it:

Every reader finds himself. The writer's work is merely a kind of optical instrument that makes it possible for the reader to discern what, without this book, he would perhaps never have seen in himself.”⁸

The author lives the duality of building a lens through which the intended experience of interactions should take place, and at the same time is trapped by the imperfection of the design as they are not completely control the user's unpredictability and understanding towards it. The ways I used to navigate in this situation was in providing enough symbolism, in texture⁹ or archetypes, without scripting too much linearity out of the costume, allowing the audience to feed itself its own imagination. I believe this is what the audience actually wants and I believe the last couple of decades have proven this with the advent of social media advertising, that minimizes the users unresponsiveness and maximizes its adoption of hyper-correlated content.

This author-audience duality is of most importance if both parties are to engage with an art piece; allowing for surprise and sensibilisation.

>The first way of seeing emphasizes the apparent in a form; the second way emphasizes the form in the appearance. (Flusser p.26)¹⁰

To merge traditional skill sets and aesthetics, to interactive networks in communications today, an artist must maintain this paradox of the self as both the 'author' and the user. Keeping the tragi-comic image in mind, the visual aspect of wearable technology keeps a fluid interactivity with a subjective social life and emanates a visual ambiguity for the audience. Aiming to integrate as much 'invisible and surprising' electronics as materials for this experience, the interaction should reside in-between the user and the artifact balancing each-other; both in the "plane of content," and the "plane of expression."¹¹

⁸ Marcel Proulx, In remembrance of lost time

⁹ <https://mawa.ca/pdf/Excerpts-TraditionallapaneseAesthetics.pdf> from: In Praise of Shadows (1933) by Junichiro Tanizaki

¹⁰ https://the-eye.eu/public/Books/Bibliotik/S/Shape%20of%20Things_%20A%20Philosophy%20of%20Design%2C%20The%20-%20Vilem%20Flusser.pdf

¹¹ https://the-eye.eu/public/Books/Bibliotik/D/Deleuze_and_Contemporary_Art_-_Ed._Stephen_Zepke.pdf p.179

Hybridity of live performances in a digital context, over a screen, becomes much more complex to achieve without the medium of a physical component or artifact, that allows the user to transcend the space and become livid in the experience of artistic consumption. Hybridity of workplay in entertainment, outside of the context of a capitalistic schizophrenia, as described by Deleuze, has a vested interest in maintaining coherent social networks that feed each other through this process of experimentation and expression, but that is self-propulsed in its maintaining of the those fundamental ambiguities in the creative process that result in an ever compounding creative culture. This entity created in the crossroads of these interactions, maintains a purely cultural ethos that forces a cooperative interaction and opts-in, to a mentality dominated by a gift economy¹². Thus the non-linear methodological pursuit or the 'improvisation' aspect of research-creation, generates a dimension in which the life and death of the crafted entity correspond to the dialectic between renewal and consumption of a form or desire, ever perpetuated by the humanity of both creator and consumer.

From these connecting socioeconomic observations we can demonstrate, nonetheless, the coherence to their dissensus. As rave culture withdraws from representative politics follows from its symbiotic relationship to precarious labour and cognitive capital, which had dissolved the workplace as the site of political activity in the hybridity of labour and leisure. Nonetheless, it is this hybrid form of workplay which now becomes the general category of labour. as it appears “unreformable” is all the more understandable given that work is simply no longer work, but a constitutive element of enjoyment (leisure).

Capitalist workplay, as its hybridity suggests (and as Deleuze and Guattari noted in the subtitle to *Anti-Oedipus*), is an entirely schizophrenic experience, simultaneously and irreducibly negative and positive. Against this schizophrenic experience of everyday worklife is projected the fantasy of a perfected leisure which never entirely was.

The parallax of rave culture’s “politics”, then, is that it operates through withdrawal from representative and expressive modes due to its constitutive adaptation of the hybridity of labour and leisure. There is a word for this hybridity: culture.

