

# pieced technology



talking drum machine

software version 1.0

jacket 0

2022 +

wearer manual

# pieced technology

## contents

### talking drum machine

#### intro

- 02 summary
- 02 components
- 02 connections

#### background

- 04 experience
- 05 influence
- 07 intentions

#### design concept

- 11 craft
- 12 the jacket
- 13 futures

#### research

- 16 history
- 16 relations
- 17 implications
- 18 alternatives

#### inspiration

- 21 visions
- 22 stimulus

#### methodology

- 24 prerequisites + software
- 25 circuit diagram
- 26 wiring
- 27 leds
- 28 code
- 28 roadblocks + forward

#### conclusion

#### work cited



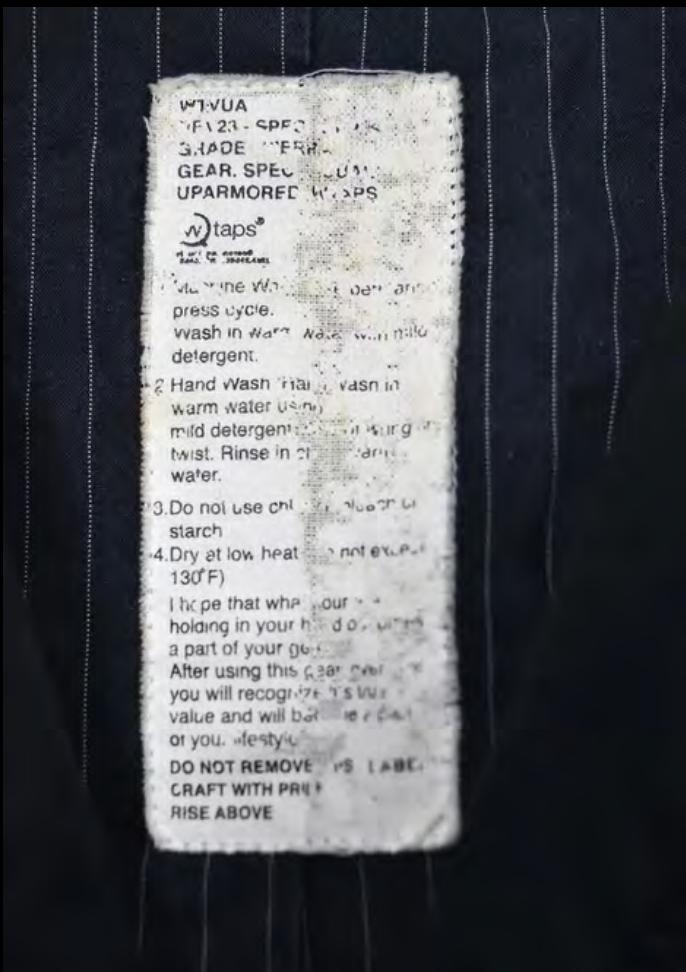
# intro

## summary

I will be creating a wearable computational device that will exist as both an article of clothing and communication protocol controller. More specifically, the piece will be a jacket. The jacket will function as a musical instrument digital interface which can connect with digital audio workstation software in order to create music or resonant sounds.

## components

On the surface level, there will be little to no distinctions between the piece and traditional american workwear. As for the computational input, the wearer will control the MIDI by patting specific locations on the arms, chest, and sides of the jacket. These gestures are inspired by juba or hambone which is an instrument that originated in Africa and has been spread throughout the world through music and dance.



wtaps black chore jacket

## connections

Sections of the jacket will represent different forms of controller data and notes that will translate to sounds within ableton. This could include samples, drums, clips, and various other types of audio. inputs can be customizable and configured to fit the wearer's musical style or preference. as patches traditionally serve as ways to mend, fix, modify, or signal through wardrobes and software, this parallel will be emphasized through the piece to highlight how computer technology can be engaged with as creatively as clothing



wtaps black chore jacket



# background

## experience

There was always a natural gravitation towards creativity and various forms of art for me. Whether it was music, visual work, or structural design, I found that more interesting than many other things going on around me. Even though I had the privilege to engage with these domains to some extent as a youth, being an artist never seemed realistic or practical. I was under the impression that unless I was a prodigy or some type of genius then maintaining a life committed to creating through creativity was not possible therefore it was never seriously considered by me. I knew that I wanted to be in a healthy economic situation as an adult and that I wanted to be able to provide for those who were close to me so I bought into the idea that I needed to follow a traditional career path.

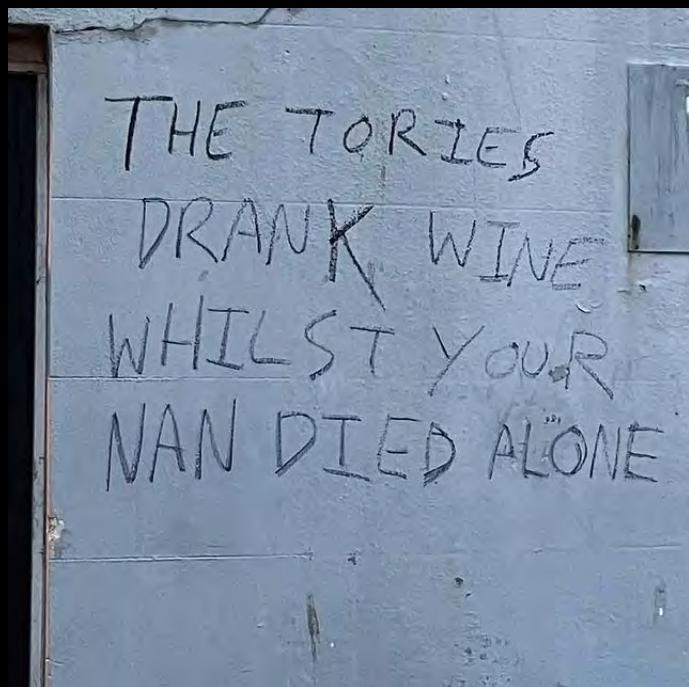
In retrospect I realize how constrained young people's ambitions can be living in a hyper capitalistic society. Outside of joining the military or working for a private/for-profit company, it's become increasingly difficult to find alternative means to make a livable wage through the past handful of decades. Becoming a doctor, lawyer, engineer, businessman, or other similar professions are what we are incentivized and encouraged to pursue as if the humanities and art mean nothing unless filtered through the corporate lens. I ended up working with computers because my family had a desktop in our living room that I tinkered with often and learned how to operate simple tasks like run games on different programs and surf the internet which exposed me to a lot in the late 90s and early 2000s. There was a sense that some aspect of creativity could be developed through computer technology so that's where a significant portion of my energy was invested.

Fast forward to today and computers are basically inescapable. We have reached a point where society cannot function without them. I've become much more conflicted about my personal connection with digital technology as I could not have predicted how pervasive networks have become and the degree to which algorithms and online entities control our lives. The past few years have been dedicated to a culmination of research, readings, dialogue, and projects around technology, culture, politics, community, and the future. My thoughts and perspective have significantly shifted to the point where I can say that a sort of augmentation of the mind took place. This augmentation is an expansion of my perspective on reality, where I fit in today's world, and what's necessary in order to cultivate the future that I envision for myself and my community.

Who we are is directly connected to all lifeforms, sources of energy, and environments that surround us. We should begin to recognize that market capitalism is not just an economic system of trade but it's also a consequential social system. This existing social system has negatively affected the majority while a small minority of the ruling elite benefit. More specifically, the global north continues to thrive off of the exploitation and abuse of the global south. More melanated people, across the board, suffer than less melanated people and that's a feature not a bug of this current globalized social system. Where I think I can contribute to helping set up an alternative system is by directing my design work, both creative and professional, as a means of out-system activism. Out-system activism is a form of involvement that focuses on areas of change that challenge the nature of the existing system itself.

We can use assets in the current system that are available to us through dematerialization, ephemeralization, leveraging sustainable technologies, and various other methods to allow for this necessary upending to take place. Instead of continuing to participate in the global mass exploitation of people, resources, and land with no regards of the outcome while abusing the ecosystem for short term gain, we can instead take great care in our actions to preserve some semblance of integrity with the natural world we inhabit and foster sustainability in a symbiotic context.

