Felt sentiments: The representation of invisible struggles through wearable sound

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ABSTRACT

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Through research-creation, this thesis presents imaginative perspectives from which critical stories about the “hidden Armenians” can be told and worn on the clothed body. These stories embed notions of Armenian collective memoires of cultural loss, and illustrate the complex relationship between cultural identity, oppression and expression, as they negotiate hidden political information to unveil unknown histories of suffering. These stories are materialized through textiles, which when enhanced with wearable technologies, become an archival interface that store tactile and acoustic material. In this project, tactility and sonification are used and intertwined to transform the clothed body into a space for cultural dialogue where narratives of social justice can be transmitted. As a result, alternative modes of cultural transmission are manifested by the marriage of the clothed body with fabric speaker technologies to elicit an emotional and immersive experience that accommodates representations of invisible struggles through wearable sound. Sound is employed to mitigate the tensions of visibility and to echo silenced voices, all the while amplifying the political struggle of the unheard to wider audiences. As such, this thesis postulates on the possibility of embedding a multilayered and non-linear system of meaning on the clothed body, further enhanced by wearable technologies, to create transcendental interpretations of wearable space. Seeking to inspire new questions and ideas on the different ways research-creation can engender alternative modes of cultural durability and transmission, through a practice-based and practice-led process, the corpus of work in this thesis evolved with an iterative design methodology that combed craft and technology as a creative process to interweave interactive storytelling and textile design.

Keywords: wearable sound, wearable technologies, electronic textiles, hidden Armenians, the leftovers of the sword, Armenian studies.

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DEDICATION

To all those who are living with stigmatized identities, held against their will, forcefully assimilated and discriminated on a daily basis.

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First of all, I extend thanks to my supervisor pk Langshaw for understanding the sensibilities involved in this project all the while granting me the creative freedom to steer my own boat and always encouraging me to use design as a tool to propagate poetic social justice. I would like to thank the members of my advisory committee; Chris Salter and Arpi Hamalian for their tremendous theoretical guidance - their input has been unquantifiable. It has been a privilege knowing and working with all three committee members.

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This research-creation project has brought me closer to understanding the complexities of my diasporic Armenian identity. It has broadened my mind to new definitions of being and becoming Armenian, and has allowed me to connect with diverse people from all walks of life all touched by this ongoing struggle.

I would like to express my heart-felt thanks to my extended family whose support has been pivotal to accomplishing this project. They all shared their genocidal histories with me and revisited painful memories. My parents deserve special thanks. My mother has been an incredible source of emotional and practical support for me whenever it was required especially in the last stretch of the creation part of the project.

In closing, I would like to thank my friends near and far who have each one in their own way contributed with their emotional support throughout the course of this masters.

“We are two sick nations: Armenians and Turks. The Armenians are suffering an enormous trauma in relation to the Turks who live through a major paranoia towards the Armenians. We are both a clinical case.... Who will heal us? Is it the decision of French or the US Senate? Who is our doctor to write the prescription? The Armenians are the Turks' and the Turks are the Armenians' doctor. There’s no other doctor or prescription. Our medicine is dialogue.”

Hrant Dink

The Leftovers of the Sword

All my life, I have been longing to open the folds that hid my secret, to tell this story…

This story is more than 100 years old, but it still goes on…
Since the Meds Yeghern[1] , we keep talking about the gone dead but we have neglected the remaining living.

In the place where I come from, the land tremors from below - all who live in it mourn secretly.
If you listen carefully, you will hear words of a long-forgotten language in complete silence.
You can see candles being lit and crosses drawn in the fields.
They say it's hard to find anyone without "impure blood" around here…

As the leftovers of the sword, we must hide even from our own kind for we are forgotten captives.

But…. I feel compelled to break this silence.

Yes…. We are still here, still bleeding…[2]

[1] Meds Yeghern means the "great crime", a term used by the Armenians to refer to the Armenian Genocide of 1915
[2] This poem is an extract from the research-creation *The Leftovers of the Sword*, written and narrated by Patil Tchilinguirian

INTRODUCTION

Context

Armenian culture flourished some 3000 years ago in the Armenian Highlands on the cusp of East and West. Armenia's geopolitical fault line has exposed Armenians to constant invasion, persecution and occupation. Ironically, these foreign invasions have contributed to forging a unique identity (Bournoutian, 2006). While there are some discernible cultural similarities with neighboring Iran, Georgia and Turkey, Armenians have managed to create a sense of alterity which lies at the heart of their cultural identity.

For centuries, textiles were deeply rooted in social, cultural, religious and domestic praxis of Armenian life. Passed on from one generation to another, from mothers to daughters, Armenian embroidery, lace making, needlework and carpet weaving have fashioned Armenian intangible cultural heritage (Poghosyan 2001; Breu & Ronald, 2002). However, in the early 20th century as an aftermath of the genocide, the textile tradition faced a decline (Breu & Ronald, 2002, p. 420), as Armenians inherited a broken heritage and a scattered nation.

The rich terrain of Armenian culture remains burdened with conflicted histories and demands new means of interpretation. History, religion, preservation of language and genocide denial are engraved in the cultural coding of Armenians; one of the few peoples from the era of antiquity who have survived to the present day. The notion of Armenian culture implies not just the culture of the Republic of Armenia, but that of the Armenian diaspora living outside of Armenia. The diaspora was formed as an aftermath of the Armenian Genocide, with its largest communities based in the United States, Russia, France, Argentina, Lebanon, Syria, Iran, Turkey, Canada, Greece and Australia. With less than one third of Armenians living in Armenia, the diaspora constitutes the majority of the Armenian population worldwide (Gorgorian, 2009).

Nevertheless, the Armenian diaspora did succeed in creating distinct cultural communities in their host countries through rituals such as churchgoing and language preservation. In the early phase of establishment, the struggle for survival stifled the representation of certain cultural specificities, knowledge systems and cultural expressions. Consequently, in this process, the minor arts such as textiles and rug weaving became neglected (Kouymjian, 2014).

For centuries, however, there has been a lack of a cohesive consensus on nationalist territorial claims, as the land that is now the Republic of Armenia constitutes only a small part of the

ancient lands of the Armenian people. Ongoing politics of cultural erasure have further stifled expressions of Armenian cultural histories and knowledge systems. With the establishment of the Republic of Turkey, the politics of genocide denial perpetuated the destruction of built heritage and social fabric, and eradicated the totality of centuries old cultural identity from the Armenian Highlands. At the same time, the aftermath of the genocide has "generated a melancholic yearning for a forgotten past, that, in turn, has generated conscious strategies of memorializing" (Moore-Cherry et al., 2007) which has become in effect the drive of diasporic cultural identity. In other words, Armenian cultural identity has been collapsed into the trauma of its past. As a result, cultural memory has been selective with political modes of memorialization.

In recent years, there has been a growing need to revisit repressed memories and reclaim new definitions of what constitutes a more global Armenian cultural identity, a century after the genocide. My research-creation project thus responds to this need through the interlacing of my personal stories with larger political narratives, in suspension between the present-day reality of genocide denial and the possible reality of future resolution.

Personal motivations

My grandmother often told me stories about her family and how they survived the Armenian Genocide. The story of her cousin from Konya, a village in Anatolia resonated with me the most. Saténig was kidnapped during the death marches by a Turkish corporal and then sold to a Kurdish family. She was forcefully converted to Islam and after hitting puberty, she was married off to her Kurdish step-brother. She had five children and lived as a "Posha"[3] in the desert of Derzor (Syria). About 40 years later after the Meds Yeghern, my grandmother's brother then living in Tripoli (Lebanon), went to look for other family members hoping to find those who had gotten lost in the genocide. While walking around Derzor, to his surprise, Giragos was greeted by a woman with tribal tattoos on her face, offering him a cup of coffee and refuge from the hot mid-day sun. There was something unusually familiar about this woman and yet she was a total stranger. As she was serving coffee, Giragos noticed the little strawberry birthmark she had on her wrist. His heart skipped a beat. Could it be his uncle's daughter Saténig? He refrained from

[3] Posha means Gypsy in Turkish

asking questions yet he was puzzled and needed to know the truth. As soon as Giragos found a fleeting moment alone with his host, he mumbled a few words in Armenian and the woman's eyes lit up. She wasn't able to respond in Armenian but she told him that was her mother tongue but that unfortunately she could no longer speak it. The two embraced one another and talked about their childhood and other family members. Saténig never wanted to leave Derzor despite Giragos's pleas. She didn't want to leave her adopted family who had taken such good care of her all those years and the thought of abandoning her children seemed unbearable.

After casting a wide net in the realm of Armenian culture, my research-creation journey brought me back to Saténig's story. Through historical research, I had discovered that Saténig's story wasn't singular. There were thousands of other similar testimonies. However, stumbling upon Fethiye Çetin's book and exploring the work of Hrant Dink gave me the incentive to dedicate my work to voices that have long been absent in Armenian transnational and diasporic narratives. Hence, my research seeks to revive and regenerate repressed stories of the genocide in "order to re-imagine new cultural, social and political meanings, so the past can positively inform the future" (Nickell, 2015; p. 236).

Furthermore, this research-creation project comes from a personal desire to feel woven into the fabric of the global world. In the wake of my resettlement in Canada, the process of up-rootedness and the search for identification and interaction, outside of my cultural milieu, led me on a path to deepen the understanding of my own cultural self. This feeling was also accompanied by a growing interest in the revival and rewriting of my stories and those of my people through textiles. The clothed body had already been a storytelling canvas for my design practice prior to joining Concordia University. Working with social justice approaches, my work was motivated by transnational, diasporic and political narratives shaped by cultural trauma. However, I wanted to delve deeper into academic research in order to study the complex relationships between identity, cultural loss, collective memory, and history within the contemporary know-how of new media technologies. As a socially-minded designer, I wanted to further develop culturally relevant wearables that combine contemporary and traditional knowledge along with artisanal practices coupled with wearable technologies to foster social engagement with the relatively unknown Armenian culture.

Thesis objectives and scope

This thesis grapples with finding imaginative perspectives from which stories can be told and worn on the clothed body. These stories embed notions of collective memoires of cultural loss, and illustrate the complex relationship between cultural identity, oppression and expression.

Further, they negotiate hidden political information to unveil unknown histories of suffering. These stories are materialized through textiles, which when enhanced with wearable technologies, become an archival interface that store tactile and acoustic material. In this project, tactility and sonification are used and intertwined to transform the clothed body into a space for cultural dialogue where narratives of social justice can be transmitted.

Furthermore, this project is an attempt to regenerate stigmatized facets of Armenian identity, culture and history, through design and the use of contemporary technologies. In this process, new insights and discursive possibilities emerge that represent different "visual, material, and spatial sources - that have not been effectively accommodated by" Armenian studies yet (Kenneally, 2014, p.50). As a result, alternative modes of cultural transmission are manifested by the marriage of the clothed body with fabric speaker technologies to elicit an embodied emotional experience. In this framing, the intimate relationship between the body and the cloth is augmented with sound that is triggered by the wearer. Sound is employed to mitigate the tensions of visibility and echo silenced voices, all the while amplifying the political struggle of the unheard to wider audiences.

In parallel, the focus of this thesis is also funneled by the quest to explore and regenerate intangible textile-based cultural heritage by using modern technologies that go beyond repurposing cultural content in digital format. The result of this overlap creates novel textile aesthetics, and at the same time, strengthens the cultural and poetic impact of textile traditions. In this project, I make use of fabric speaker technologies to bring innovation and modernity to textile technologies of the past. To this end, my work is guided by three research questions. Imbued with sonic agency, how can textiles evoke an embodied emotional experience? How can wearable technologies foster dialogue and transmission of culture? And how can research-creation contribute to Armenian studies?

The scope of this project is set within a framework of multidimensional research and a wide range of empirical investigations with critical, reflexive and iterative approaches that are practice-oriented with socio-cultural relevance. By asking what-if questions, my practice operates as an impetus to generate experiential learning opportunities. Since the core of my research methodology is designing by learning, it is what drives this research-creation to its completion.