In this sense, what rave culture embodies – and enacts worldwide – is the autonomy of a culture, not from the simplism of socioeconomics (from which escape is consumed as ideological fantasy), but to be culture. By being culture, it enacts the only autonomous position possible within network socioeconomics.¹³

¹² <https://libcom.org/files/Mauss%20-%20The%20Gift.pdf>

¹³ https://www.researchgate.net/publication/266222108_Technics_Precarity_and_Exodus_in_Rave_Culture p.33

II.II Interaction Strategy

Fictional scenarios related to the tech: The irony of this piece is that it still maintains a logical artistic paradigm if the user or creator remains completely in awe of the item, without any other form of interaction. You can try to stay still as long as you can. You do you. Be unpredictable towards the machines predictability in giving a response.

To fidget in the face of amazement: make small movements, especially of the hands and feet, through nervousness or impatience.: "the audience had begun to fidget on their chairs". synonyms: move restlessly. fidgeting in the face of the design is possibly the most natural reaction to anything surprising or out of the norm, i found creating these interactions in the times of "non-transcendence" gave an inherent value to the creation process of the artifact. Making you nervous as to what it is about to do, is ultimately a victory in the eyes of the creator, who has triggered a drastically more powerful reaction (that translates into a physical nervous tick) in the interpretation of the piece than the actual artists creative limitations.

In Disenchantment of Affect¹⁴, the researchers support an open-ended engagement and appropriation, suggesting that enchanting experiences may be designed only by approaching enchantment obliquely: not by engineering it, but by providing opportunities where it may emerge; opposing script and controls to surprise, emotional engagement and freedom to act.

Interaction System ¹⁵

Take advantages of what is provided: beaded jewels, large sleeves, dreadlocks

>The user aims to converse with tangible computing but is ultimately part of a bigger network than itself: culture

In developing an interaction strategy, the design capitalizes on the multiplicity of materials and the flexibility of the users appropriation of the creation as their own. As the user aims to converse with the tangible computations of the artifact, using their own subjective interpretation of its form and purpose, they reflect a compounded influence on the larger perspective of the experimentation process, forming niche-like cultural isolates.

¹⁴ <https://www.deepdyve.com/lp/springer-journals/the-disenchantment-of-affect-RWKvRHfs7h>

¹⁵ <https://www.usability.gov/what-and-why/interaction-design.html>

The conduction of culture and its transformation by the medium of art, the digital 'dreadlocks' in this case, allow for the customization of appropriated culture by maintaining the integrity of the artistic pieces representation of the culture. Here, the interaction strategy puts the user in the driver seats, allowing the creator to adjust, adapt and innovate, based on the extent of the user's unquenched curiosity.

Visual Aspect: from prototype to final sketch

Focusing on the visual aspect of “early 1900”, I am opposing the linearity of optic fiber use in communication cable to a non-linear material-driven networked approach.

Upcycling luminous and rare textile afforded design around its specific linearity.