Through this project I will establish a renewed relationship with innate interests for creative endeavors from early life that were sidelined. Additionally I will inject components of my own culture and history that the mainstream consciousness has come to consider trivial but what I believe could be the key to a better future for many. This work will be an expression of suppressed creativity that's influenced by lived experiences including elements ranging from the technical to the imaginative to the spontaneous.



untitled

## influence

The work will exist in the space between computerlessness and engaging with a GUI which provides technologists with ways to experiment with completely new potential experiences. Voice technology like the Amazon Echo, Apple's Siri, and others are examples of technology within this between space. It's debatable exactly how positive the contributions of these modern day consumer electronics are for us as a society. On one hand they allow us to become more efficient in some areas of our lives and make gaining access to information, media, and other people(on a surface level) more convenient than ever while on the other we spiral into a life where individualism, isolationism, division, and other qualities that are fundamentally detrimental to our wellbeing.

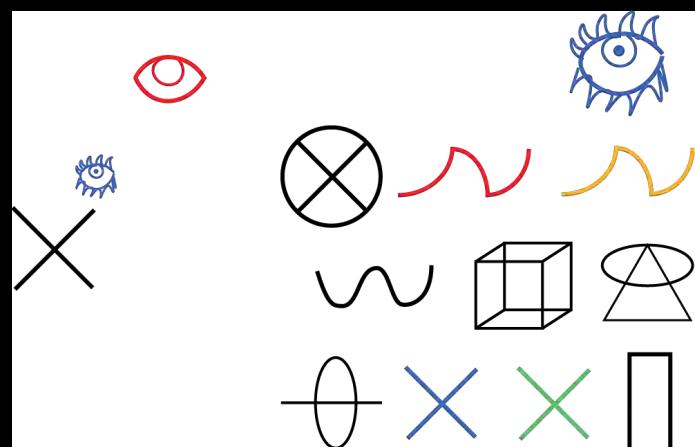
There are those of us who call software like Siri, Alexa and Google Assistant "smart" technology but all that really means is that they collect a massive amount of data on us only to barely make the services behind them incrementally better. What notable innovations which benefit the masses have come out of big tech in the last ten to fifteen years besides improvements of smartphones and voice technology? The primary purpose of the data aggregation from those devices and other "smart" technology like it is to either sell it to advertisers or create a digital online persona which is attached to us without our consent and can be manipulated and controlled through the black box algorithms that are constantly being used on us. Our digital footprint will continue to follow us as long as the internet exists and who knows how what's being generated now will be used decades down the line.

A private company can say that they will not use your information for any nefarious reason but companies can be bought. Who's to say the buyer, who now owns all the information from the purchased company, won't have more unethical or morally bankrupt intentions?

It must be understood that Silicon Valley, which plays the largest role in constructing our current understanding and bondage with digital technology, is just as much rooted in the same abuse and profiteering that basically every other US industry is. We have always been dependent on work done by various skilled teams and individuals that never got the recognition. One can't help but think that our relationship with the material world would be very different if there wasn't such an extreme disconnect between our products and what goes into making them. The US's labor practices of the past which aided in the development of Silicon Valley that helped create the PC revolution and administer internet access to the masses involved deep levels of skill and craft from a wide range of people who were not white men even though that's never how the popular narrative is told. Because of the way that history has been framed in the west, the contributions of marginalized groups have pretty much been erased. This disconnect is encouraged in every facet of our lives. Out of site and out of mind the motto that institutions depend on to ensure the narrative does not change. Subjected and marginalized groups cannot be aware that they have a claim to a vast majority of innovations that have been traditionally credited solely to a small group of people. We are now experiencing and existing through the result of hyper industrialization and the constant overproducing of products that we really don't need but must be manufactured to create the incentive to constantly consume.

These processes are having a detrimental effect on the planet and in result our lives.

Part of what I believe is my role as a designer in the field of technology is, is to illuminate these gray areas where people who are unfamiliar with the inner workings of these systems and highlight the way we can easily be taken advantage of and used. Through the wearable MIDI, I am proposing a new way to interact with digital technology separate from the visual mediums which currently dominate many of our lives. Also this work will be going in the direction of touch input that will translate into sound instead of voice as a command into a digital black box disguised as a virtual maid. By accepting sight as the most legitimate of all the senses we reject alternative forms of knowledge and understanding.



anti-surveillance symbols

## intentions

The goal of my thesis is to explore, or push the boundaries of, human behavior through modern computer technology and the interactions between them. Now that we live in a world where many of us spend a significant portion of our lives recording our thoughts, bodies, and actions or watching other people's recordings more than ever before, our psychology and behavior have altered in ways we are only just beginning to understand. The dramatic shifts in the ways we operate with and within the world and towards each other in physical spaces throughout the past decade and a half up until now has forced us to augment ourselves and our realities in a diverse set of different ways.

Historically there have been groups or individuals who have been able to take different technologies and shape them to serve a purpose that existed outside of the boundaries of what they were originally created for. Many times the most cultural and artistically profound movements or work came from marginalized or oppressed groups. People in this realm have always been able to innovate and create new visuals, sounds, experiences, and languages. Often though, acknowledgement or recognition by larger society isn't given unless it is appropriated or commoditized to where by then, it has been filtered to fit the within the range of tolerance or bastardized to portray those from the culture it was conceived within in a particular way. Building one's own vehicle and paving one's own path is a way to ensure the positive impact is recognized so efforts can be embodied and built upon for future generations before it's too late.

We are in the moment where the world seems to be changing very significantly in a short period of time. With the impending climate catastrophe, economic fallout on the horizon, world powers escalating tensions, the rise of fascism and the police state, hyper-surveillance and the psychology of the collective human mind being shifted dramatically through the online experience, humanity is due for a reckoning like no other. Despite how stacked the cards are against the people and how far beyond the bounds of possibility a better world seems, ideal alternative futures are possible. We as a multi-talented heterogenous group of people can work together to forge this existence. The hope is that all my work including this piece can inspire a new outlook on what can be envisaged and created by anyone who wants to divert from the norm or status quo.

I have never before felt as alienated as I did while a student in my MFA program even though I've gotten familiar with being somewhat an outlier for a good part of my adult life. The word "Master's" alone highlights issues existing within the academy. Everyone knows the higher the economic circle is the less melanated the demographic becomes but experiencing it first hand as a darker skinned person hits differently as many can attest to. One can only imagine what it must have been like for others like me in the past or what the energy would have been like in my absence. It may have had to do with the recent onset of a global pandemic on top of all of the social issues of the world which could have made things awkward. Perhaps I've just grown to be a standoffish person after going through recent phases of disillusionment. Maybe it could just be part of getting older as a man in a very individualized world.

Regardless, my experience reinforces the idea that most affluent spaces were never cut out to have people of African descent in them to begin with, but are instead designed to keep them out, I would argue, no matter how much effort is put into attempting to cover up this evident reality. I don't think any individual school itself is to blame for my internalized estrangement as there are much larger socio-economic issues at play. In any case, all I can do is carry on and try to make the best of the situation for myself and future generations.