Overview of chapters

In the first chapter of this thesis, I expand on the theoretical framework that supported this

research-creation. Placing historical memory at the center of the Armenian psyche, I explain the critical need for new interpretations of Armenian cultural identity and heritage. “Who are the hidden Armenians?” provides a contextual, historical, sociocultural and political overview of the aftermath of the Armenian Genocide, shedding light on the plight of the hidden Armenians. Next, I explore how these interpretations can be worn as wearable narratives on the clothed body. Using electronic textiles as an interface to deeply probe political engagement, this research-creation also dives into the material sensibilities of textiles and enhancing capabilities of wearable technologies. In this project, sound stimulates the representation of invisible voices unveiling an intimate safe space between the cloth and the body. Within the accommodation of cultural specificities, my motivation here is not to repurpose apparent characteristics of Armenian intangible cultural heritage in its current visual form. Having said that, the goal is to incite new questions, factual narratives and alternative methods for cultural durability and transmission.

In chapter two, I present my practice-based methodology which combed craft and technology as a creative process to interweave interactive storytelling and textile design. Moreover, in order to navigate the problem space brought forward by my research questions, I expand on two separate research-creation projects that were developed within the context of this Master for Design, as a precedent to the final work *The Leftovers of the Sword*.

In chapter three, I present in detail the diverse empirical investigations, material explorations and iterative prototyping, all the while, mitigating the dichotomies of working with traditional textile practices along with body responsive fabric speakers. Nevertheless, the marriage of concept, material, technique and process was accomplished through a series of experiments that offered experiential learning and informed the design process. Hence, the principal methodology employed in this research-creation is gathering information, designing by learning and doing, testing and evaluating. This cycle of iterative design process brought forward the acquisition of new skills such as garment construction, felting, electrical circuitry and wearable computing. These experiments evolved within a reflective framework that stimulated and stirred the practice towards its finished state.

Furthermore, I describe some of the challenges and successes that I encountered while prototyping, leading up to the final production of the sonic garment *Leftovers of the Sword*. Finally, the thesis concludes with reflections on the overall research-creation process.

CHAPTER 1: ALTERNATIVE INTERPRETATIONS OF ARMENIAN IDENTITY, CULTURE AND HISTORY

Who are the hidden Armenians?

Since the mid-2000s, around the yearly Armenian Genocide Remembrance day on the 24th of April, similar survival stories such as the aforementioned story of Saténig's, have continued to emerge in documentaries and articles. Formerly, these survival stories were told as one-off genocidal tales in the comfort of one's home through intergenerational interactions. Siblings and relatives, who were left behind in the death marches, had become Islamized distant kin that were lost along with ancestral territories post-genocide.

Up until recently, it was largely understood that Armenians around the world were divided into two groups: those living in the modern-day Republic of Armenia and those living in the diaspora (Örs & Komsuoğlu, 2007). For Armenians outside Turkey, time was frozen after 1915 and it was inconceivable to think there were Ottoman Armenians still living in their homeland (Hadjian, 2018). In reality, discrimination was a daily occurrence to surviving Armenian orphans, forcing them to hide their Armenian identity to flee from persecution (Hadjian, 2018). Furthermore, they were ordered to be fully immersed in Turkish culture, and prohibited from speaking the Armenian language at all times (Üngör, 2012). From 1915 onwards, the strict policies of assimilation to Turkishness ordered by the Young Turk government were rigorously implemented, and continue to be so until today.

In the diaspora and in Turkey alike, no one really knew whether Armenians in Anatolia were in the thousands or millions (Hadjian, 2018). While their exact number is still not clear, it is estimated that roughly 1 out of 3 Turkish people today have an Armenian grandmother. These Armenian Genocide survivors and their offspring have been assimilated into Turkishness, yet they are still recognized largely by the Turkish as "leftovers of the sword" or "converts" (Hadjian, 2018). Such so-called "hidden Armenians" constitute a very complex group of people with non-homogenous behaviors and attitudes towards their respective Armenian identities. While some are not aware of their origins, others intentionally hide their identity as a result of ongoing ethnic discrimination. Often, their hidden identity is revealed through word of mouth and storytelling in safe environments.

In the 1960s, expeditions to Syria and Eastern Turkey were quite common to search for relatives and compatriots by Armenians residing in the Middle East (Hadjian, 2018). However, most

converted Armenians refused any affiliation with “Armenianness” living in perpetual fear of the Turkish government. In fact, state-wide Islamization was orchestrated a few centuries before the genocide, and waves of conversion continued until the early 1980s. By then, Islamization had spread everywhere and the last batch of Anatolian Christian Armenians had fled either to Istanbul or overseas (Hadjian, 2018).

However, demographic data is scarce and population registry records have long been a state secret. Hence, the number of remaining Armenians in post-Ottoman Turkey is not known. By the same token, there isn’t a quantitative way to classify this diversified and complex population of secret Armenians (See Figures 1 and 2 below). Demographic research shows that during the genocide, around 100,000 Armenian orphans were forcibly Turkified, and that another 200,000 converted willfully to Islam in order to escape the mass killings and deportations (Bedrosyan, 2013). Since 1915, Turkey’s population has multiplied seven fold, and with forced conversions centuries before and after, demographers estimate the number of people with Armenian ancestry to reach several millions, far surpassing the present-day population of the Republic of Armenia (Bedrosyan, 2013).

Figure 1 (on the left): Local Christian resident in the village of Gomk in Sasun, Turkey in 2015. Photographer: Anahit Hayrapetyan for the New York Times

Figure 2 (on the right): The two wives of a Muslim Armenian man whose father was a survivor of the genocide. The woman on the left is Armenian, and the woman on the right is Kurdish. Photographer: Anahit Hayrapetyan for the New York Times.

Muslim Armenians juxtapose a new definition to the prevalent existing historical and traditional identity of Christian Armenians (Bedrosyan, 2013) and challenge the heretofore perception of Armenian national identity. Granted that one’s personal identity is always in a state of flux and acquisition, ironically in Turkey, “the identity of a citizen is a matter of national security” (Fisk,

2018). Perhaps this explains the assassination of Hrant Dink, an Armenian-Turkish journalist and founder of Agos, the only remaining Armenian newspaper in Istanbul. Dink was assassinated in 2007 after claiming that Kemal Atatürk's adoptive daughter Sabiha Gökçen was in fact a hidden Armenian orphan. Not only-but-also, in the early 2000s, Dink had already estimated the presence of about 2 million hidden Armenians in Turkey where the genocide is still not recognized (Hadjian, 2018). However, Dink's affirmations baffled the Turks as they were learning about the 1915 mass killings of the Armenians for the first time. Reactions of hatred cost Hrant Dink his life, but his death also engendered deep sympathy and solidarity with the Armenians. His legacy continues today as Agos steadily helps hidden Armenians to uncover their dark past and connect with their roots (Jones, 2015).

Alongside the influential Agos newspaper, Fethiye Çetin's book *My Grandmother: An Armenian-Turkish Memoir*, published in 2008, was ground-breaking as it exposed a wider range of Turks to their Armenian ancestry for the first time. Çetin recounts the story of her grandmother, who - after decades of hiding - revealed herself to be an Armenian survivor of the death marches with the name Heranush and not, as believed, a Turkish Muslim named Seher. This book caused a national wrangling over the prevalent perception of Turkish identity and mobilized civil society to dig deeper into their own ancestry.

That is also true for the Armenians who were confronted with a new layer of identity which deconstructed their centuries-old understanding of what constitutes Armenianness away from the Armenian Church. Today, Armenian communities worldwide are beginning to grasp the reality of the ongoing existence of the millions of women and men who are still living as hidden Armenians in Turkey. Most of the research shows that the remaining Ottoman Armenians in Anatolia deal with their heritage in very different ways. The reception from Armenian and Muslim communities has been equally diverse (Aghjayan, 2015). However, Armenian scholars have been instrumental in reaching out to hidden Armenian communities spread around in Anatolia. The Armenian Weekly is one of the few publications that documents the scholars' experiences in Western Turkey and maps out the diasporic interactions, inquiries and searches of hidden Armenians. Other organizations such as the Armenian DNA Project have been focusing on the importance of genetic testing as a tool for diasporic Armenians to research their family history and connect with their ancestry in Anatolia.

New possibilities for Armenian cultural histories

During the years of Soviet rule, the Armenians in the Republic of Armenia, were isolated from

those in the diaspora. As time followed, this isolation generated a cultural dichotomy between Armenians in the Republic of Armenia and those in the diaspora. In fact, linguistic specificities, knowledge systems, traditions and cultural expressions vary greatly between the two groups of Armenians. However, since Armenia's independence, the diaspora has continuously sought to build bridges between their countries of residence and their country of origin. Several birthright programs have facilitated the repatriation of diasporic Armenians back to the Republic of Armenia. Furthermore, in the last decade, Armenia has been a developing country due to an exponential rise of large scale economic, social, and cultural projects undertaken by skilled diasporic Armenian entrepreneurs, businessmen, and educators.

The unexpected discovery of a third large demographic of Muslim Armenians has been difficult to digest for a global Armenian community already grappling with so many past traumas. However, in recent years, stories about hidden Armenians have been echoed in transnational Armenian political discourses. Awareness of the other is bringing all groups of Armenians together and regenerating the need for new definitions of Armenian cultural identity and heritage. Despite the inherited trauma of the 20th century, Armenians now find themselves in a process of reconciliation and globalization.

However, globalization is a double-edged sword as it exerts contrasting transformational forces on culture. On the one hand, globalization implies a homogenization process that blurs and dilutes local and ethnic cultures (Brumann & Cox, 2009; Greru & Kalkreuter, 2017; p. 139). On the other hand, globalization thrives on cultural diversity and generates a need for the revival and preservation of intangible cultural heritage (Labadi, Log, 2010; Greru & Kalkreuter, 2017). Since 2003, the UNESCO Convention for the Safeguarding of Intangible Cultural Heritage (ICH) has been advocating for the importance of preserving all kinds of intangible cultural heritage worldwide, to which textile arts belong to. UNESCO defined ICH as living culture in the form of "[…] practices, representation, expression, knowledge, skills […]" with a focus on formation of identity (UNESCO, 2003; Greru & Kalkreuter, 2017; p. 138).

Further, it can be argued that UNESCO's declaration postulated that arts, crafts and design constitute a key component in the formation of intangible cultural heritage and its safeguarding. Moreover, design is being perceived as a "mediator for revival and continuity of tradition" (Maldini 2014; Greru & Kalkreuter, 2017). The assimilation of ethnic practices with contemporary design, engenders novel artistic production, material culture and new media technologies. In this process, design is uniquely positioned to generate new possibilities for artisanal cultural practices and manufacturing expertise, by bridging ethnic technical know-how with global fields of knowledge and technological advancement.

Against this backdrop, it could be said that design has the power to revitalize and creatively push the boundaries of Armenian cultural identity and heritage expression through interdisciplinary and innovative forms of cultural production. Additionally, design brings the focus back to the mending of a wounded past, by offering narratives of social justice and ensuring cultural durability at the same time. Hence, this thesis posits that design can contextualize narratives on the clothed body to add a material dimension to the process of storytelling and sense-making. Activated by touch and gaze, textiles possess an enigmatic quality that embeds complex layers of symbolism, that are further stimulated once worn on the body.

When textiles are enhanced with wearable technologies, they augment the body as an intelligent communication device with infinite possibility (Pailles-Friedman, 2016). As Berzowska suggests "smart textiles and wearable technology are a form of twenty-first century archive corresponding to the human need to preserve the past" (Berzowska, 2013). Hence, surpassing traditional fabrics, smart fabrics have reactive functionalities that are capable of communicating visual, auditory, tactile, haptic and olfactory experiences.

The commemorative characteristics of textiles

The clothed body being the canvas of my investigation is chosen carefully because of its subtle ability to exhibit constructed notions of social identities. Textiles articulate "meaningful form" and "make the body culturally visible" (Luccioni 1983; Silverman 1986; Ryan, 2014). As per Ryan, discussion about textiles providing "cultural visibility" is apparent in the work of many scholars including Kaja Silverman and Walter Benjamin. However, Eugénie Lemoine-Luccioni was the first to claim that "clothing and other kinds of ornamentation make the human body culturally visible" (Ryan, 2014). In other words, we have developed complex relationships with our clothed bodies. Through touching, wearing and looking, textiles evoke embodied emotional and mnemonic experiences. Once the body and the cloth are in proximity, they interact to encode sociocultural meaning (DeLong, 1998).