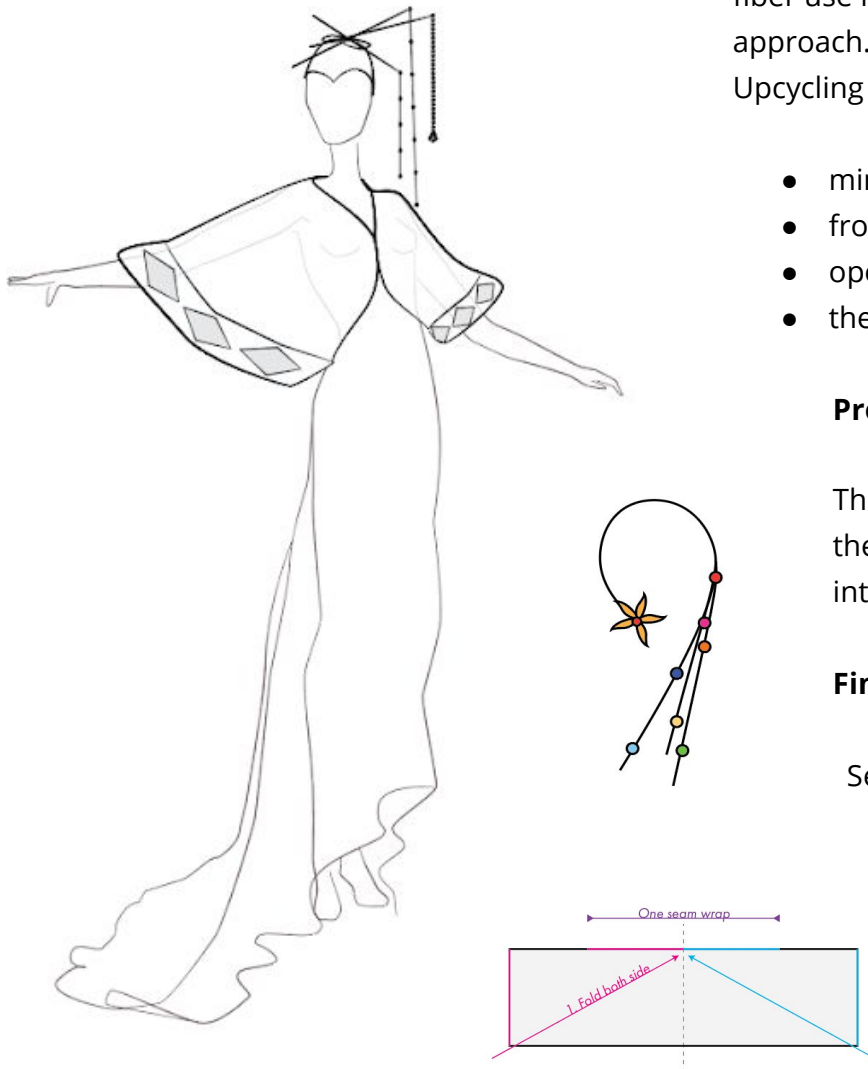
- mindmap = interactive design thinking
- from learning process to made-to-measures
- open-ended, as in freestyling to the final form
- the coat = 2 lines + draping = sun at the back

Proposal: Hybrid/composite, blooming, human centered, skin response, DIY

The conductive touch sensitive materials are present, the LED matrix from the proposal changed to an integration of optic fiber as display and a clearer interaction protocol between them is established.

Final: Non-linear duality, assemblage; making as a mean for storytelling

Sensitive sensors to headdress, beaded tilt sensor on sleeves for balance



>The Art of Sitting Still, is both a tool of contemplation if the creator wears it, and/or an object of distraction if an acrobat uses it to perform for an audience.¹⁶

From a linear and reactive system (prototype) to learning system that includes the user (final interactions)

1. Sleep mode: Interactive as in its visual aspect of being clothes tells a story about users culture
2. Start: Users unpredictability
3. Mode 1: tilt sensing from either beads or head
4. Mode 1 react: Led display on fabric and/or headdress
5. Mode 2: The user stands still for a duration of time
6. Mode 2: The distractive lights fade away
7. Mode 3: Soft sensing capacitive button detects touch
8. Mode 3 react: mode cycling and learning to use the object

0-0 Reacting



0-2 Learning



A flow chart architecture could help

Usability - Relation with its context - why we prototype¹⁷

Rope walking, stilts, concentration. The lights then mean unbalance and danger to fall, thus provoking emotions to the audience.

Shake, dance, excitement and lights

MC usability: I think I could host a skillshare workshop now. But would I become a charlatan too? Is the technology world and ideology really driven by grants and fame? "Aestheticization of technology and new media" and the political aspects. The 4th wall