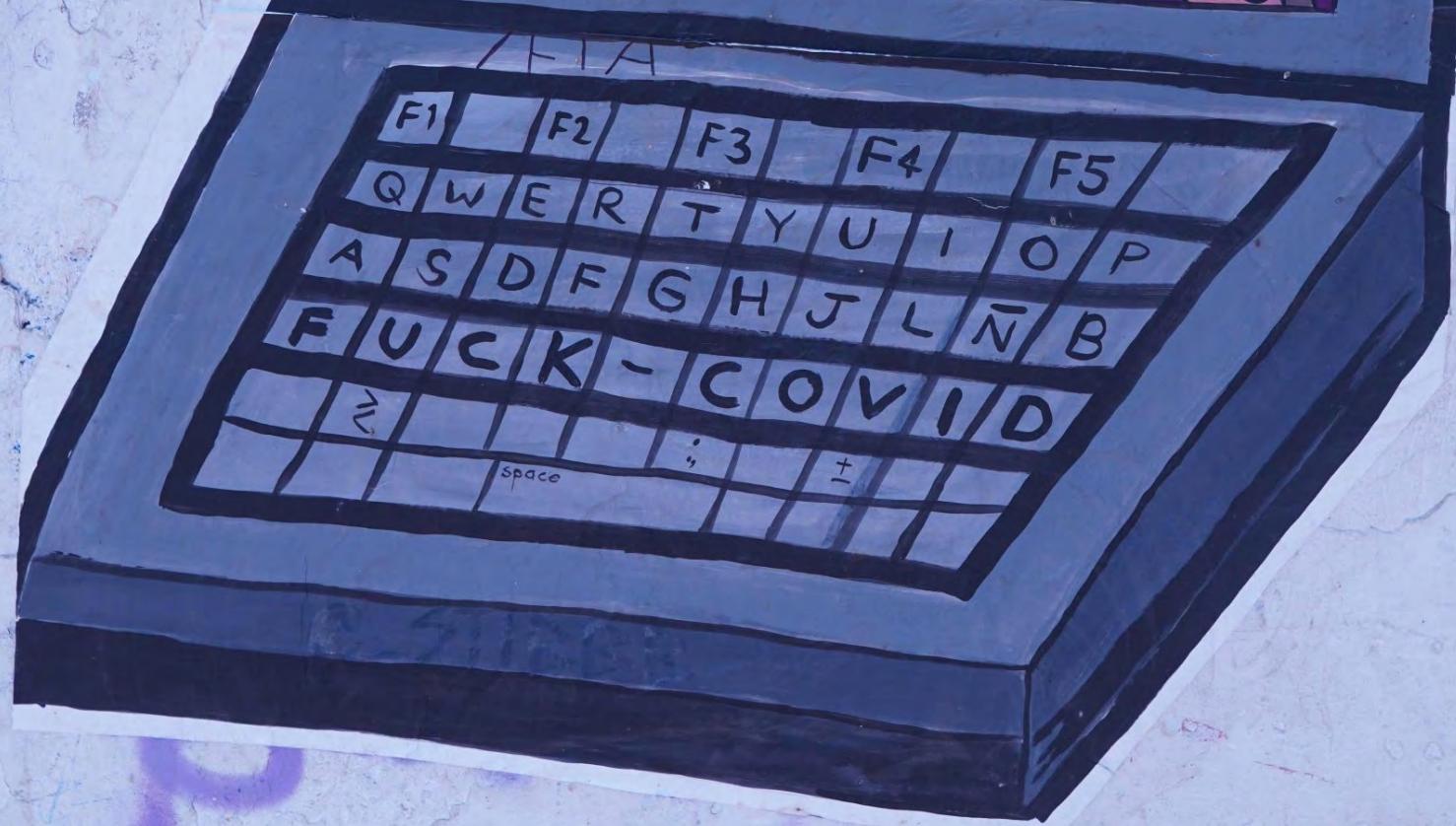


the great conjunction of jupiter and saturn

Despite how abstract and foreign this work may seem to the unfamiliar, I'd like for it to resonate with anyone who wants to engage with it but the primary groups that I have in mind are those from marginalized or disenfranchised communities who are mostly darker skinned people of color. There are a lot of people in my life who come from backgrounds such as these and I have made it a primary objective of mine to do whatever I possibly could to support and uplift them. The experience should challenge our current understanding of the globalized interconnected world, switching back and forth from feelings of emotional isolation and deprivation of human connection to euphoric moments of pleasure and playfulness in a way that's particularly unique to our current times.

There are many of us who are ostracized for what could be a myriad of reasons and do not have a choice but to try and make the world work with our disposition. I don't believe the alternative, which is to either give up or conform, is sustainable for the individual or the collective in the long run. I find that as time progresses what was once the feeling of otherness is what makes one unique in every aspect and is something to embrace and hold on to. With that said it's necessary to acknowledge that in addition to the project being for groups who are under subjection, it's first and foremost a tool of expression for myself.

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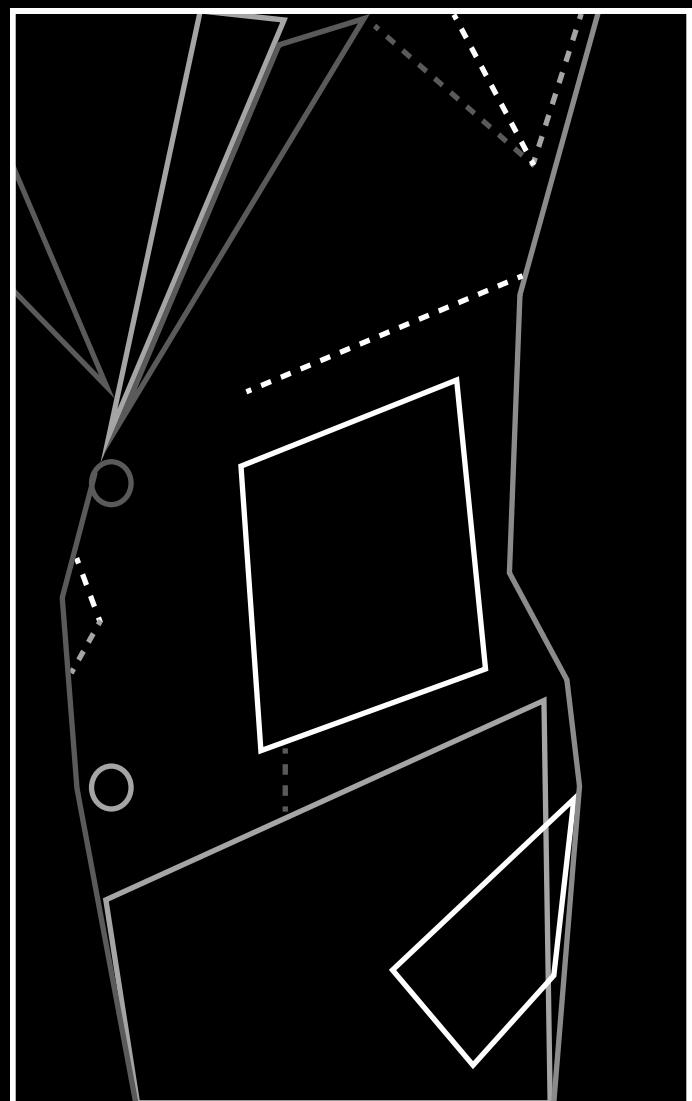
# design concept

## craft

We can learn a lot about what humans' lives were like and how they interacted with one another and the world around them by looking at the tools and technology that they used. The mainstream rhetoric around ancient forms of technology generally subscribe to the notion that these entities are either primitive or unsophisticated. Despite the fact that many innovations from earlier in human history do not solely focus on efficiency or growth to the extent that we do today in modern western society, the users of pre-industrial technology were able to develop a much closer connection with their creations. Early humans didn't have access to nearly any of the tools or resources that we do now yet they were able to provide everything they needed for themselves. What they did have was the time and attention needed to concentrate on what was necessary for cultivating craft. Craft served a purpose beyond functionality and aesthetic, but also contributed to the development of memories and values which brought upon tradition and collective identity. At our current point in time we should begin to reckon with this tradeoff.

It feels like there is little space to give the time and attention to anything that doesn't serve capital. Even my duration as a student in my program has felt like an instant flash compared to earlier points in life. With immediate gratification or satisfaction as the priority we miss a lot of what may make different aspects of life more meaningful and impactful. Slowing time down allows one to remember better which leads to much richer memories and values. I often wonder what the implications of people's habit of cyclical consumption today are for how we will remember what is going on at this moment in the future and how we will perceive reality then.