Cultural identity is expressed through fabric embedded with motifs, patterns, meanings and concepts. Since ancient times, textiles have been deeply rooted within the domain of the personal and the political, reflecting societies, traditions, rituals, and religious mores. Distinct cultural fingerprints have developed to render the body instantly perceptible as an adherent of a certain society or religious faith. For an example, in Islam, the hijab is used as a piece of fabric to spiritualize the female body. These meaningful mobilizations heighten the invisible or "sublime negotiations" (Carroll, 2017; p.196) that occur through fabrics in dependence with material culture, political, and religious beliefs and the areas of the body they cover. As per Carroll, fabric

is “both material and immaterial; it both covers and masks and – while doing so – reveals” (Carroll, 2017; p. 206).

Moreover, Carroll posits that fabric has spiritual affordances that situate fiber materials in a “sensible space”. Shaped by the architectural form, Carroll believes that textiles have the ability to create intimate and “sacred spaces” (Carroll, 2017; p.206). In my work, the “sublime” is hidden yet audible, considering the “sacred space” as a safe space through which hidden identities can be negotiated and commemorated. The subtle articulation of these invisible negotiations depend greatly on the communicative capabilities of textiles. In *The Fashion System*, Barthes (1983) views “fashion functions as a communication system” and textiles operating as “cultural signifiers” (Barthes, 1983; Andrew, 2008 p 36). In this research-creation project, Barthes’ view of textiles as signifier aligns with more sensorial inquiries, including:

- Visual properties (Armenian-Turkish symbols, imagery and decorative motifs that have a specific meaning, or relate to unique cultural knowledge systems).
- Colors, textures, or patterns that evoke an Armenian cultural experience in the wearer and viewer.
- Tactile qualities of fabric and the meanings and emotions they can carry within, which are perceptible by touch and gaze.
- Wearable fabric speaker technologies that synthesize sound and transform the body into a space for cultural dialogue.

The communicative potential of textiles is expanded in *Fashion as Communication*, as Barnard highlights the “visual evidence of the part of clothing that plays in the legitimization of a social order” (Barnard, 1996; p.109). The social context of fabrics is further articulated by Nickell, who talks about “the language of cloth” as being a good vehicle to address “fragmented societies and nations” through “holes, tears, seams, patches, layers, mending, darning, joining, fraying, ripping – all ways to visualize and articulate the fabric of society” (Nickell, 2015; p.236). In addition, Nickell posits that textiles have been used over time and across nations, as a medium in their own right, for storytelling, social commentary, and commemoration (Nickell, 2015).

These concepts of the social-material-linguistic context of cloth provide one set of theoretical frameworks for the artistic work described in the thesis. Specifically, I address the modality of constructing specific emotional scenarios that can contextualize stories on the clothed body using textiles as an archival interface. In this instance, smart textiles offer new pockets of imagination through materiality, corporeality and sensorial engagement to amplify the political power of the personal realm in the form of oral histories as “semiotic texts to be read and deciphered” (Lerpiniere, 2013; p.28).

From a theoretical perspective, this research-creation is interlaced in fashion theory and the discourse of embodied interaction design represented through human garment interactions (HGI); a term proposed by Tomico and Wilde as a counterpart to Human Computer Interactions (HCI), which encapsulates "the design of interfaces, the way humans interact with technology, and user experience, into the realm of garments" (Tomico and Wilde, 2016, p. 3). The dynamism of wearables is disruptive to traditional and normative perspectives of fashion, as insofar it engenders unanticipated levels of stimuli, creating heightened sociocultural interactive experiences while augmenting the clothed body.

In this thesis, I focus on fashionable wearables as the field of my research interests and anticipated outcomes. Much more than fashion, "fashionable wearables", a term coined by Sabine Seymour, are textile-based body adornments amplified with wearable technologies (Seymour, 2008, p. 12). Fashionable wearables offer limitless possibilities of embodied interactions conveying affective data (Joseph et al., 2017). Additionally, wearable technologies entail computational input, electrical circuitry, sensors and wireless communication that transform the body into an interactive interface that can emit sound (Seymour, 2008, p. 15).

Moreover, McLuhan posits that today's "electric age ushers us into a world we live and breathe and listen with the entire epidermis" (McLuhan, 1995, p. 122). To that effect, wearable technologies intertwine the digital, the physical, the real, the constructed and the augmented (Gandy, Baker, & Zeagler, 2017, p. 116). Undoubtedly, the consequences of these technological applications refashion the process of cultural identity construction through multisensory experience. Furthermore, McLuhan's observation also points to the escalating convergence zone where the design process must take into account the socio-cultural functions of wearable technologies, as well as the socio-cultural functions of dynamic textiles (Buechley et al., 2008; Devendorf et al., 2016; Dunne et al., 2014).

To an extent, wearable technologies are still in their infancy and currently a field in development. In fact, the far-reaching applications of wearable technologies and their socio-cultural performance and impact largely remain to be explored. At the same time, as mentioned above, Armenian art studies are equally a field under construction and Armenian textile heritage is in perpetual decline. Furthermore, there is no extensive body of Armenian contemporary design that can act as a point of reference for the integration of traditional cultural information with modern technologies. Therefore, my research-creation project attempts to address this evident gap with culturally-driven and textile-based design thinking and practice.

The representation of invisible struggles through sound

Sound artist and theorist Brandon LaBelle asks whether, in a world that is predominantly textual and visual, sound can lend itself to contemporary struggles and political action (LaBelle, 2018). The public sphere is habitually experienced and understood in relation to perceptibility. Indeed, "whereas eyes can be closed, shutting out unwanted sights, ears have no lids" echoes Francis Dyson (Dyson, 2009; p.3). The sensorial ubiquity of sound makes it physically and emotionally pervasive, engendering affective experiences. Seen from this perspective, listening becomes somehow a surrounding imposition, and can take on various roles tuning us into delicate subject matters. In recent years, sonic practices have taken on emancipatory functions of storytelling in research and artistic production engaging with issues of citizenship, representation and transnational dialogues (LaBelle, 2018). For an example, LaBelle posits a sonic means of imagination that has the ability to negotiate inclusive spaces to amplify the conflated personal and political in more radical ways. Further, he postulates that sound is a critical base to address political conflict "exceeding arenas of visibility by relating us to the unseen, the non-represented or the not-yet-apparent" (LaBelle, 2018; p.2).

Such a departure highlights the role that the acoustic can play in revealing that which is visibly hidden. In light of this theoretical background, my research seeks to examine how sonic textiles can act as both a medium and an environment articulating truths otherwise not apparent or visible to the eyes. The invisibility of sound creates a space for listening with the ability to echo the voices of invisible demographics such as the hidden Armenians. Paired with the textile interface, on the one hand, sound creates a safe "space of appearance" (Arendt, 1958; p.199) for these identities to be represented, while on the other, it connects the individual to the hidden collective in total immersion. This results into a shift from "looking at to being in", an enveloping space where emotional borders are created virtually "no longer bound to here and now of lived experience" (Dyson, 2009; p.136). Sonic material does not intend to recreate the past per se, but surpasses time by bringing intangible elements from both the past and present to offer an immersive experience disseminating a "truth supposedly understood beyond language" (Dyson, 2009; p.8). Hence, sound provides transcendental interpretations of shared space, dialogical exchange and mediation forging new relationships and discourses.

Sound was de-territorialized for the first time with the invention of the phonograph and the tape recorder (Cox, 2009). Instead of delivering "articulate sound", Cox states that the phonograph "transmits acoustic events as such, the spectrum of noise" (Cox, 2009; p.23). Similar to the phonograph, fabric speakers perform "a sort of trompe l'oreille" with a spectrum of noise (Cox, 2009; p.23). The phonographic properties of the low-fidelity fabric speaker technology do not

articulate accurate sound but a small range of frequencies that are audible, yet lean moreover towards the corporeal with a new texture supplementing the existing materiality of the felted wearable. This “spectrum of noise”, particular to the fabric speakers, is chosen for its conceptual merit to artistically highlight the intertwined and often jumbled identities of hidden Armenians.

CHAPTER 2: RESEARCH METHODOLOGIES

This thesis is inscribed within the methodological framework of research-creation. This approach "combines creative and academic research practices, and supports the development of knowledge and innovation through artistic expression, scholarly investigation, and experimentation. The creation process is situated within the research activity and produces critically informed work in a variety of media (art forms)" (Social sciences and humanities research council, 2019). By using this definition, my work can be categorized as *research through design* (Cross, 2001). This approach operates "as a form of systematic inquiry performed with the goal of generating knowledge" (Bonsiepe, 2007; p 27), "from the perspective of designability (and changeability) and thus arrives at new ideas" (Schneider, 2007; p 215).

Through a practice-based and practice-led process, the corpus of work in this thesis involved generating alternative knowledge that is both culturally-driven and socially-engaged. The work at the heart of the thesis entitled *The Leftovers of the Sword* was naturally inspired from traditional fashion design processes. Hence, an iterative design methodology emerged to orchestrate the marriage of the clothed body with wearable technologies. To activate the interplay between the latter and Armenian culture, I began the design process by gathering information. Knowledge produced was thoroughly assessed, evaluated, and "understood through and in relation to the practice" in an ongoing reflective conversation (Stead, 2005; p.4). In turn, practice brought intrinsic knowledge and insight to the problem-solving space, meaning that every experiment was carefully planned and carried out with conceptual, aesthetic, and technical objectives, and finally evaluated through a specific set of design criteria depending on the task at hand. These criteria juxtaposed the aforementioned experiment goals with more practical factors such as skills, collaboration, time and budget. Finally, the new knowledge gained was integrated accordingly, prompting either a return back to ideation and research, or a transition to the next series of experiments.

Using textiles as an interface to mediate a sonic experience entails the use of wearable technologies, particularly those involving the diffusion of sound through flexible speaker components. Nevertheless, these technologies are still in their infancy and do not fully comply to the material specificities of textiles. Therefore, the iterative approach adopted in this thesis used existing technology to hone the interlacing of traditional textile practices with fabric speakers, and at the same time, exposed theoretical and conceptual considerations to be addressed during the design process according to what's technically possible. As such, I found myself in a

constant process of reframing the setting of the problem while also reflecting on the various multidisciplinary ways to approach it (Schon, 1982). Reflection throughout the prototyping process progressed into further practical investigations until the final desired outcome was reached. An overview of this iterative methodology is illustrated in the diagram below. (see Figure 3).

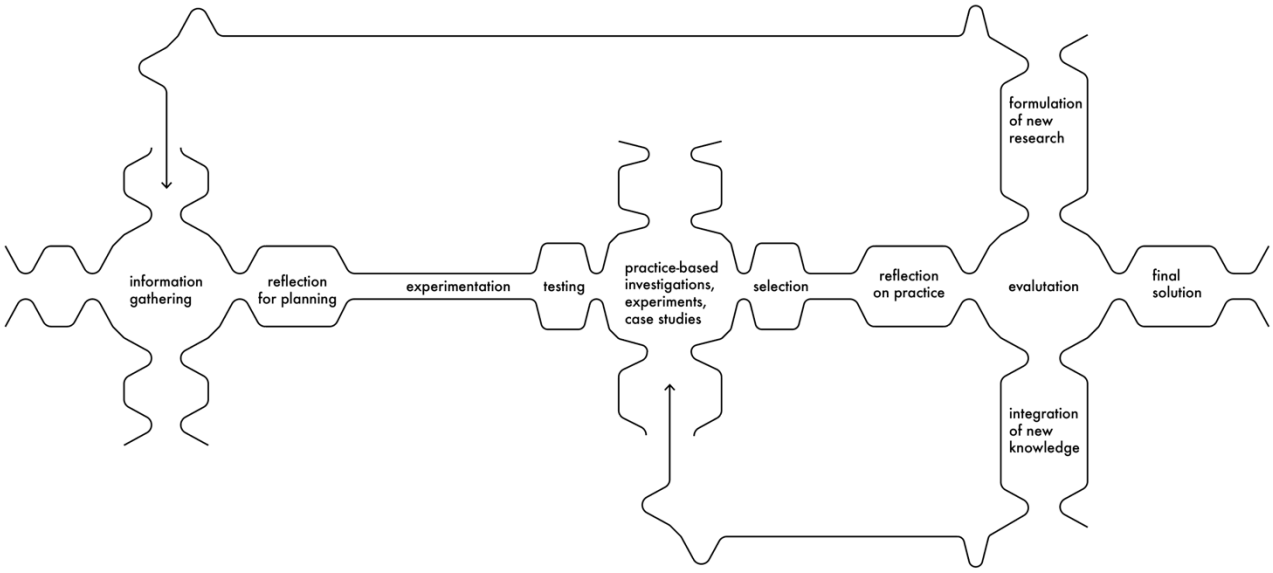


Figure 3 Iterative Design Methodology adapted from Stead's model of macro and micro views of design-oriented research (Stead, 2005) The graphics in this diagram are extracted from the design of the motif of the fabric speakers embroidered on the final sonic garment.