¹⁶ <https://ceasefiremagazine.co.uk/walter-benjamin-art-aura-authenticity/>

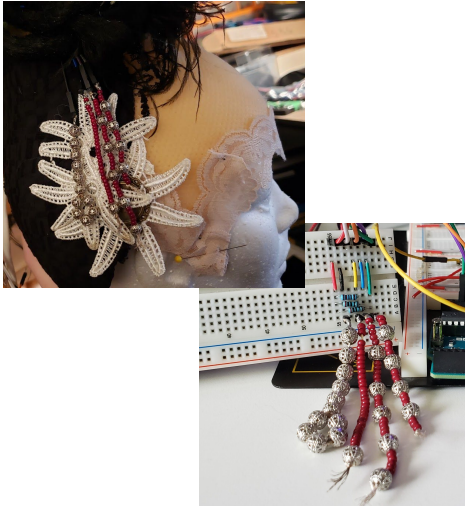
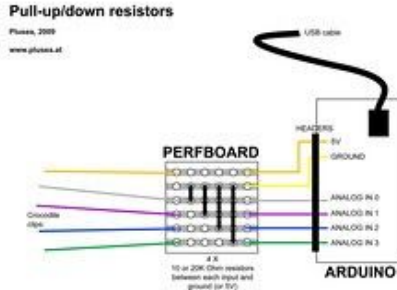
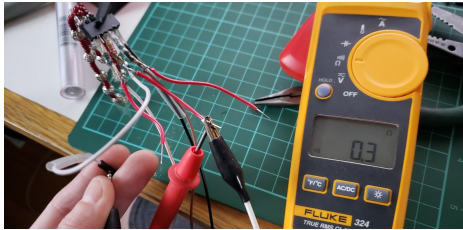
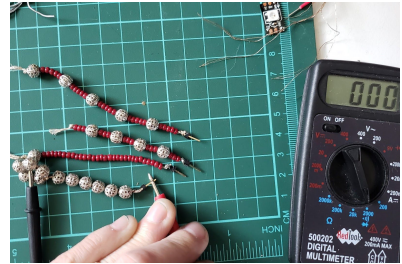
¹⁷ see also mid-term report for deeper technical reasons of understanding why we work in iterative steps

II.IV Material Composition - Controlling the narrative about materiality - electronics as materials - Creating Computation

Silver as a semi-precious jewel and interactive ornament, a touch of charleston/burlesque. Contemporary Arts.

Grain of fiber optics may be used on different starting points(led), weave and wave the fabric in shape.

Sensor Affordances and Technical Evaluation

Resistive sensing	Composant Technicalities	Integration	Reference
<p>Conductive thread and materials for DIY signals</p> 	<ul style="list-style-type: none"> • 1 connector / row • conductive thread • approx. amount of silver or conductive exploration. • assortment of resistors • digital multimeter 	<ul style="list-style-type: none"> • analogRead() + Peak detection over time • The range of analog reading is 0-1023. • contact switch/ resistive change / capacitive change 	<p>LariviereMC 360 sittig still.ino</p> <p>Kobakant, Pulsea</p> <p>+ video in action</p> 

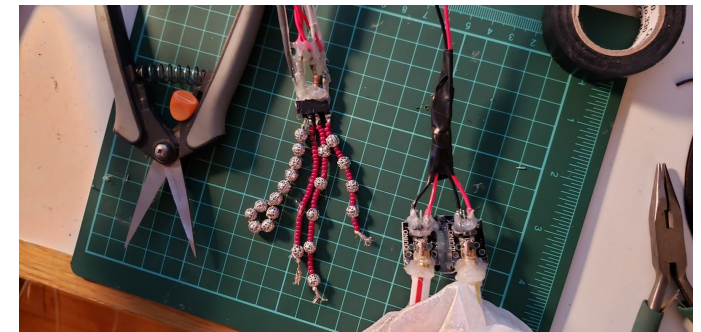
Sensors impact: user experiences and expectations.