In many ways work that is too involved, too long, or too deep of a commitment to engage with has increasing difficulty gaining an audience which leads to creators of all kinds being incentivized to constantly produce whatever sells nonstop. This may end up having an adverse effect on the quality of the pieces overall while enforcing a cycle of undistinguished creations. This isn't to say that being able to carry out tasks such as streamlining the fabrication of clothes or making music/moving images instantly with just a smartphone or laptop are negative acts in themselves. There are great things coming out of us having access to technology focused on efficiency but there should be much more room for the unhurried approach.



We can see how this demand of repetitive consumption is now playing out with our personal devices. The nature of computers today is one that requires constant updates in order to run the applications and programs that people want to use. OEMs and hardware companies design their products with planned obsolescence in mind for the sake of future profits which is not only detrimental to the climate but also supports the perpetuation of indifference when it comes to the physical objects that we rely on day to day. It makes no sense that smartphones, which are made to hold in the hand, can't handle regular falls on the ground right out of the box. Operating Systems shouldn't be outdated and unusable after around five years. It's going to take industry wide endeavors to get behind establishing a craftsman-like relationship with our technology. Maybe as technology continues to become more accessible and inexpensive more efforts, separate from corporate powers, can be made to develop a solid infrastructure which prioritizes preserving legacy software by keeping them compatible with particular types of hardware.



rough digital textile

## the jacket

For us to explore alternative forms existing with modern technology and how they can be connected to the concept of craft it would be useful to explore the technology of clothing itself and how its form, function, and design has evolved with society.

Covering the entire history of clothing within this writing would require way more time and space than what's available so for the purpose of this particular work we will primarily be focusing on workwear, or uniforms of labor, in America.

The type of clothes that people within the US have worn has always conceded with the advancement of technology through different periods. From the early years of colonial America, clothing mostly reflected the dominant styles in Europe at the time which were of the puritan or cavalier. During this time most of society created their own clothes and there wasn't much of a business model around what was worn. When the industrial revolution began many new inventions were created which made the need for more factories, machines, and labor. Cities also began to grow rapidly along with the populations. Having much more streamlined manufacturing which made styles exponentially more uniform and accessible. During this period we also see the beginning of sweatshop labor and the first appearance of the modern suit.

For a majority of the last century the suit jacket or blazer has represented qualities such as sophistication, dominance, authority, and others. It wasn't until somewhat recently when wearing a suit was basically mandatory for white collar workers in the US and many other parts of the world. It was essential to be taken seriously and convey status. We have moved quite far away from this standard in the past few decades and perceptions of people who wear blazers or suits are now that they are most likely middle class workers as opposed to wealthier professionals that typically work in tech, law, or banking. Comfort, as well as the embracing of more casual attire is now the dominant approach. Significant societal shifts have taken place in the last couple of years that have eliminated the need for many people to even commute and work in office at the scale we once did. What does the new hybrid work model say about how we used to value certain sartorial principles in retrospect when it comes to working or just labor in general?

## futures

This speculative wearable technology looks into the history of labor in relation to design in order to challenge perceptions around professionalism and power by injecting elements of improvisation and playfulness in the form of music onto what was thought of as a very rigid and formal aesthetic. Because of how stiff and inflexible suit jackets are, the original material will be a used traditional workwear chore jacket which has similar features but a much more relaxed fit. I aim to open up the possibility of forging a completely new type of relationship with one's clothing.

With fast fashion and cyclical consumption being so deeply entrenched within our culture we should aim to shift mindsets about our clothing to one that embraces craft and living in unison with our technology. These new values will accommodate the process of upcycling and prioritize sustainability, environmentalism, and moving the direction of future societies into a positive trajectory which puts humanity at its center.

Through digitally customizable inputs the wearable jacket may also expand the wearers ability to express themselves sonically to suit their auditory preferences. It's in our best interest that we create space for how our computers are designed to eventually move away from the GUI, screens, and keyboards. There's no better domain than our attire, which is an extension of our physical selves, to look towards seeing how that reality may be possible.



wtaps black chore jacket





# research

## history

Before there were machines there were tools which all could be considered a form of technology. One can argue that the human relationship with and dependency on technology is what separates us from a majority of the rest of the living planet as our usage goes back to the beginning of our species' existence. We have always had the ability to manipulate the world around us to fit our living needs and that has contributed to the development of many different societies and cultures. At some point in our very short history, our ancestors began using tools simultaneously with other tools in order to create apparatuses that served more complex purposes.

The general lexicon around the past from the western perspective insists that machines are mechanical and contain electrical components by default. If this is the case then what would we call the level, pulley, millstone, etc.? These simple machines and others are what civilizations were built on. There's also the human factor that's necessary to power these ancient machines that's often left out of the conversation. Most if not all machines need human labor or input in order to work as expected. We don't like to admit it but humans have always functioned as machines. People were the first craftsmen, manufacturers, and computers. Industrialization has mostly detached the need for people but we still haven't gotten to the point where it's completely removed. We cannot have an honest understanding of machines without looking at the history of human labor, especially in the context of the US.

When analyzing how we understand labor, which is the expenditure of physical or mental effort when difficult or compulsory which has evolved into work, a job, and now what we know of as a career, it becomes evident that we've been coerced into a state of bondage that's rooted in colonial practices. Modern slavery refers to a variety of situations in which a person is forcibly or subtly controlled by an individual or a group for the purpose of exploitation. Modern slavery includes slavery, servitude, human trafficking, forced marriage, debt bonding, and forced compulsory labour. We have transitioned from operating machines to converging with machines through the complete commodification of our lives.

## relations

Witnessing how we as people have gone from computerless to inseparable from computers within my lifetime has been an intriguing experience. It isn't common knowledge that the original computer and internet technologies were constructed out of wartime incentives designed to calculate weapon trajectories and set up 'resource-sharing' networks. Around the late 1970s and early 1980s the technology had grown sophisticated enough to be bought as personal computers that could exist inside citizen's homes. Since then computer technology has become more consumer focused and an integral part of the social and economic infrastructure. The computer's origin as a weapon has implications on their actual effect on society and human psychology. Similar to many other forms of western technology developed with the purpose of conquering and dominating, all computer technology is rooted in "dead-reckoning", cold empiricism, or calculating what is believed to be exact.

This is in part why it is almost impossible for us to envision a reality outside of the one that is constructed for us by the powers that be. The ability to imagine that which cannot be seen or measured is being lost in the name of efficiency and capital.

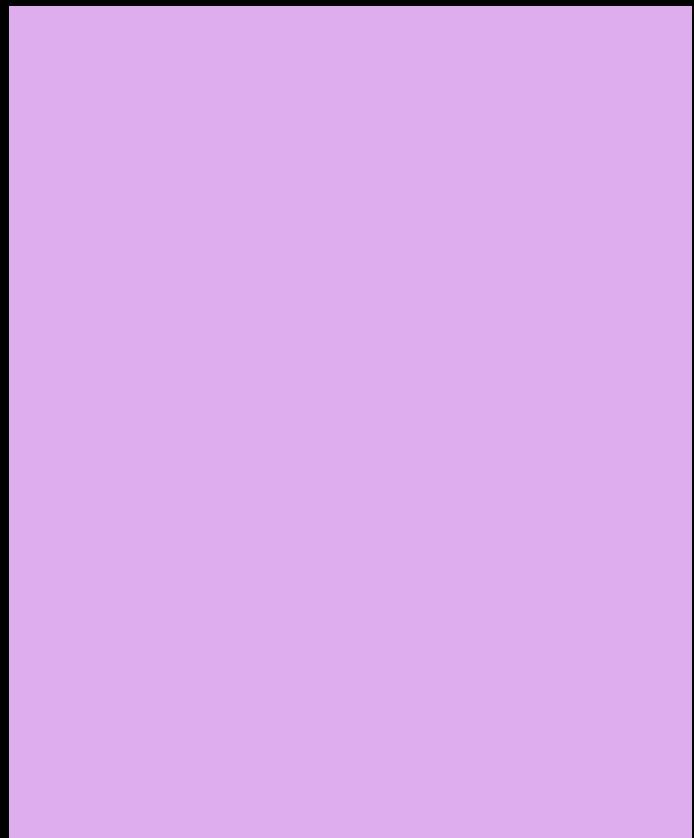
The algorithms that power the social media platforms which serve private interests are extractive, exploitative, breeds antagonism as well as unhealthy competition, and reinforces many of history's most harmful biases and prejudices. As time progresses we may slowly become more repressed due to experiencing life through a screen or vicariously through others. How media is being framed and the conversations around it, which are heavily influenced by algorithms that serve the economically and politically powerful, play a massive role in shifting the thoughts and ideas around those who engage with them. The degree to which our psychology is being shifted by the internet and digital media can't be understated.