This proposed methodology was further divided into two main phases. The first phase entailed navigating a wide range of research questions and their respective problem spaces, to formulate a thorough understanding of Armenian cultural identity. This phase fostered the design and development of two separate research-creation projects. These projects are expanded in the section "Research-creation for exploring new modes of cultural transmission". Several applied methods such as brainstorming, literature review, exploratory research, iterative prototyping, and critical design approaches were utilized in these projects. Finally, the knowledge produced from these projects was later integrated in the final project.

The second phase incorporates the project at the heart of this thesis entitled *The Leftovers of the Sword*. Due to the interdisciplinary research scope and technical nature of this research-creation,

"critical making" (Ratto, 2011) was the chosen method that drove the work to its completion. "Critical making" interweaves the material and conceptual during the process of making, and therefore connects the theoretical with "physical making, goal-based work" (Ratto; 2011; p. 253). Hence, in this thesis "critical making" cultivated a language of embodiment and channeled social reflection and commentary into the finished work (Ratto; 2011; p.253).

Alongside "critical making", a sociomaterial approach of storytelling drove the design and development of the tactile and acoustic experience. I expand upon this process in the subchapter "Interweaving narrative analysis and material research". Narrative elements from Fethiye Çetin's (Çetin, 2012) novel entitled *My grandmother: An Armenian-Turkish memoir* – whereby the Turkish author unveils her grandmother's hidden Armenian identity – were carefully selected and curated to chronicle the social phenomena of the hidden Armenians.

Lastly, "Critical making and experiential iterative prototyping" describes the philosophy of learning by doing which was the guiding principle behind the creation process of the final work. Designing by learning accompanied all stages of this project. On the one hand, it procured an acquisition of new technical skills, and on the other, it advanced the practice along until the final outcome was achieved.

Research-creation for exploring new modes of cultural transmission

Stimulated first by a series of broad research questions, my aim is to investigate the design space where the regeneration of Armenian cultural heritage and histories, both in their tangible and intangible forms, are materialized through the synergy of emotional design and textile-based practice with social justice approaches. These questions are answered in the form of two distinct projects undertaken throughout the first year of the Master of Design program. Thereby, I researched alternative modes of creating cultural information to examine and generate new interpretations of transnational and diasporic Armenian issues. Despite the fact that these projects do not constitute the final outcome of this thesis per se, the conceptual, aesthetic, and technical knowledge produced were transferred in various forms into the final work entitled *The Leftovers of the Sword.*

My initial explorations delved into gathering patterns of knowledge that capture as Bateson puts it best, "the stuff of culture, or the bits of culture, or the feel of culture" (Bateson, 1987, p. 84). This exploration of Armenian culture is elaborated below in the first project *The Armenian Culture Kit.*

Research-creation project 1: The Armenian Culture Kit

Initially inspired by NASA's Voyager Golden Records project and its curatorial representation of culture, *The Armenian Culture Kit* became the first design space of investigation where I set out to explore meaning-making processes that can embed Armenian symbolic thought, tangible poetics and sociocultural experience. The purpose of *The Armenian Culture Kit* is to encapsulate significant Armenian values, beliefs, behaviors, historical, social and cultural practices that can enable and reenact an Armenian cultural experience. Furthermore, the kit operates as a medium for weaving various thematic threads inquiring how diasporic Armenians inhabit their Armenian identity in the age of globalization (Panossian, 2002).

An essential part of experiencing the kit is the private, intimate act of opening the box, examining the different items within, all the while being guided along by brief instructions. The kit contains a series of informative cards, symbolic objects, a book, and a USB flash drive, that materialize notions of Armenian transnational identity spanning from geopolitical histories to various types of intangible cultural heritage expression such as food, music, dance, opera, ballet and art.

Furthermore, the book entitled *Hishatakaran* is a pastiche of Armenian literature (poems and proverbs), mythology (myth of origin, legends, gods, and heroes), history and geography. This assortment is curated with multiple purposes in mind. On the one hand, it enables diasporic Armenians to revisit their past factually and objectively, while at the same time, familiarizing non-Armenians with the history of a scattered nation (Bournoutian, 2006). On the other hand, *The Armenian Culture Kit* is a means to document collective cultural memoirs and diverse moments in history by juxtaposing factual narratives with physical objects to instigate prevalent Armenian beliefs, memories, and practices.

Nevertheless, the kit is a Fluxus-inspired tool that offers whoever come across it, the possibility to become author-participants. Operating from a standpoint which considers national and cultural identity always "in flux, dynamic and evolving" (Panossian, 2002; p.123), the loose instructions found in the box, encourage people to intervene, build on, reassemble, and conversely to reconfigure it partially or entirely as they see fit (See Figure 4 below).

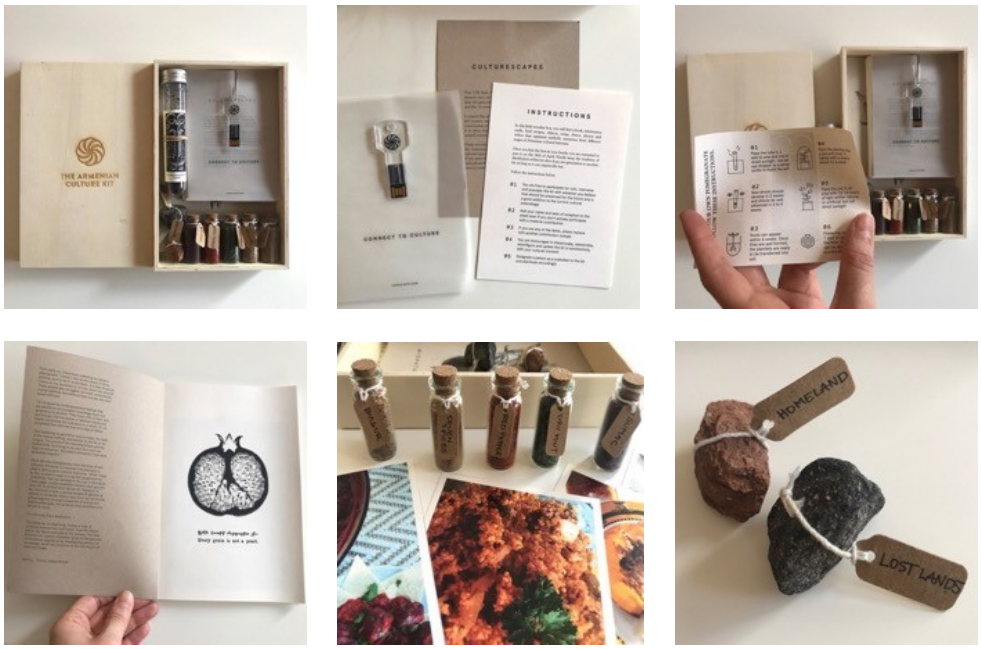


Figure 4 The Armenian Culture Kit (Instructions and culturescapes ,Hishatakaran: the book, instructions on how to plant a pomegranate tree spices and recipes, Armenian geopolitical dilemma: homeland vs. lost lands)

The difficulty here lied in creating a tangible kit that would translate tacit knowledge of Armenian cultural histories into a tangible experience, without making any exhaustive or significant historical claims. Furthermore, the physical props were designed as a compilation of tools that could mediate an Armenian cultural experience. All the while, I was aware that any kind of depiction or representation I would choose would still contain "deliberate omissions, purposeful obfuscations, or accidental occlusions" (Sayers, 2015; p.159). The opposite was also equally true; whatever inclusions, enthusiastic descriptions or intended magnifications I would adopt would be critical in shaping *The Armenian Culture Kit*. However, I intended these absences or presences to act as meaning-making processes that personalize the kit instead. At the same time, these nuances were to grant a certain kind of agency to others to fill in the existing gaps in their own ways.

As such, *The Armenian Culture Kit* negotiated symbolic meaning onto material and physical objects. By doing so, it helped "contextualize the past in the present" informing future design practices" (Sayers, 2015; p. 167). Furthermore, through this project, I was able to identify the underlying knowledge systems and visual languages of Armenian cultural heritage, and I sought to produce translatable modes of cultural transmission and engagement.

Research-creation project 2: Armenian Spatial Imaginaries

This second research-creation project stitches together geographical imaginaries that provide social commentary on the complex relationship of transnational Armenians with their inherited geopolitical dilemma. Using design fictions, alternative spatial narratives are conjectured in suspension between the present-day reality of genocide denial and the possible reality of a future political resolution.

In the diaspora, the experience of the homeland is dissociated from the physicality of the lost territories and the present-day Republic of Armenia. Furthermore, the experience of Armenian spatiality and sense of place resorts to a virtual place that is culturally coded with nostalgic views of mountains, rocky terrains, churches and rural areas. These landscapes have been imprinted as a typical portrayal of the Armenian homeland in the collective transnational consciousness.

Concerned with the modalities of "critical thought translated into materiality" (Dunne & Raby, 2013; p.35), this project explores ways in which thought can be translated into thread to convey emotional and spatial knowledge. My research of textile practices is driven not only by embroidery techniques that can convey Armenian spatiality, but also by an underlying interest in Armenian textile heritage and symbolism. The following research questions delineate the design problem space: How then could embroidery create a multi-layered Armenian sense of place beyond geographical coordinates? How could the material act of stitching delineate the entanglement of cultural landscapes with geospatial borders?

I attempted to answer these questions in my practice in a form of a spatial continuum that represents the virtual place wherein laid the transnational Armenian homeland. Through embroidery, this work coalesces Armenian spatiality with critical materiality from what Ness and later Guattari call an "ecosophic" perspective. As per Guattari's definition, ecosophy is manifested in an "ethico-political articulation of the three ecological registers (the environment, social relations and human subjectivity)" (Guattari, 2005). Hence, to imagine an Armenian sense of place, I conducted a thorough visual research of various Armenian landscapes. I analyzed the recurrent territorial characteristics in juxtaposition with the idyllic and nostalgic views of transnational Armenian spatiality. To further anchor my subjectivity as a member of the transnational Armenian diaspora, I visualized the panoramic landscape through pictures I had taken during my travels. Consequently, the spatial continuum originated from my own lens through a collage of several pictures from various geographies. (See Figure 5)

Figure 5 A picture of the embroidered landscape construction

As such, “Armenian spatial imaginaries” are literally stitched together to form a complex web of tangible Armenian landscapes to make an abstract geopolitical statement. Embroidery opens up a “new dimension in the understanding of the interface between abstract and embodied knowledge, through the exploration of the relation between line and thread” (Pajaczkowska, 2015; p.20). Thought as thread transforms lines into meaning and materializes different forms of relational, emotional and spatial knowledge. Moreover, stitches exert a living texture that emerges on the surface of the embroidered landscape. (See Figure 6)

Figure 6 A close up of the embroidered muddle at the borders where edges meet

In this project, the fabric is naturally dyed as per the Armenian textile tradition of dyeing fabrics with pomegranates. Natural dye extract was prepared from pomegranate rinds. By soaking the

fabrics for longer durations, I was able to achieve different tinctures ranging from golden yellows to darker browns (See Figure 7).

Figure 7 Coloring process of pomegranate dye from preparation till various tinctures

In this project, I set out on a parallel investigation of Armenian motifs embroidered with the Tajima machine. Inspired from a handkerchief that was embroidered with Armenian cutwork by my grandmother, I began designing a series of patterns that were later integrated in future works (See Figure 8).

Figure 8 Hand embroidered handkerchief with Armenian cutwork

The visual aesthetics were developed through experimentation and the use of different fabrics, embroidery techniques, and various digitizing software. This project does not offer any solutions

to the complex geopolitical problems. Hence, the final outcome remains a work in progress as a piece of research whereby my creative process became the designed outputs in which relational forms of knowledge were created.