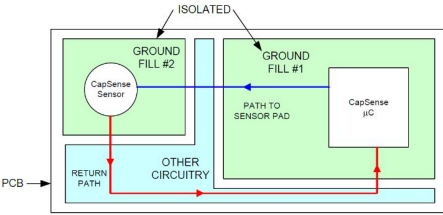
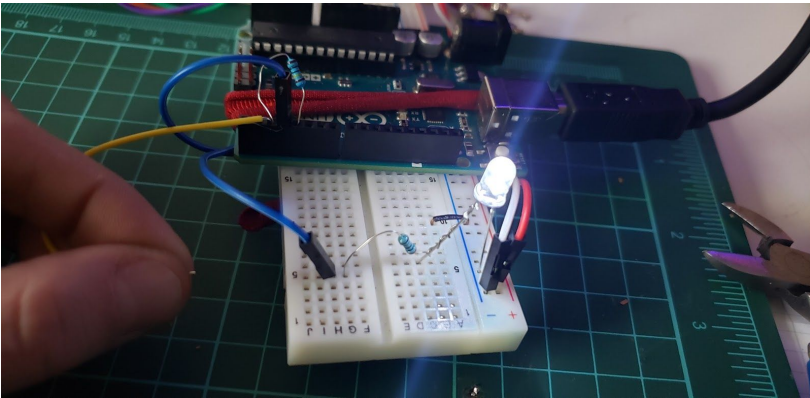
Subtle yet effective, provides with some variety in modes and measures.

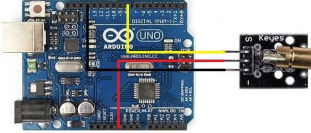
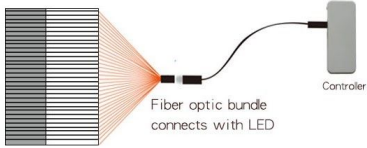

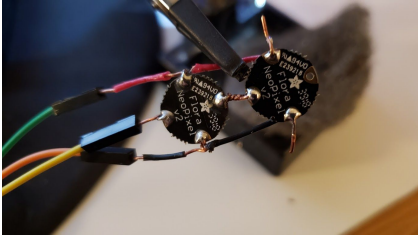
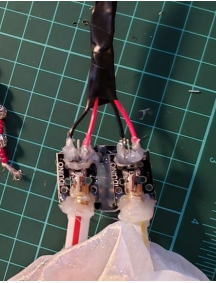
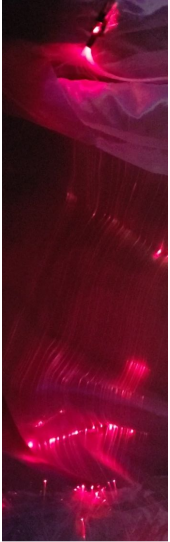
Can copy and recreate at different intervals on textile.

Expectation: lights control and twinkle effect on choc

Surprise: How will the user stage it? What will I observe?