## implications

With the rise of information and computer technology, our thoughts and conditions are being consolidated to a degree exponentially higher than ever before. I feel as though many of us are losing the ability to engage productively in person unless it serves capital. Today's mainstream digital communication platforms, or social media services, are designed to make sensational dialogue and toxic rhetoric the most visible. Being isolated with our devices has the potential to trap us in an echochamber of knee jerk reactions and there are massive psychological implications for this. Consider the idea of language and how it is an ever evolving form of technology, how communication controlled by algorithms that serve private interests are simply not for our benefit.

These networks function as a positive feedback loop which overproduces what's necessary in order for capitalism to sustain itself as the people who provide the data which power the algorithms continue to bear the brunt of socioeconomic fallout.

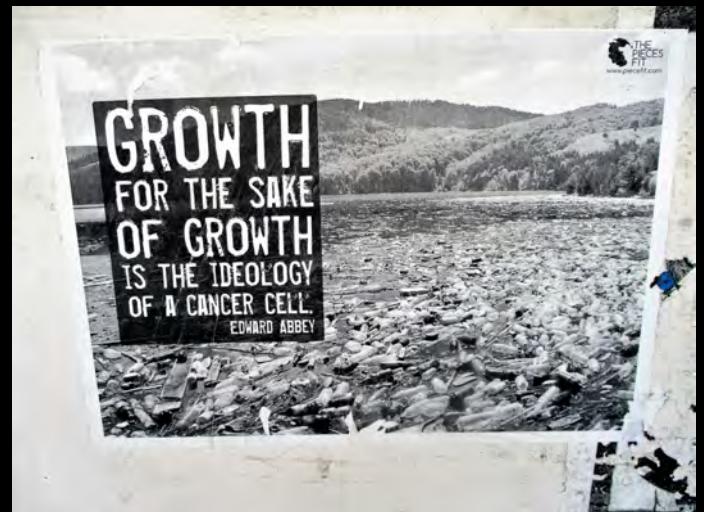
While the technologies like language and the internet do have profound potential for good and can benefit communities greatly, what we're seeing is a strengthening of monopolistic powers which are essentially manipulating us into providing them with detailed information or recording of our entire lives while they take that data, filter out what can support the ruling class, and then uses it against us under the guise of modernization or while we slowly accept becoming commodities and walking billboards or advertisements. Our lives are being recorded, by our own doing, from the cradle to the grave in compliance with corporate power. We don't have to allow this as it doesn't serve us and is responsible for the slow degradation of our lives.



## alternatives

As a designer within the domain of technology we can be the forerunners in developing alternative futures which combine tools from the past and present that resonate with people in a non-extractive or exploitative way. The first step is for an education of the masses on how the dominant digital platform's code actually functions. That should be followed by a demand for complete transparency of the algorithms they are using. The urgency for a shift to a mindset which incentivizes this type of thinking is necessary when considering society's current relationship with digital communication.

With modern digital technology, it's possible to look outside of strict empiricism and utilize earlier technologies such as music, movement, and fashion to explore alternative ways of living. Technological advancements have brought us to a point where creators have the ability to do a lot more and more with less resources. By taking advantage of ephemeralization, which is the ability to do more with less due to technological advancements, we can use assets that were at one point inaccessible to the masses for developing resources and tools for a new age. Examples of ephemeralization are how computers have gone from taking up the entire space of rooms to now being able to fit into our pocket or accessing specific microcontrollers and electrical components is easier and cheaper than ever allowing us to create our own tools, services, and resources which in the past was exclusive to either government programs or the extremely wealthy. It's essential that we understand the ways in which knowledge can be derived and shared through sources alternative to what is considered meaningful, comprehensible, or logical through computers.



Anti-capitalist/consumerism street poster

## primary components

enhance

- enclosed personal space
- increases private energy of user

- private energy displaced in to corporate uniform
- sampling capability

- Group chem

- classic / traditional c

- reverses into conventional attire
- increases musician mobility

- reverses boredom

play	performance	• visual digital consumption	• cold logic
midi		• natural human movement/ gestures	• group connection
clothing		• obsoletes traditional instruments	• ensemble
		• subcultural creativity	• sound reproduction
		• retrieves memory	• clothing as thermal control
		• global energy of mask or	• topology