My experiments intertwined traditional Armenian textile heritage with digital embroidery. As such, this project provided me with the opportunity to learn how to operate the Tajima sewing machine, which proved essential for the subsequent implementation of the final work.

A summary of the general takeaways of these two research-creation projects

In the first project entitled *The Armenian Culture Kit,* the research objective was to examine the process of national and cultural identity creation, maintenance, and preservation within the context of the Armenian diaspora. Looking into purposefully capturing the "bits" that constitute Armenian culture, my work was concerned with modalities that mediate an authentic Armenian cultural experience. Undoubtedly, the crux of this project lied in generating meaning-making processes to address the various aspects of Armenian culture that could be communicated and included in the kit.

After exploring the rich terrain of Armenian culture, the second research-creation project entitled *Armenian Spatial Imaginaries*, focused solely on the Armenian geopolitical dilemma. Without seeking to offer practical solutions, the project nevertheless articulated historical facts embedded in abstract and embodied knowledge to provide critical reflection and social commentary through textile-based practices. Further, *Armenian Spatial Imaginaries* offered an experiential learning journey which made the merger of traditional Armenian textile heritage with digital embroidery and digitizing software possible. During this project, a series of textile sketches and experiments were carried out using analog and digital textile techniques. While all these experiments served as play sessions that helped me acquire new skills, ultimately these investigations led to understanding the extent of what could be done using contemporary technologies.

Finally, these research-creation projects have provided me with an important departure point from where to continue my broader thesis work; unveiling the stigmatized existence of hidden Armenians through material storytelling at the intersection of wearable technologies and Armenian textile heritage. In the next sub chapters, I explain the two methods that orchestrated the final work.

Interweaving narrative analysis with tactility and sonification

In this thesis, the stigmatization of hidden Armenians is studied as a social phenomenon through narrative analysis of first person accounts, books, articles and documentaries. Narratives provide data in the form of characters and events interweaved into a plot to make a point (Stovel & Koski-Karell, 2015; p 211). Besides the plot, narratives provide "broad patterns, themes and qualitative characterizations" (McAdams, 2019; p.2) that, on the one hand, can formulate an understanding of social phenomena, and, on the other, inform the storytelling and design process of accommodating narratives on the clothed body. The objective here is to dissect and "break the narratives into elements" (Stovel & Koski-Karell, 2015; p 211), which are then associated with symbolic meaning that should be manifested through tactile and acoustic expression in the future work.

By virtue of narrative analysis, I began to see similar story patterns emerging. One story that compellingly stood out and was rich enough to inform all aspects of the social phenomena of living with hidden identities was Fethiye Çetin's grandmother's story. Çetin's grandmother Heranoush who lived as Seher all her life, was no different than the hundreds of thousands of women and men abducted during the death marches. However, her story served as an ideal introduction point for the general narrative about hidden Armenians.

More importantly, "Çetin's memoir not only thematizes these forgotten women", but it also addresses the trauma of the women's descendants, and therefore Çetin's own (Dolas, 2013; p 2). Çetin, who identifies as a Turkish Muslim, implicitly reveals her own identity crisis caused by her grandmother's revelation. The author finds herself "being ethnically tied to the perpetrator and likewise ethically and ethnically tied to the victimized people" (Dolas, 2013; p 3). Thus, Çetin is exposed to the truth of the hidden Armenians, and despite the discrimination she would later face, she decides to openly write and fight for genocide recognition. In my case, telling the story of the hidden Armenians from this perspective correlated with the factual and emotional arguments that I set out to make through my creation of the garment entitled *The Leftovers of the Sword.*

With the aim of finding the transformational themes related to Heranoush/Seher's conflicting identities, life milestones and significant experiences, I carefully read the book several times. Every passage was demarcated, examined, highlighted and categorized (See Figure 9).

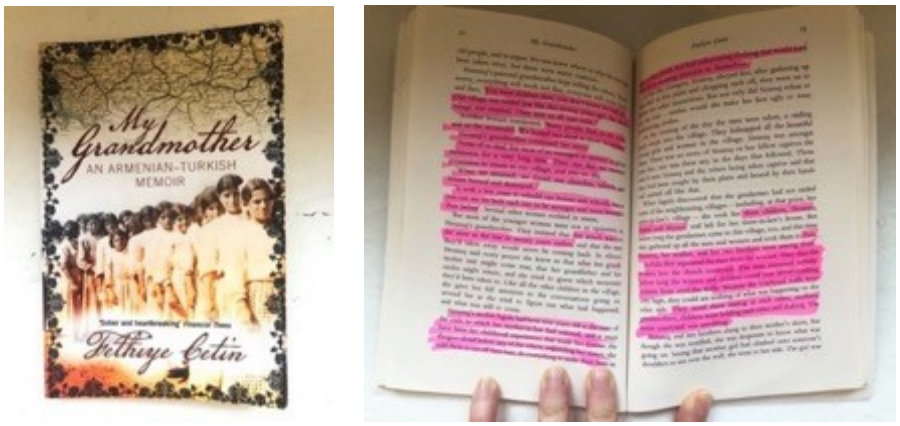


Figure 9 Close reading and narrative analysis of Fethiye Çetin's book entitled My Grandmother: An Armenian-Turkish Memoir

Three main themes seemed to emerge: The Armenian identity in Heranoush, the transformation of Heranoush to Seher and finally the Turkish identity in Seher. To delve deeper into understanding Çetin's grandmother's personality and identity, I resorted to social and cultural theories.

To begin with, I adopted the social penetration theory or the "onion theory" developed by psychologists Irwin Altman and Dalmas Taylor. Social penetration theory (SPT) implies that self-disclosure occurs with the unveiling of biographical data, preferences, beliefs, and concept of self in layers (Altman & Taylor, 1973). The analogy with the onion is related to how Altman and Taylor see these layers in a concentric way. The onion designates various layers of personality with a superficial presentation of the self on its periphery, and a more intimate understanding of the self at its core. Moreover, the overarching psychological themes revealed the inescapable intermeshed qualities of Heranoush/Seher's Turkish-Armenian identity and of the hidden Armenians in general. In the final analysis, I created my own onion diagram as illustrated below (See Figure 10).

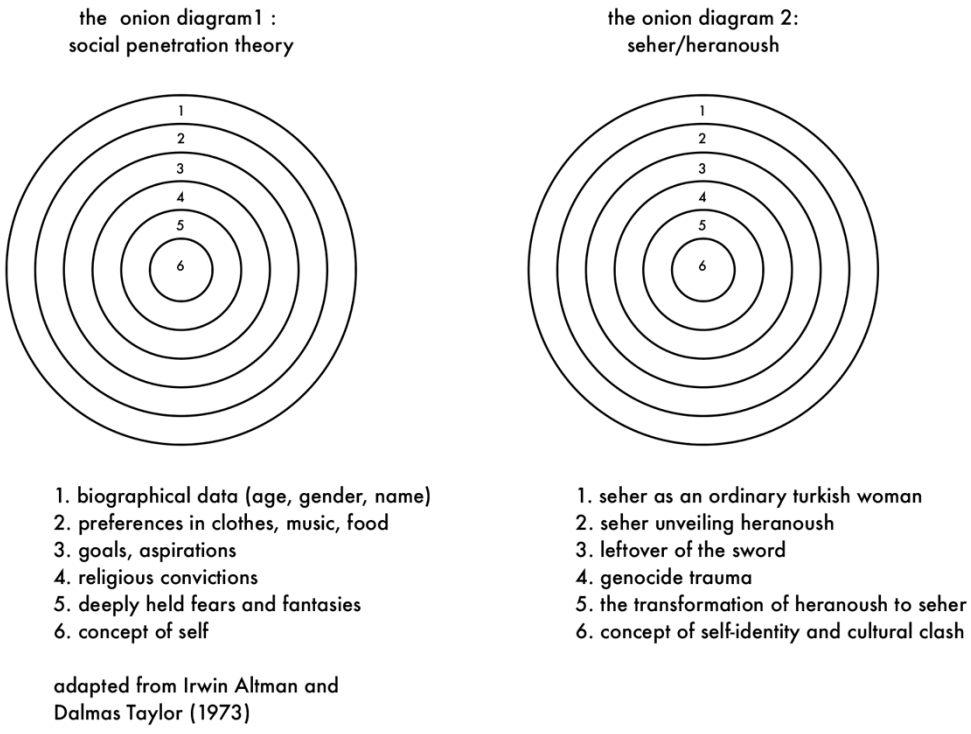


Figure 10 The Onion Diagram 1 + 2

Furthermore, to translate elements of the narrative analysis into tactile and acoustic form, I adopted Karabeg's (Karabeg, 2002) polyscopic modeling methodology as a foundation for the challenge of sociomaterial designing and conscious informing. Karabeg defines polyscopic modeling as "information design by scope design". In this model, the "scope" is an active perspective that creates systems of meaning and shapes "how things work and exist in three dimensions and in the fourth dimensions of time, even if we cannot picture the thing in our mind yet" (Kolko, 2011; p 17). Hence, the chosen scope provides a justification for design decisions and gives a meaningful direction to the use of technology. Karabeg argues that this particular model is essential to depart from traditional ways of informing and can lead to innovative and non-linear information formats.

Discovering De Landa's book *1000 Years of Nonlinear History* was instrumental to this particular phase of the research. De Landa argues that different stages of history coexist and interact with one another like materials that would form accumulations and stratifications (De Landa, 1997). Here, history and this process of stratification operate across geological, biological, and linguistic perspectives, where each strata coexists and interacts with the other by self-organizing and homogenization processes at the same time.

DeLanda's concept of materialist historiography provided a useful way of thinking about how, within such a project, different narrative elements can intersect and stratify as non-linear and self-organizing systems. In this thesis, these narrative elements take textual, visual, and auditory forms overlapping with material, emotional and technological based work within an embodied storytelling context.

Critical making and experiential iterative prototyping

Ratto posits that "critical making" highlights "new modes of engagement" that link conceptual reflection with physical making and material based work within a technological context (Ratto, 2011). As a starting point, critical making informs processes that stimulate "socio-technical" imagination and foster the development of new modes of implementation and concretization within artefacts (Ratto, 2009). The process of critical making entails three stages that are practically inseparable and unchronological. One stage involves mining ideas from the compilation of relevant body of literature and theoretical framework, and consequently, mapping these ideas through fabrication to low-fi material prototypes. Another stage fosters the development of technical prototypes to expand empirical investigations with the aim of optimizing the technical experience. And lastly, the third stage involves a reflexive design-oriented process that encourages new configurations that open up possibilities to critique, challenge, and reformulate the existing conceptual, technical and material models.

The marriage of the clothed body and fabric speaker technology was conceived through a series of physical making, material experiments and technical prototypes in a DIY context. These experiments evolved alongside an ongoing *reflective* and *reflexive* conversation with myself, my supervisor, my advisory committee and lab technicians (Schön, 1991). The interdependent cycles of "critical making" are illustrated in the diagram below exposing the inherent design process fueled by experiential learning (See Figure 11).