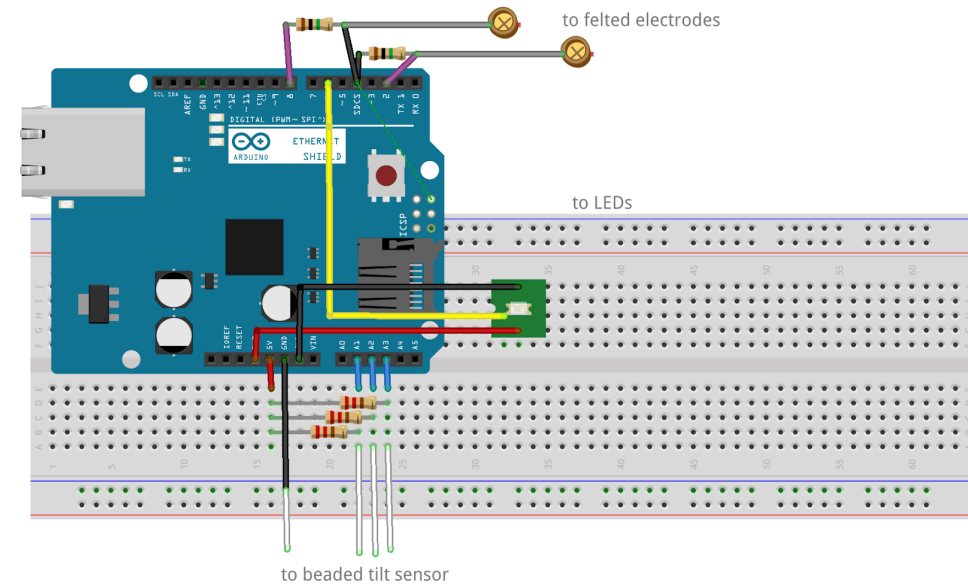
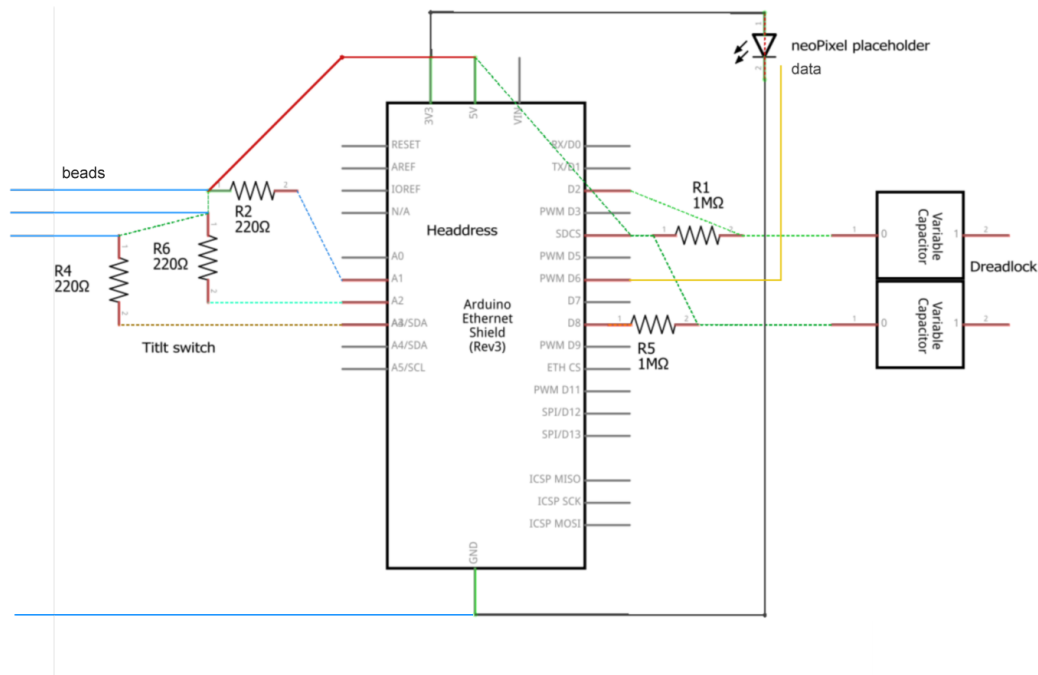


Capacitive sensing: Electrodes	Composant Technicalities	Integration	Reference
<p>Conductive thread and materials for DIY signals</p> 	<ul style="list-style-type: none"> • 1 connector / dreadlocks • 10MΩ resistors between pins 4 and 2 • Felting + `steel wool` 	<ul style="list-style-type: none"> • Measure and compare capacitance of arduino with human RL natural response • The range of reading is 0-15000 in millis() • contact switch/ resistive change / capacitive change 	<p>LariviereMC 360 sittig still.ino</p> <p>capSense + Slab</p> <p>Design Guidelines Cypress</p> <p>khan academy</p> <p>+ video in action</p>
<p>Need 'tuning of the material' almost before any interaction due to its composition (felting, stretching)</p> <p>Sensors impact: Visual communication with functionality</p> <p>Expectation: light reaction, Capacitive electrodes for cycle</p> <p>Surprise: Crochet, embroideries on coat and a layer of insolation?</p>			