retrieve

or →

**obsolesce**

a wearable midi



# inspiration

stimulus

Carceral Capitalism

|

Jackie Wang

Dark Matters

|

Simone Brown

Mutual Aid

|

Dean Spade

Indigenous Circuits

|

Lisa Nakamura

On Bankers and Empire

|

Charisse Burden-Stelly

Race After Technology

|

Ruha Benjamin

Laboring Beyond Black  
Representation

|

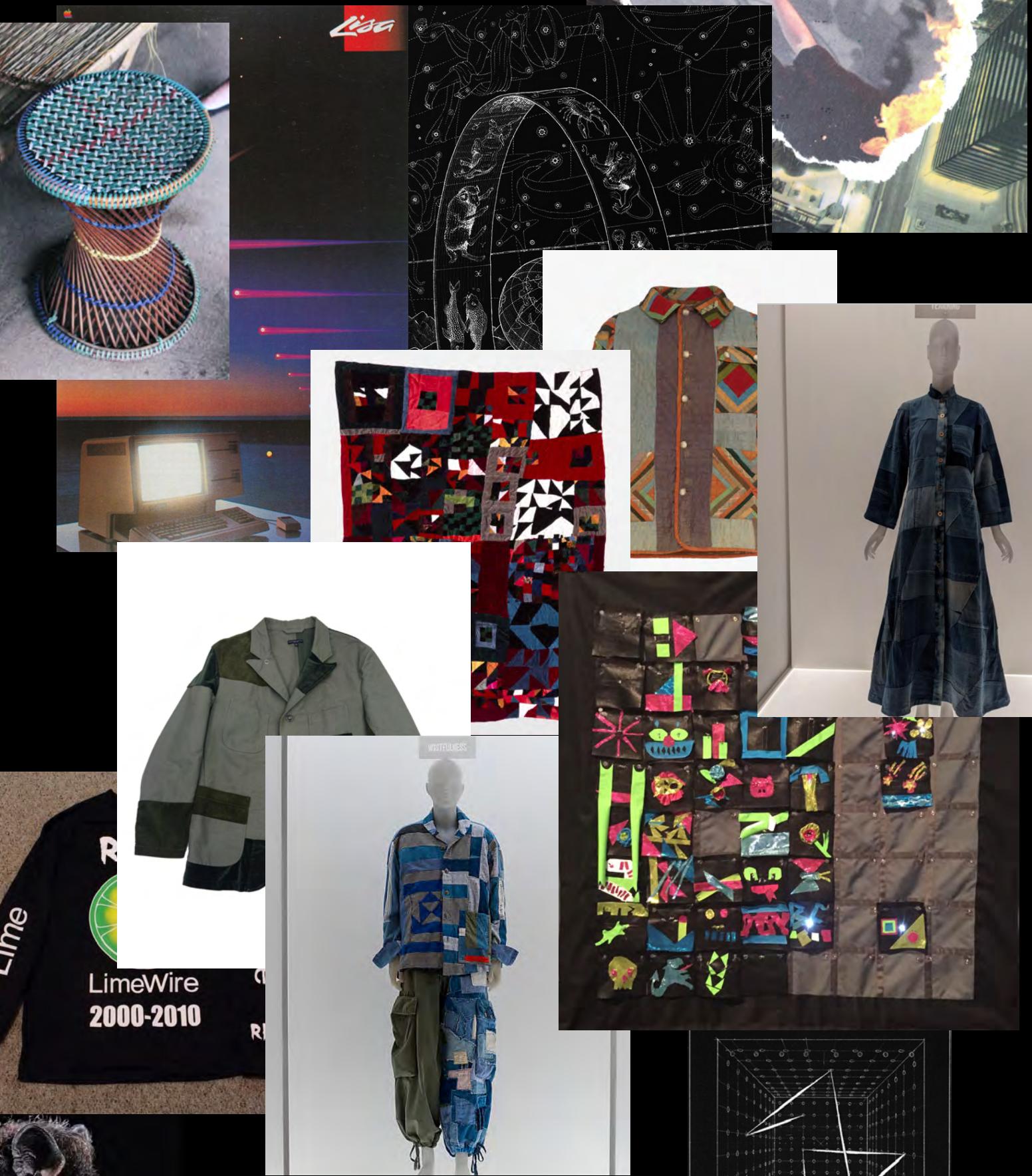
Too Black

How the Internet  
Happened

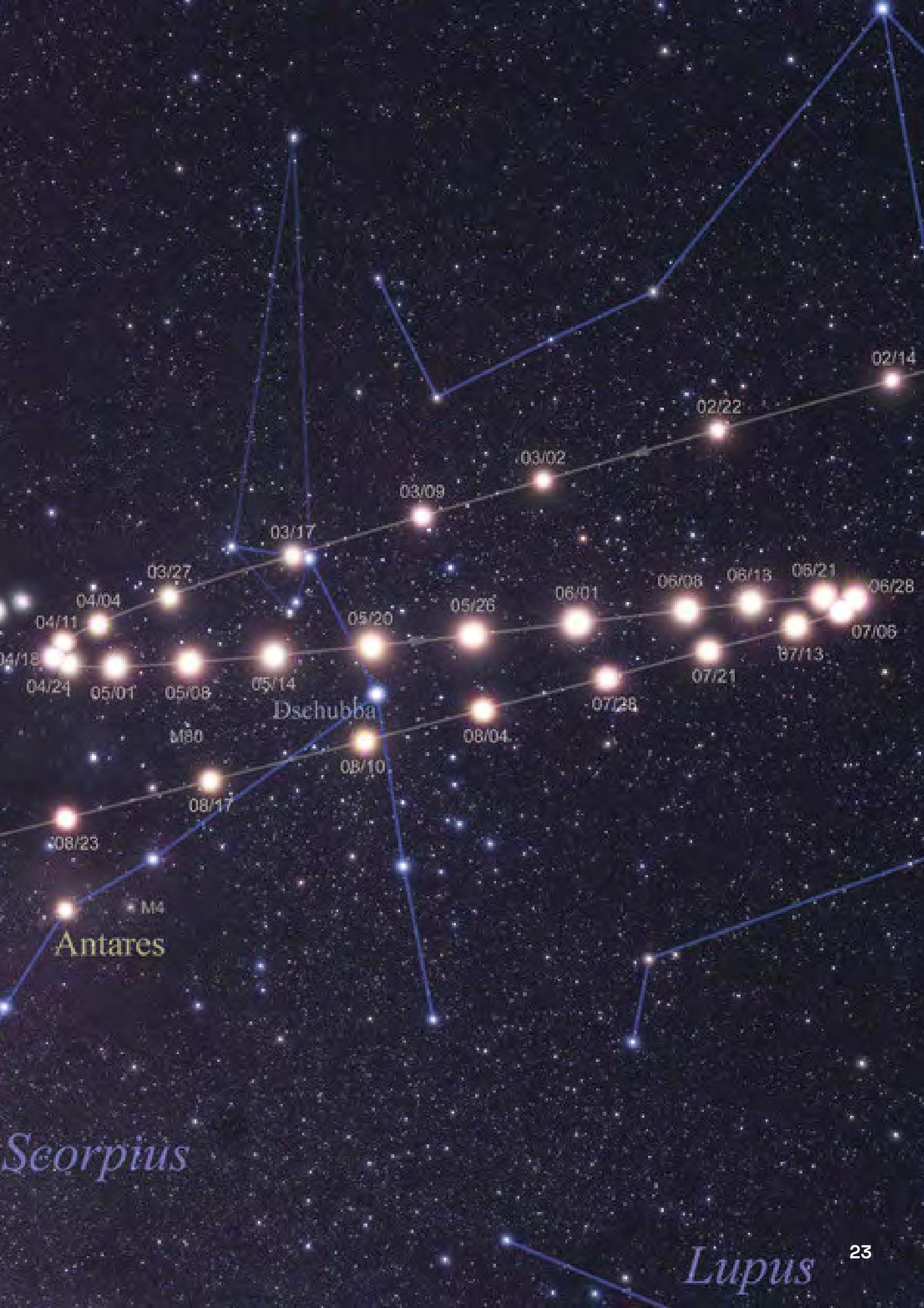
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Brian McCullough