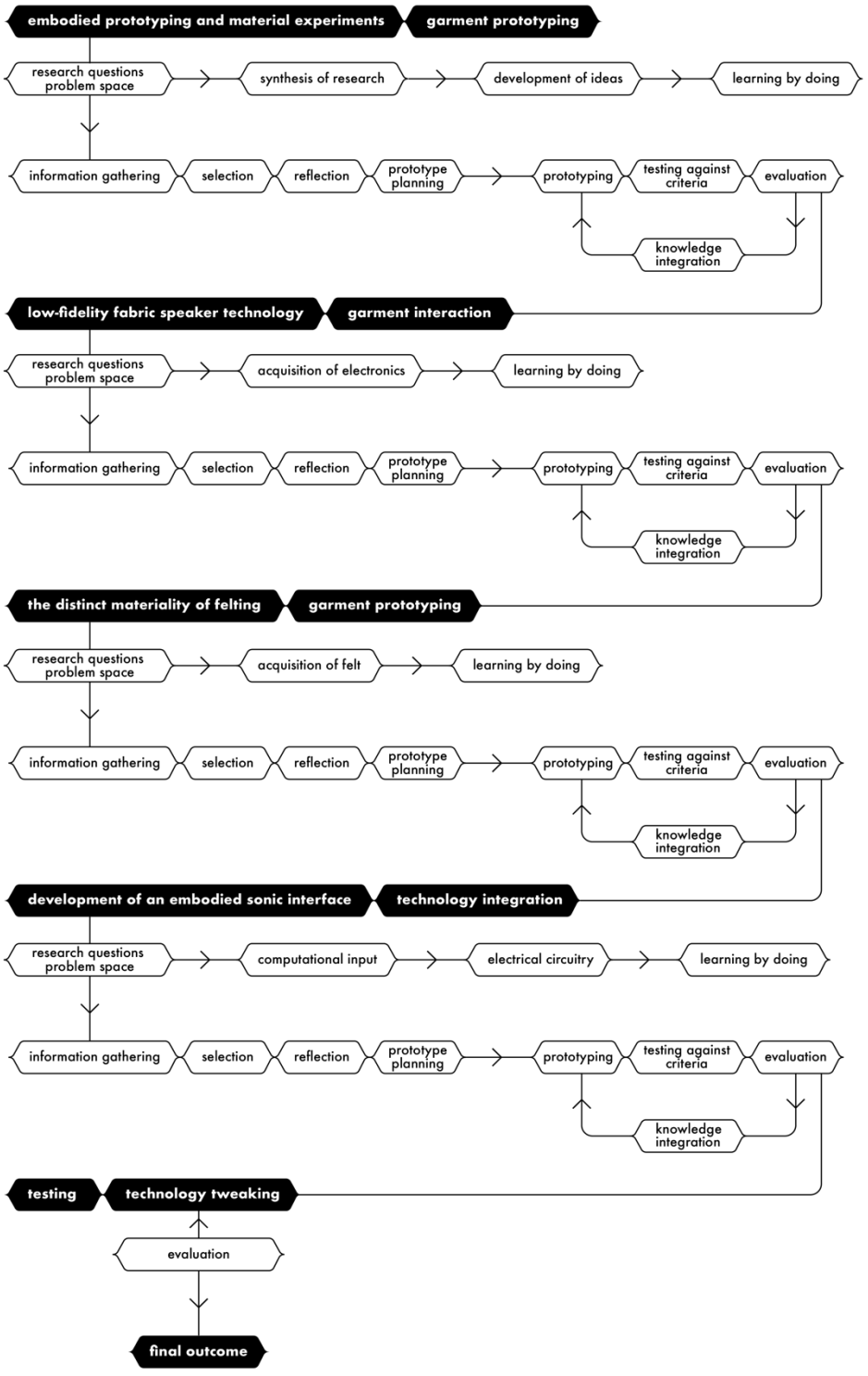


Figure 11 The extended "critical making" and experiential learning process (Inspired from Stead's iterative fashion design methodology (Stead;

2005)

The making of *Leftovers of the Sword* consisted of four different series of non-sequential investigations that often overlapped and influenced each other. These interdependent cycles of practice and *reflection in* and *on action* are detailed in the following chapter entitled "Combing craft and technology as creative process", whereby I discuss the design and material development of the garment, the fabric speaker sound system, the electronic circuit, the collaborative sound design process and overall technological integration as part of the conceptual development approach. Naturally, these investigations "enabled my designs to emerge organically, rather than being predetermined" through a constant tug-of-war between aesthetics, technology and concept (Stead, 2005).

Moreover, *Leftovers of the Sword* materialized with the interlacing of two opposite practical approaches. The first relied on technology to configure the design of the garment, and the second prioritized aesthetics and semiotics over technological functionality. This tension created an interesting negotiation space where compromising decisions would define the final form of the wearable. Early on, the first series of experiments utilized fashion techniques as design methods in order to ignite the conceptualization process. The methods employed were brainstorming, bodystorming, model-making and pattern cutting. Through physical making, these experiments paved the way for conceptual, material, and technological development.

Next, my attention turned towards conducting experiments to explore the design-fabrication of a fabric speaker sound system to be embedded within the garment. All along, I continued improving my knowledge of wearable computing and operating the Tajima machine through a series of workshops at the Textiles and Materiality Research cluster. Concurrently, at the Sensor Lab, I tested different types of microcontrollers, amplifiers, capacitive proximity sensors and electronic circuits. By the same token, at the Surface Lab, I learned wet felting and needle felting through a series of individualized workshops. With continuous inquiry, improvement and learning by doing, I underwent an authentic learning process that drove the design and technological development of this sonic garment.

In the following sections, I will describe the results of these intentional experiments, some of which were completely unplanned or unexpected. Despite encountering several cycles of trial and error through this "critical making" process, I nevertheless gained valuable takeaways that contributed to the "global experiment" of making an aesthetically pleasant garment while integrating the fabric speaker technology in an acceptable way (Stead, 2005).

CHAPTER 3: WEARABLE NARRATIVES: COMBING CRAFT AND TECHNOLOGY AS CREATIVE PROCESS

Embodied prototyping and material experiments

After the research synthesis, it became clear that the design challenge at hand consisted of designing a garment that could subtly reveal a hidden "communication system" through distinct "cultural signifiers" along with narrative elements, to make the body "culturally visible" through both tactile and sonic means. Hence, non-linear and multilayered cultural information should be embedded in the emotional exchange that takes place between the body and the cloth. In this sense, using the body as a device for cultural transmission demanded the interweaving of several fields of research and artistic mediums in order to negotiate symbolic meaning onto a physical garment. Additionally, the design and fabrication of the garment needed to incorporate a merger of traditional textile practices and materials with sonic wearable technologies in order to enhance the communication of forceful notions of invisibility and hidden cultural information.

In the early stages of conceptualization, the ideation process aimed to discover where to clothe the body, with a departure from the concept that positions the garment as a device to force the body to fit into a particular social role, position, or hierarchy (Calefato, 2004), I began brainstorming and sketching to explore areas of the body that could most pertinently provide social commentary. My aim was to design the "sensible space" between the body and the cloth where the "sublime" could be revealed (Carroll, 2017). At first, sketching situated the "sublime negotiations" (Carroll, 2017; p.196) directly on the clothed body. *Powerpoint* presentations and *Pinterest* boards were prepared to aggregate visual references to stimulate the design directions the garment could take. For inspiration, I was drawn towards investigating traditional articles of clothing and the areas of the body they cover. The head and shoulders are considered spiritual body parts in many religious contexts, yet they also delineate a person's intimate private space. While covering the head and shoulders can be interpreted as an authoritarian gesture that hides and conceals the body in a certain social or religious role, the same can also be a vehicle of cultural identity expression through cloth. Further, my research so far inferred that with the enhancement of wearable technologies, to create a "sensible space", cloth should cover sensitive parts of the body such as the head, ears, and shoulders to instill a feeling of safety and intimacy, where hidden identities can be whispered through fabric. This line of thinking was mirrored in Anatolian folkloric clothing, as traditional headdresses were worn by both women and men.

These traditional headdresses covered the head and half of the body, and some of them even extended towards the feet. They were prominent in everyday life during the Ottoman empire

with diversified styles depending on their region. As a point of departure, they helped to anchor my practice in an existing rich cultural tradition, and provided a learning ground for basic clothing construction. As a starting point, I began investigating how Anatolian headdresses are made. Theoretical and technical investigations overlapped with material exploration to understand which fabrics can best deliver this tactile and acoustic experience. My material exploration consisted of acquiring cloths that are used in both the Armenian Taraz (national dress) and Turkish folkloric clothing. These textiles entail silk, suede, muslin, cotton, velvet, mesh, and wool. At this point, I realized that two-dimensional sketches were not beneficial to illustrate and simulate body gestures and the wearable experience. Accordingly, thereafter all sketches and design prototypes were developed in three dimensions in order to inform the interaction design of the garment, as well as, provide a better understanding of how aesthetics feel once worn on the body.

During this stage, I sought expertise to learn the necessary skills to kickstart the process of physical making. Therefore, this series of five different prototypes were all produced in collaboration with Annie the seamstress, in her alteration clothing shop in Bourj Hammoud – the busy Armenian neighborhood of Beirut (See below Figures 12, 13). Annie taught me the fundamentals of cutting fabrics, making patterns and joining the fabrics together through different seaming techniques. Diverse textiles were used in the fabrication of these prototypes to understand how different materials and textures play a role in aesthetic appearance and in the overall wearable experience.

Figure 12 Brainstorming with traditional headdress prototypes and conceptualizing through making

Figure 13 Understanding the relationship of aesthetics, garment construction and wearable experience (at the Annie's alteration clothing shop Bourj Hammoud in the Armenian quarter of Beirut, January 8, 2019).

These early prototypes informed the conceptualization process and allowed space to experiment further with other fabric manipulation techniques such as layering textiles, making pleats,

contrasting different types of fabrics together and investigating color palettes. Concerns with tactility and fabric touch on skin were also investigated. Furthermore, spending time at Annie's alteration clothing shop was in itself an interesting and stimulating experience altogether. Not only did it allow me to acquire new skills, it also offered me the opportunity to come across other Armenians from different generations with whom I had informal conversations about hidden Armenians. These conversations brought intrinsic knowledge from an "insider's or native's perspective of reality" (Fetterman, 2012; p 3) and nourished the design process together with the physical making on many levels. Annie's alteration shop also nurtured the kind of environment where the desirability of these early prototypes could be tested. Feedback was collected from informants at the shop who wore the prototypes, and provided an account of their experience. Furthermore, these conversations suggested a new way of designing that "focused not only on the look or concept but also on the experience of wearing" (Stead, 2005; p 42).

Furthermore, the making of these headdress prototypes functioned as an introduction to garment construction, where I gained skills such as preparation of fabrics, correct measuring, pattern making, and cutting procedures. With a reflexive mindset and iterative prototyping process, the work was constantly being evaluated as it was being created. Some of the ideas resulting would then be fed into the design of the next prototype which would explore contrasting areas of investigation. The final series of these prototypes served as props in sessions of bodystorming, whereby I would wear the headdress, and perform body gestures to imagine and create new design possibilities.

However, these early prototypes also brought forward the realization that such a garment requires a great deal of engineering know-how. By the same token, it was deduced that the construction of the garment needed to incorporate textile forms of architecture to create a three-dimensional space between the cloth and the body. By extending this "sensible space", the fabric environment would create a safe internal dwelling space where hidden identities could appear. The notion of safety could be accentuated through fabric thickness, texture, and touch. While the velvet and suede did provide some of these qualities, they had a very traditional look and feel, and were technically too lightweight to be modeled in an architectural form, without any type of metallic structural support. At this point, it had been suggested that other fabrics needed to be investigated. New-found tacit knowledge had increased my awareness on how to interweave aesthetics, narrative, and cultural information into visual and auditory representations.

After reflection on action, I went back to research and probed deeper in two different directions. The first one dived back into traditional folkloric clothing from Anatolia that also covered a priori the same areas of the body. The second direction explored architectural textile design and

fabric sculptures.

Shifting towards a new design direction

At the intersection of these two research directions, I stumbled upon the Kepenek – a shepherd's outer cloak. This outer garment has been grounded in a traditional and widespread felting practice from Western and Central Asia, which has survived to the present day. The Kepenek tells a rich story about the use of textile architecture among Turkish rural and nomadic communities, as this garment is worn as a portable and wearable tent. Depending on its region, the Kepenek can have a hood, sleeves, and other ornamental colored or embroidered markings (See Figure 14 and 15 below).

Figure 14 A Kepenek worn by a Shepherd woman and a Kepenek worn by a Shepherd man (wearable tent position on the right)

Figure 15 A sleeveless Kepenek with a hood and pointy shoulders

From a conceptual standpoint, the Kepenek served as a melting pot, since it blended both Turkish and Armenian cultural identities through cloth. While felting was an original textile practice in the Armenian highlands since 3000 BC, the Kepenek was not worn by Armenian shepherds. It was prominently an outerwear that clothed Turkish, Kurdish and Persian shepherds. Interestingly, that historic piece of information provided an opportunity to imagine a new raison d'être for the Kepenek – as a cloth of concealment that shelters the Hidden Armenian body. Seen from that perspective, this traditional wearable and portable tent presented a fertile design-fabrication space where tensions of visibility and invisibility could be negotiated and sound could be produced.