Light effect & Reaction	Technicalities/Integration	Integration	Integration
<p>✓ KY-008 Laser Transmitter</p> <p>X Flora sewable neoPixel LEDs</p> 	<ul style="list-style-type: none"> See LED placeholder on schematics pin 2 can monitor I on A0-5 2 panels of 6ft each, tubing for connections 	<p>Neopixels</p> <ul style="list-style-type: none"> Addressable RGB + libraire  	<p>Laser: how it is meant to be</p>  
<p>Impact: user experiences visual form of reactions through the lights</p> <p>Affords the acrobat a costume that fulfill their need to be seen if they perform at night. It is a hybrid between seamless technologie and costume design, it is calm, most electronics are invisible or used as ornaments and it has multiple layers of enchanting effects of movement and light.</p> <p>Expectation: Used to signal movement, danger to fall FULL-ON cycle, twinkle like the sway of the beads</p> <p>Surprise: when you stay still, if you stay still</p>			

III. Final Implementation: 'The Art of sitting still'

III.I Integration and code - Similar circuit in both objects



Calibration phase

The sensors I made are either contact switch (on/off) or resistive sensors that change their electrical or capacitive value when manipulated. The sections concerning sensitivity calibration are explained in the .ino file and were tested with serial. See also sensor affordances tables section II.IV

- > The tuning of the capacitive electrode is in a threshold variable in .ino
- > Compared lights intensity and code adjustment.

Processing with Arduino IDE

Using the internal pull-up resistor of the digital pins of microboard to implement capacitive sensing¹⁸, the measure is in millis()

The tilt sensor uses analogRead() of resistance on choc

Code explanation - please refer to the comments in the actual .ino

Librairies: CapSense, neoPixels

The range of analog reading is 0-1023.

when a threshold is met...

Time of duration = reaction to present movement. I want to integrate delays and conditions now that the final wires are completed.

Duration or periodicity: In contrast to linear progression, the concept of *duration*¹⁹ as a discrete measure of present time in Deleuzian philosophy resonates with the artifact/experience.

IV. Fidelity Levels to the development process / why we prototype

Lvl		Nov. 20th	meeting/feedback	Dec. 11th
High	Components/Materiality	evaluate each sensor separately	revisit interaction storyboard, no need to add anything	linearity vs non-linearity
Mid	Software	add sensors to flow chart add codes	processing of signal	comment codes somehow neverending
High	Integration INTERACTION	connections for sensors Have more Neopixel	GO FULL CIRCLE no dilution in experience	the wearer converse with it emotions for audience
High	Form/Structure	sketch final garment (know final length and form)	sewn prototype + dimensions	drapping, headdress
Mid	Documentation	prototype video assets		

¹⁸ <https://www.arduino.cc/en/Tutorial/Foundations/DigitalPins>

¹⁹ [Deleuze Reframed pdf online](#) p.85-87, Bergson, Creative Evolution, Process Philosophy

Observation/Conclusion

The duality of perception, or ways of seeing, combined with the non-linear approach of material-driven practice and Deleuzian philosophy, lead to a social study upon the behavior of the 'author'-audience(or user) relationship, here explored in interactive and wearable computing. I discovered that philosophers have thought of this process before, and to cite their research in conceptual approach helped me intellectualize what I have learned by virtue of experience in a variety of artistic and crafting environments; from the corporate creative chain gang to the artisanal custom wearables workshop. In essence, `following the grain of materials` is a continuous evolving process that relates to how the author juggles and innovates throughout the creative journey, by following the natural correlations found in their hands. To imagine-segment-experience and rebuild conveniently symbolizes a networked cultures behaviour when interacting in a computational frontier.

Next iteration, opening on more capacitive driver modules, skin conductance, study variations in signals
magnets are 'invisible forms' too, could be use as a fastening tool
modular electronics seem a very interesting way of building clothing with responding accessories, and it speaks of networked behavior
<https://tutorial45.com/arduino-with-nrf24l01/>

IRL circuit in small (__AVR_ATtiny85__)

I would like to go out and evaluation on user/tester to observe initial behavior with artifact.
Are they fidgeting already? do they go beyond their first impression?
should I show them?

Table of Contents

Bibliography

Annexes

mindmap,

LariviereMC_360_sitting_still.ino