# visions



LimeWire  
2000-2010



*Scorpius*

*Lupus*

# methodology

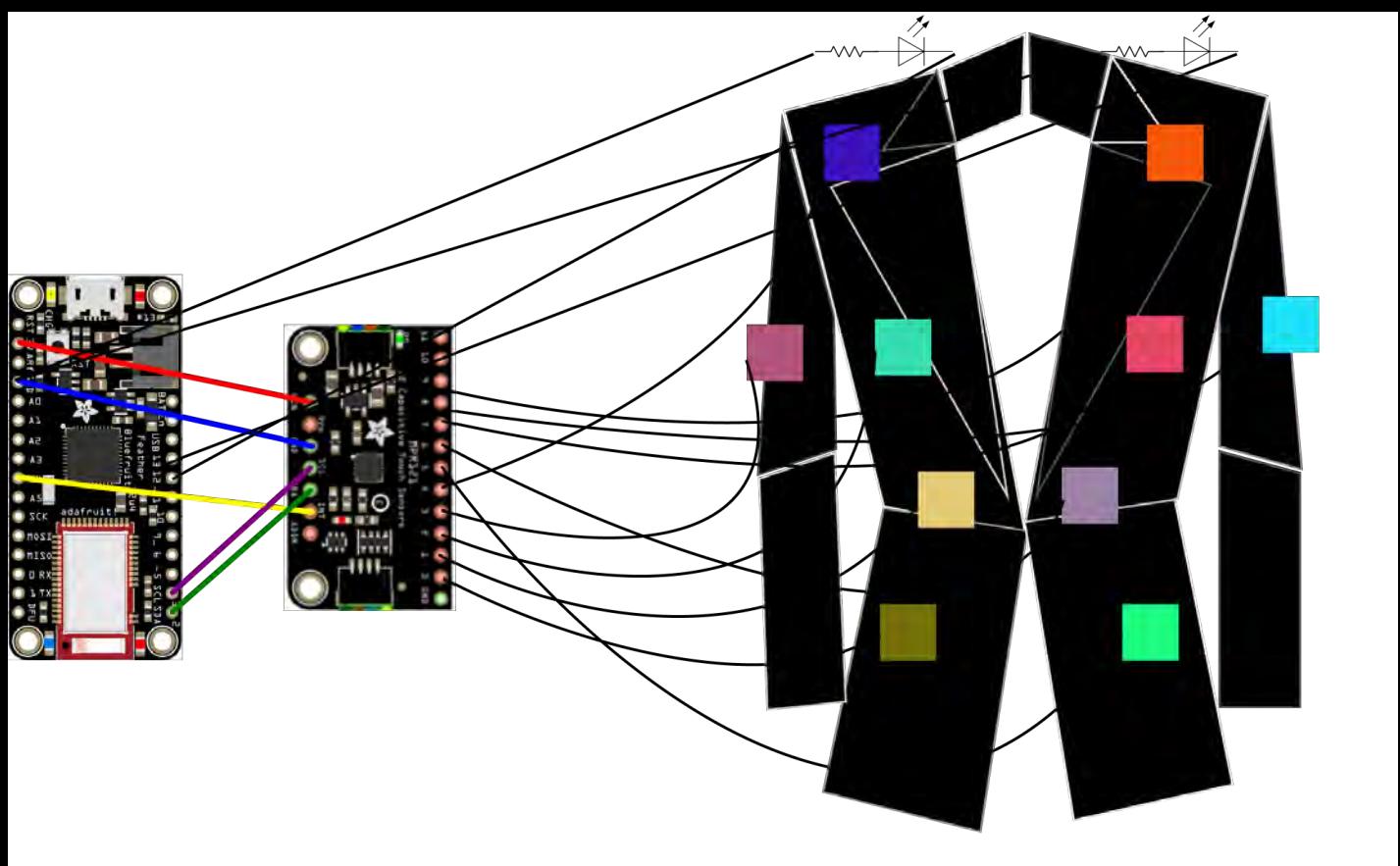
## prerequisites

- Light jacket that can be sewn into
- 10+ square light cotton fabric swatches
- Copper Taffeta Fabric
- Copper tape
- All purpose thread
- Optional: Karl Grimm Conductive Thread
- Solder iron + solder
- Silicone Cover Stranded-Core Wire - 50ft
- Masking tape
- 2+ NeoPixel RGBW LEDs
- Adafruit Feather 32u4 Bluefruit LE
- MPR121 Capacitive Touch Sensor
- 2500mAh Lipo battery
- Micro USB charging cable w/ data transfer
- Laptop w/ Bluetooth
- Arduino software
- LoopMIDI(this is for PC, Macs will use different software)
- MIDIBerry(this is for PC, Macs will use different software)
- Ableton Live 11 (any other DAW should also work)

## software

- Arduino
  - For this project you will need version 1.6+ of the Arduino IDE with the Adafruit Arduino Board Manager added to your preferences. There are many tutorials online which cover how to do this.
- Install Libraries
  - Adafruit MPR121
  - Adafruit BluefruitLE nRF51
- Install Adafruit AVR Boards
  - Arduino IDE > Tools > Boards > Boards Manager
  - Select Adafruit Feather 32u4 Board
  - Select correct Serial Port
- LoopMIDI (PC Exclusive Only)
  - This software is a virtual loopback MIDI cable for Windows machines 7, 10, and 11. You will need this in order to create virtual loopback MIDI-ports to interconnect applications on Windows that want to open hardware MIDI ports for communication.
- MIDIBerry (PC Exclusive Only)
  - MIDIBerry allows a Bluetooth device to send MIDI signals from INPUT to OUTPUT, between MIDI devices. This software is what will allow notes to be played in the DAW via the microcontroller. This must run after LoopMIDI has already started running.
- Ableton Live 11
  - In order to actually create music on one's computer you may need a DAW (Digital Audio Workstation). Ableton Live is designed to be an instrument for live performances as well as a tool for composing, recording, arranging, mixing, and mastering. It also allows beatmatching, crossfading, and a wide range of other effects. The jacket will be played through this software.

## circuit diagram



## wiring

The circuit diagram shared in the earlier section displays how the microcontroller and capacitive touch sensors should be wired into the clothing. Make sure that the microcontroller and touch sensor are wired and functioning correctly through tests before sewing them into the jacket. Otherwise you will either have to troubleshoot them attached to the jacket or remove them and re-sew.



Once you have securely sewn all of the necessary wires into the jacket, now cut a small hole within the square of where the patch will be and stick the wire through the hole from the inside of the jacket to the outside. Do this for each patch/wire combination. Once you have the head of each wire on the outside of the jacket use the copper tape to attach a small cutout square of copper taffeta fabric onto exposed wire. This will allow the capacitive touch sensor to recognize the copper taffeta as a touchpad.



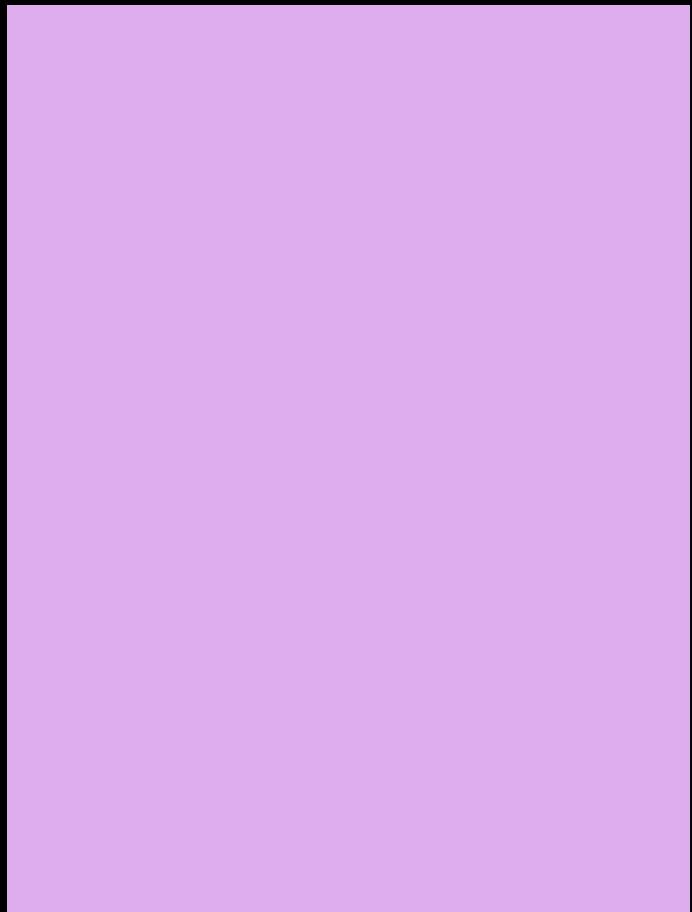
Depending on exactly where you sew in your microcontroller, you will need to make sure that your silicon wire is measured and is long enough to reach where you will be placing your patches. Because soldering on wires can be somewhat fragile, it is important that you handle with care and sew the wires into the jacket as well so that they aren't loose and at risk of potentially being ripped apart. Masking tape also comes in handy to ensure everything stays in place while being modified.

At this point you can now begin to sew your swatches onto each square which will cover the copper taffeta pads. The copper tape can be pulled off so make sure that it is firmly stuck to the wire before sewing. Ultimately where the squares are placed and what swatches to use is up to one's personal preference as long as everything is wired correctly.



## leds

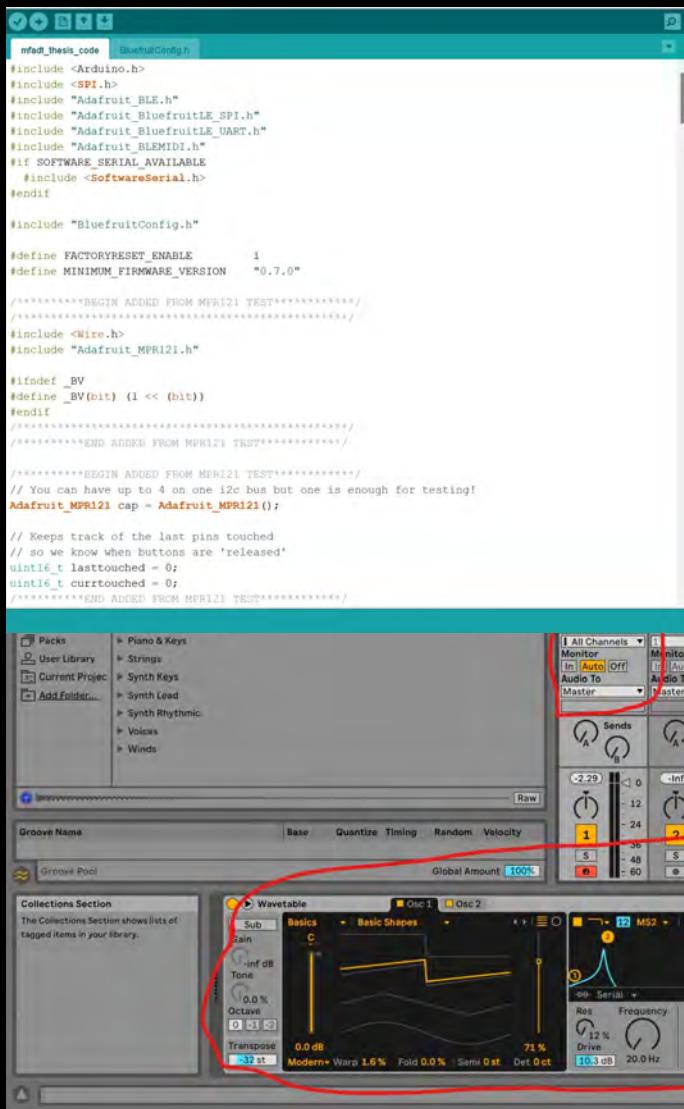
I've placed two LED on the center upper back of the jacket on the outside part of where the tag is. They are connected to two arbitrary digital/analog pins and ground. You can place your LEDs wherever you like as long as there is a resistor connected to ground as well. Also, I used NeoPixel RGBW LEDs but you can connect any LED of your choice. Depending on what note is triggered either the left or the right led will turn on.