Retrospectively, the headdress prototypes had insinuated that the design of the garment's outer appearance should embed visible elements of Turkish clothing, to visually imply the notion of forceful cultural assimilation. The onion diagram echoed the same reasoning, and it was therefore decided that the outer appearance of the wearable would be inspired by the Kepenek to make the body "culturally visible". Once activated, the internal fabric environment could then subtly synthesize underheard voices and ambient soundscapes.

For the aforementioned reasons, the discovery of the Kepenek instigated a new phase of idea regeneration and physical making, and redirected my design practice back to the drawing board. This phase entailed a new series of computer generated illustrations, three-dimensional maquettes and wearable prototypes. Bodystorming, online tutorials and learning by doing accompanied this iterative prototyping process. With reflection in and on action, technical knowledge and newly discovered insight illuminated the following steps.

Naturally, the next stage was to develop my sketches and ideas through computer generated illustrations. Using *Photoshop*, I designed a sleeveless felted garment inspired by the Kepenek, that covered the whole body from head down (see Figure 16 below). It was implicated that the garment would be a stand-alone felted sculpture without any metallic structural support. With an elevated neckline, the garment aimed to harbor a safe and soft environment. Inside the wearable, the back would be embroidered with fabric speakers that emit sound and narration around the head. Further, technical drawings were developed on *Illustrator* to figure out pattern dimensions, garment construction steps, and the technical integration of the fabric speaker technology system (See Figure 17).

Figure 16 Computerized prototype design in felt

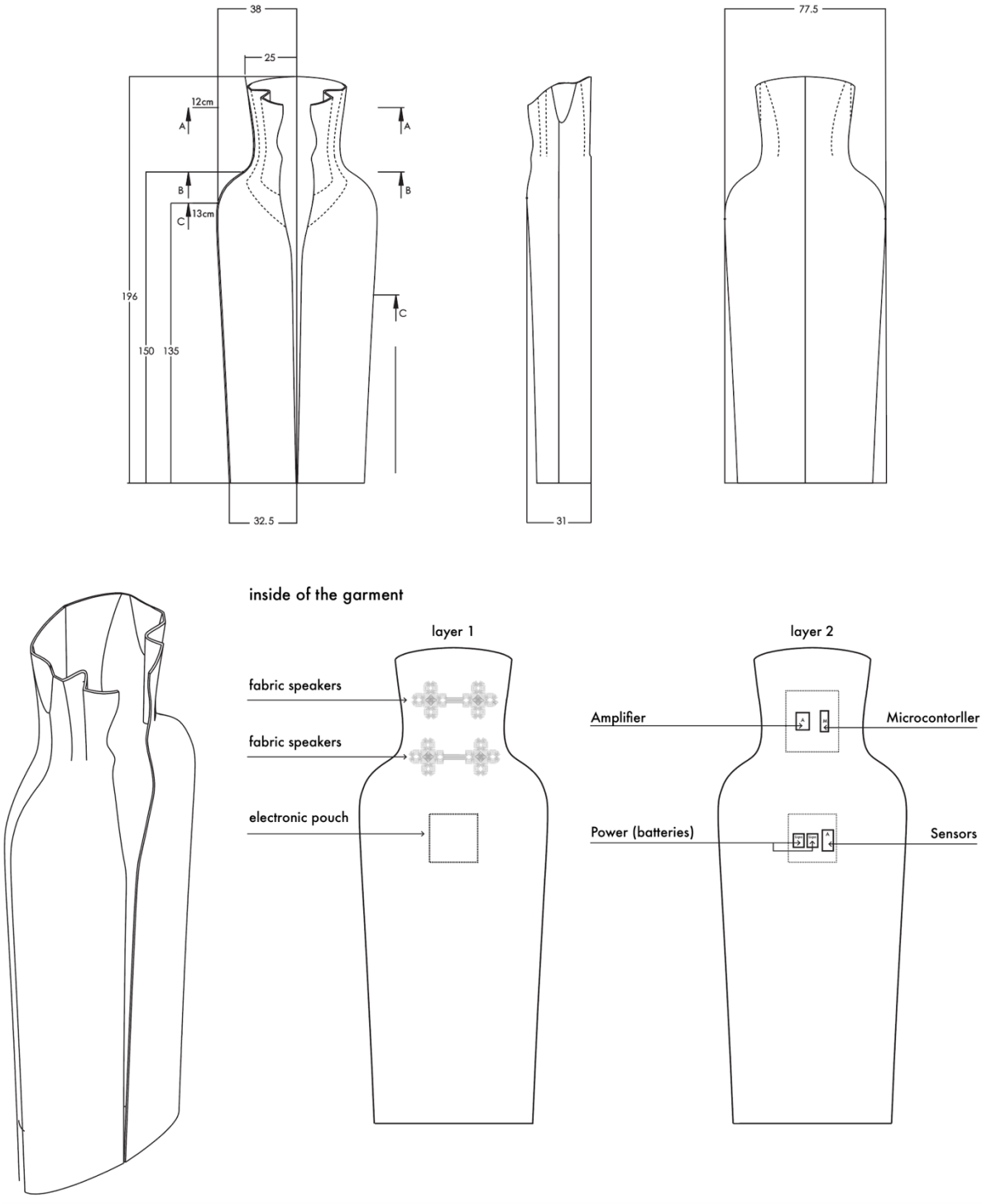


Figure 17 Technical drawings with dimensions, multiple views, placement of fabric speakers and electronic components

In the next stage, to test out the designs, these technical drawings were produced in three-dimensional prototypes made out of stabilizers, used commonly as embroidery backings on the Tajima machine. Patterns were cut out of rolls of this material and joined together with quilting pins and masking tape. The result was a flexible wearable that could be adjusted on the go to make new configurations. Bodystorming was crucial to this process and helped assess the wearable experience. Subjecting my own body to physically experience the garment and simulate scenarios, I envisioned its prospective aesthetics and technical function in its context of usage (See Figure 18). Further, the physical making cycle was accompanied by a continuous ideation process that attempted to solve technical problems of garment construction as they came up. The objective was to design and produce patterns that would build a prototype that could mirror the computer generated garment as closely as possible.

Figure 18 Creative process: prototyping and bodystorming (round 1)

Following how the Kepenek is traditionally made up of three parts, the patterns produced consisted of one piece for the back and two for the front. Although, the patterns were identical, they were cut in half to make an opening at the front. The neckline of the garment was quite

challenging to achieve on different levels. First, in order to have that sort of naturally pleated opening was a really tricky matter to extrapolate into a pattern shape. Second, stabilizers and felt do not have the same texture, weight, and materiality. Hence, I had to figure out how to achieve an architectural form using stabilizers, all the while being aware that this pattern would have to be readjusted to produce the same desired effect with felt. In practical terms, felt was a very expensive and labor-intensive material. Instead, I used stabilizers to make quick and iterative prototypes, even though this demanded speculation and planning. However, I continued tweaking the first designs on the computer in parallel with sessions of altering the prototypes by adding, layering, cutting, and removing pieces in conjunction with an ongoing process of bodystorming (See Figure 19).

Figure 19 Creative process: prototyping and bodystorming

Making alterations to the overall pattern of the wearable on such a large scale was quite time consuming. Since I was acquiring know-how on building the garment piece by piece, without the use of any type of metallic structural support, the next stage of ideation and physical making was to test out new fabric construction techniques, aesthetic touches, and architectural durability.

Therefore, to save time, I began developing a series of miniature maquettes much more rapidly (See Figure 20).

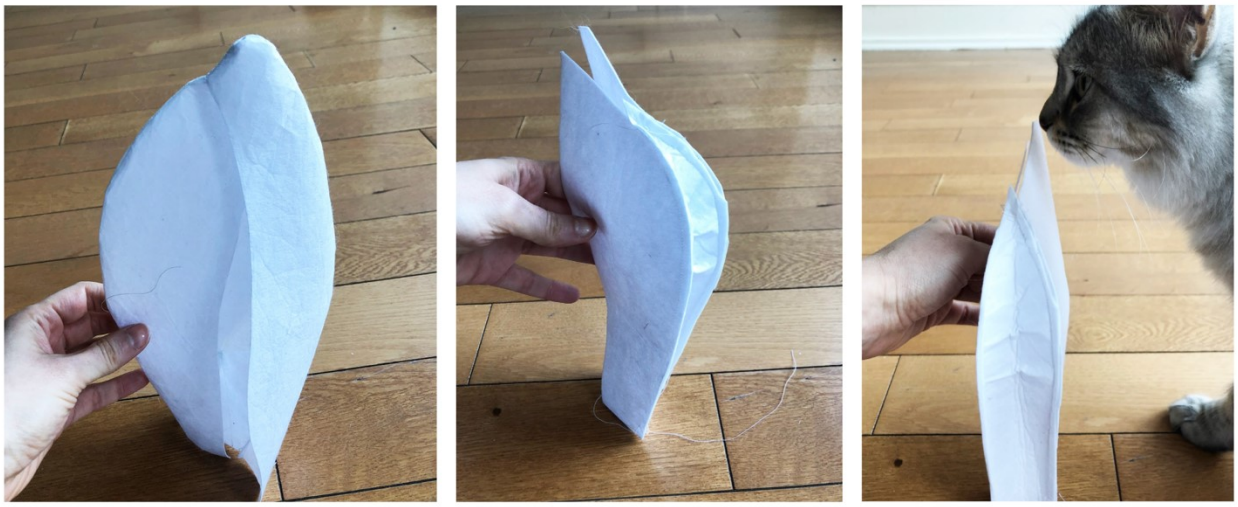


Figure 20 Creative process: Learning by doing by making maquettes

During this period, I began inquiring about different types of felt and wool (See Figure 21). My material research led me to scan the market for industrial design felt, natural organic types of wool and synthetic felt. After weighing the pros and cons of all the different materials, it was deduced that wool would be the best material to use for this garment. This resonated with the way the Kepenek is traditionally made out of organic wool. However, this decision equally implied that I would have to learn wet felting and needle felting in order to progress. The experiential learning of my wet felting journey is elaborated further down in the chapter “The distinct materiality of felting”. But first, my attention was needed to develop the fabric speaker technology of the garment which is described in great detail in the following section.

Figure 21 Material research – industrial designer felt wool 100%, merino and carbonized felting wool

Low-fidelity fabric speaker technology

The first time I discovered that conductive thread in proximity with magnets can produce sound I was astonished. This breakthrough was revealed through an *Instructables circuits* tutorial entitled *Embroidered Fabric Speaker* (PluseaFollow. (n.d.)). In this article, basic instructions explained how to embroider conductive thread in a spiral form on fabric. It also showed how connecting the conductive thread with an amplified sound source and holding a magnet close to the coil would activate an electromagnetic field that translates electrical frequencies into audible waves that we can hear. It all sounded so exciting, despite being uncharted territory. Coming from a graphic design background, I was not familiar with electronics and soft wearable computing. The challenge here was to design and develop a fabric speaker technology which could be suftly fitted within the garment. Researching similar projects broadened my knowledge of e-textile kits and audio boards, but none provided any ready-made solutions that I could readily adopt.

Hence, the making of fabric speakers was a slow but very hands-on learning curve. At the very beginning, the technician at the Sensor Lab introduced me to basic Arduino language which provided a direction for the design and integration of technology. Key to the development of the fabric speakers were my computer generated illustrations that "visualized thoughts and made connections between pieces of unconnected research" (Stead, 2005; p 179). Intuitively, I was able to break down this process into separate parts with tacit knowledge, and carried on with the experiments until the desired outcome was achieved. At each stage, the results were evaluated with reflexive and iterative approaches. Accumulated knowledge informed the practice and at the same time, acted as a reflective tool for the next phase of research and "critical making". This process brought forth a series of 30 technical prototypes that eventually led to the development of the fabric speaker technology used in the *Leftovers of the Sword* garment.

It is worth mentioning that the creation of fabric speakers was highly interdependent on the resources available at the Textiles and Materiality research cluster and the Sensor Lab. The embroidery Tajima machine was utilized to lay down the conductive thread for the fabric speakers, electronic circuits, and soft switches. In addition, the equipment available at the Sensor Lab, ranging from alligator clips, to auto-ranging digital multimeters, microcontrollers, amplifiers, soldering irons, and AC power sources were all needed to connect and test the fabric speakers. Therefore, the making of low-fi fabric speakers entailed a constant negotiation oscillating back and forth between the resources and time slots available in both labs.