## code

Access code on Github [here](#)

- [https://github.com/gabedeko/mfadt\\_thesis\\_code](https://github.com/gabedeko/mfadt_thesis_code)
- The notes range from C4 to B4 from sensor pin 0 to 8 while 5 is not used because the location on the jacket was not to be ideal for this iteration.
  - Sensor Pin 1 = Note: C4(middle C) | 60 | c' (Schloss-C)
  - Sensor Pin 2 = Note: D4 | 62 | d'
  - Sensor Pin 3 = Note: E4 | 64 | e'
  - Sensor Pin 4 = Note: F4 | 65 | d'
  - Sensor Pin 6 = Note: G4 | 67 | e'
  - Sensor Pin 7 = Note: A4 | 69 | d'
  - Sensor Pin 8 = Note: B4 | 71 | e'



```
mfadt_thesis_code  BluefruitConfig.h

#include <Arduino.h>
#include <SPI.h>
#include "Adafruit_BLE.h"
#include "Adafruit_BluefruitLE_SPI.h"
#include "Adafruit_BluefruitLE_UART.h"
#include "Adafruit_BLEMIDI.h"
#if SOFTWARE_SERIAL_AVAILABLE
#include <SoftwareSerial.h>
#endif

#include "BluefruitConfig.h"

#define FACTORYRESET_ENABLE      1
#define MINIMUM_FIRMWARE_VERSION "0.7.0"

/******BEGIN ADDED FROM MPR121 TEST*****/
// You can have up to 4 on one i2c bus but one is enough for testing!
Adafuit_MPR121 cap = Adafuit_MPR121();

// Keeps track of the last pins touched
// so we know when buttons are 'released'
uint8_t lasttouched = 0;
uint8_t currtouched = 0;
/******END ADDED FROM MPR121 TEST*****/


Packs
User Library
Current Project
Add Folder...
Groove Name
Groove Pool
Collections Section
The Collections Section shows lists of tagged items in your library.

Wavetable
Sub
Zain
-Inf dB
Tone
0.0% Octave
0 - 32 Transpose
32 32

Basics
Basic Shapes
C
0.0 dB
Modern Warp 1.6% Fold 0.0% Semi Oct Det Oct

OSC 1
OSC 2
MS2
OSR
Res 12% Drive 20.0 Hz
Frequency 103.0 dB
Frequency Res 60.1 Hz
Drive 8.62 dB

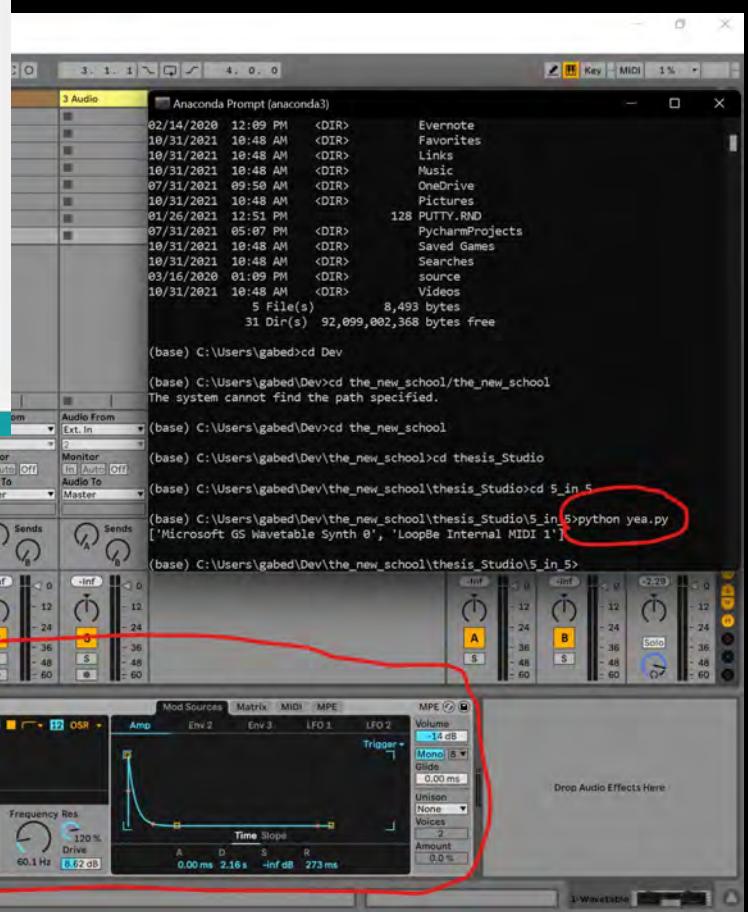
Mod Sources Matrix MIDI MPE
Amp Env 2 Env 3 LFO 1 LFO 2
Trigger Volume -14 dB
Mono 8 Glide 0.00 ms
Unison None
Unison Voices 2 Amount 0.0%
Time Steps 0.00 ms D 2.16 s -Inf dB R 273 ms
Drop Audio Effects Here
```

## roadblocks

Fortunately there weren't any large scale issues with the building process. Once the scope was understood and all of the necessary tools were in order things fell into place. Getting the Bluetooth the work correctly with the virtual loopback MIDI was tricky but made sense after a series of attempts. There is a specific order that the software should be ran in order for the Arduino code to function as expected.

## forward

For future iterations there could be improvements made with the overall sewing and stitching into the jacket. It was my first doing both so it was far from what it could have been given I had more experience. Adding different types of fabrics that could function as controls for mixing, crossfading and synthesizing would be nice as well.



# conclusion

The MIDI jacket works and I am happy with what I was able to accomplish within the given window of time. Going from no idea at all to having this somewhat complex physical object that fits in the space between the sartorial and technological which can be used to make music isn't something that happens often. I'm not sure if this type of project has ever been approached in a way similar to mine. I'm very curious to know how the unfamiliar may view and engage with the piece. I doubt I will ever sport the clothing casually on any given day partially because it's slightly small on me and the wiring is too fragile to handle everyday usage. Still, it works as a solid conceptual piece that serves as a proof of concept for myself if I am to ever iterate on the work.

There are fragments from each course that I've been a part of while in the program which lives in the project. I appreciate all of the professors who taught each class and exposed me to ideas and other forms of work that served as precedence. I'm conflicted about the length of the program as I love learning all there is to share and know but the assignment deadlines can be overwhelming even though I know there are long term benefits to the effort put in. To say that the past two years have been in extreme flux is an understatement. The entire program feels like it happened so fast and long ago at the same.

Where I'm at now is figuring out how this can be shared beyond the bounds of the academy and serve as an inspiration to those who do not have the same level of access as I do. The plan is to share it with a variety of different individuals and groups from all walks of life to get a feel of how it's received. I also like to believe that this isn't the last time I'll be attempting something of this nature.

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