In the first instance of making fabric speakers, I resorted to my drawing board on *Adobe Illustrator* in order to explore design possibilities of the shape of the speakers. I designed a basic spiral as a proof of concept to test if it could produce sound (Figure 22). Even though the

technical literature insisted on the spiral embroidered form as being the most conducive form through which to create and play sound, I was nevertheless determined to design speakers in such a way that would also incorporate traditional Armenian embroidery shapes and symbolism. I had previously used the Tajima machine to embroider a series of patterns for the *Armenian Spatial Imaginaries* project. Revisiting some of these graphic studies seemed like a good place to kick start the design process of the speakers.

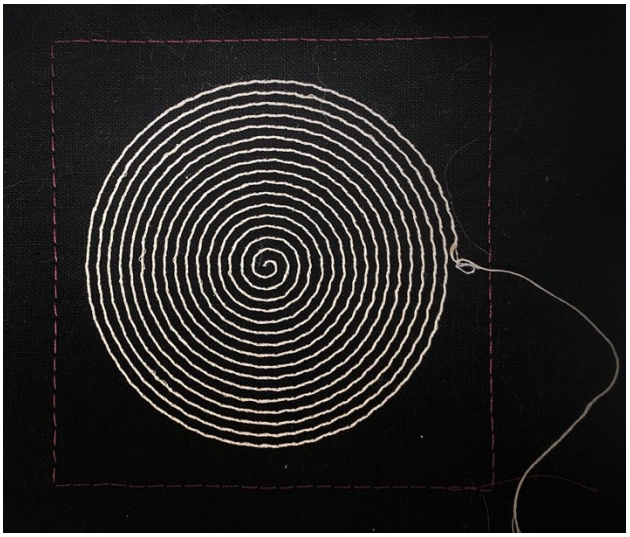


Figure 22 First fabric speaker experiments (Functional)

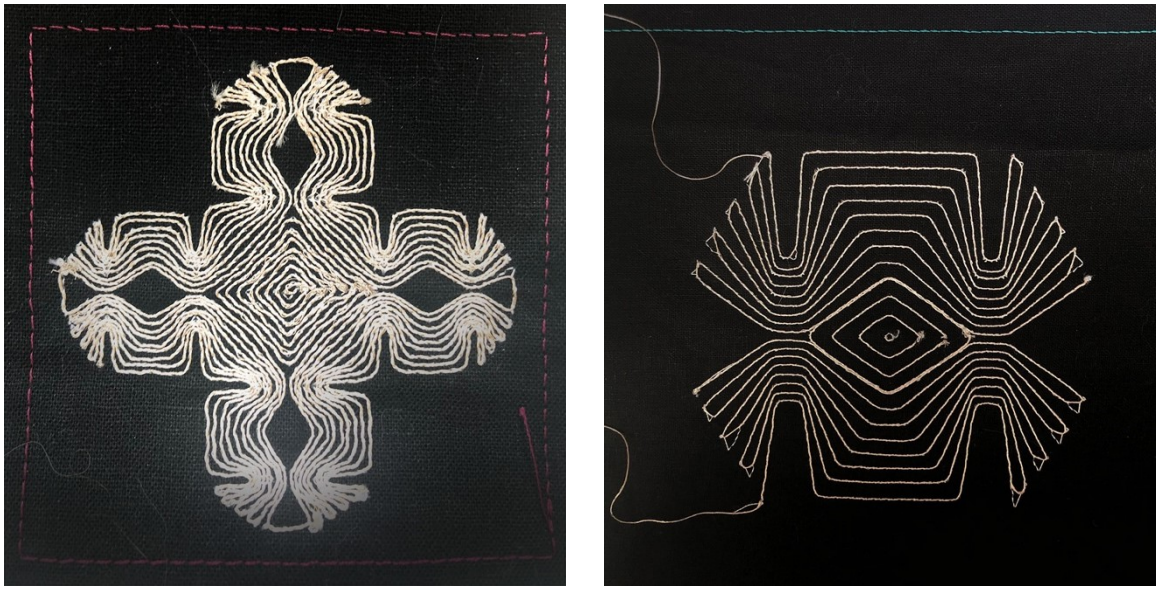


Figure 23 First phase of prototyping fabric speaker experiments (They did not produce sound)

As seen in Figure 23, both designs were generated out of the same initial form with different configurations. What these patterns had in common was a layering system reminiscent of the onion diagram. Conceptually, the main intention here was to apply the revealing of sonic information through a multilayered and stratified aesthetic in order to articulate the theoretical research through the design process. These first prototypes were very eye-opening, as so far I had not used the laying feature of the Tajima machine. I discovered that conductive thread does not behave like yarn. The metallic nature of the thread is harder to tack down and as a result, right angles are impossible to achieve. Oddly, the way the machine laid the stitches actually distorted my initial patterns. This unexpected result served to further inform and foster my thinking of the design problem-solving process moving forward. The other curious matter was that the machine connected all the open shapes, making it clear that the next generation of patterns would need to be made out of one continuous line, all the while taking into consideration for the strategic placement of the two open ends that would be connected to the amplified source of sound. This factor would be crucial to the success of the sound production.

Although, the two speakers in Figure 23 did not output any sound, they nonetheless provided ample knowledge on various aesthetic limitations related to technological integration. The spiral prototype in Figure 22, however, triumphantly worked. Through experimenting with holding different number of magnets closer to the spiral coil and playing a variety of genres of music from my laptop, I started to gauge the audible frequencies that the fabric speaker was able to transmit. I finally understood the direct correlation between the number and size of magnets and the quality and volume of the sound emitted. Further, I began to sense the conductive thread warming up incrementally, and felt the vibrations that made the fabric fibrillate. It was an interesting sensation that replicated the impression of someone speaking gently and closely into one's ear, as if their warm breath permeated through the fabric.

The next stage of the investigation involved gathering empirical data for optimizing the functionality of the fabric speakers. Fifteen different Archimedean[4] spirals were developed with various radial dimensions and differing distances between the lines (see Figures 24 and 25 below). These experiments functioned as a series of technical prototypes to measure the properties of the conductive thread in relation to the quality and volume of sound desired. The

[4] Archimedean spirals (also known as arithmetic spirals) visually represent the trajectory of a point moving from a straight line onto a plane curve toward a fixed destination at a constant rate rotating at a constant speed.

main goal was to measure the resistance of the conductive thread to achieve an optimal hearing range and also evaluate which thicknesses would allow the embroidery of an ornamental pattern without any distortions.

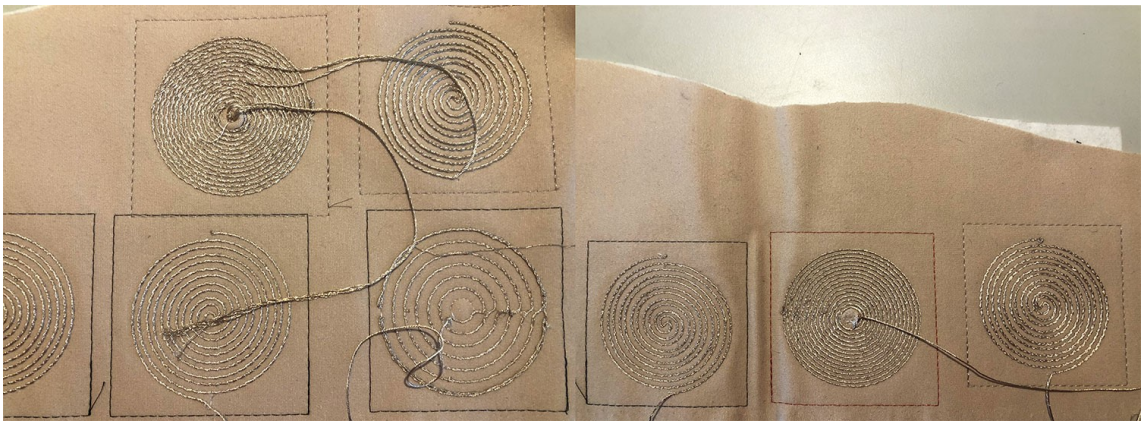


Figure 24 Spiral coils laid with different thicknesses of conductive thread

I experimented with the thickness of conductive threads varying from one to five. I discovered that thread number 1 produced too weak of a sound on smaller surfaces but functioned rather well on larger ones. Threads two and three, however, had very similar performances across all surfaces. On the other hand, conductive thread four produced distorted music notes and muffled voices. Interestingly, conductive thread number five didn't produce any sounds at all, apparently because the thickness of the thread affected the accuracy of the embroidered coil. Hence, the thicker threads four and five were harder to tack down to the fabric. The results of these experiments suggested that the looseness of the conductive threads influenced the electrical resistivity and conductivity (See Figure 25).

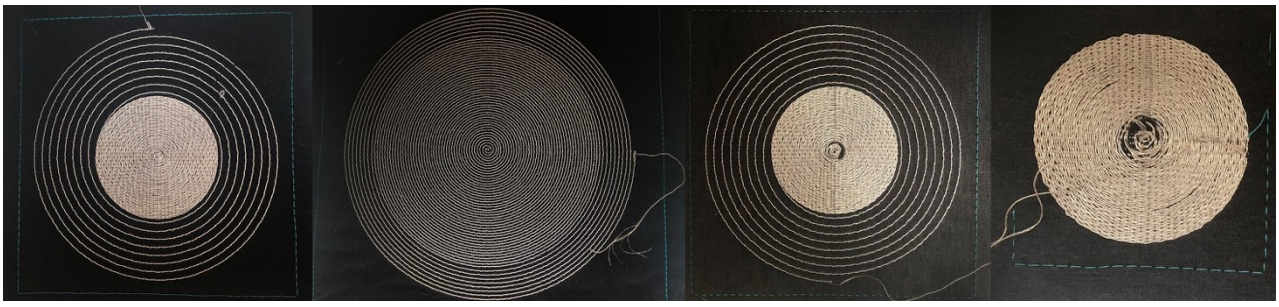


Figure 25 Experimenting with the scale and radial dimension of the spirals and the distances between the lines of the spiral form

The spacing between the conductive threaded lines in proportion with the scale of the spirals

contributed a great deal to the overall performance of the audible range produced. It was equally important to embroider these spiral coils on different types of fabrics to assess how the fibers affect the quality of the sound.

From this series of experiments, it was deduced that conductive thread number three transmitted the most optimal hearing range when in proximity with a total of five rare-earth disc magnets of 1.26” D x 0.08” H. Further, conductive thread three produced better embroideries aesthetically. Overall, the findings implied that there were two ways moving forward for the development of the sound system. A decision needed to be made on whether to develop a single audio channel output or two independent audio signal channels. I picked the latter in order to purposefully design and develop a polyphonic experience that could make the sonic environment inside the garment more immersive to the wearer.

Hence, I began testing two fabric speakers at the same time to generate stereo sound. At this stage, as the design of the garment was being developed, conceptual and material research had inspired me to choose felt as the main textile material of the wearable. Therefore, the next series of fabric speakers were to be embroidered on felt. The successful spirals with the sound quality and desired aesthetic fed into an on-going and iterative design process until material and technical fruition. First, I explored the ways in which the speaker coils could be incorporated within a larger ornamental pattern. At this juncture, I integrated all the analyzed technical data in the design process, all the while continuing to fine-tune the empirical settings during each testing session. Nevertheless, voltage had proven to be a decisive factor, since the higher the current, the more distorted the quality of the sound was rendered.

Thereafter, I continued researching and testing different audio boards and amplifiers (such as Music Maker Featherwing with amp, Adafruit Feather Adalogger without amp, Adafruit Audio FX sound board with amp, and many others). I set out to test which type of stereo audio board would be the most convenient microcontroller to use and whether the amplifier should be embedded within. Consequently, I was tweaking the voltage to get the best audio experience. So far, 7,4 volts with 0,4 amps synthesized the best audible sound. However, for safety purposes, the voltage needed to be reduced to 5 volts which, in return, suggested the need for adjusting the dimension of the speakers in order to have a smaller surface of conductivity. The high voltage also contributed to some of the audio boards heating up excessively and, as a result, a few of the amplifiers were blown out in this process. Further, the tests pointed out that the microcontrollers with a built-in amplifier had a tendency to heat up faster, which led me to integrate a separate stereo Adafruit amplifier in the speaker system (See Figure 26).

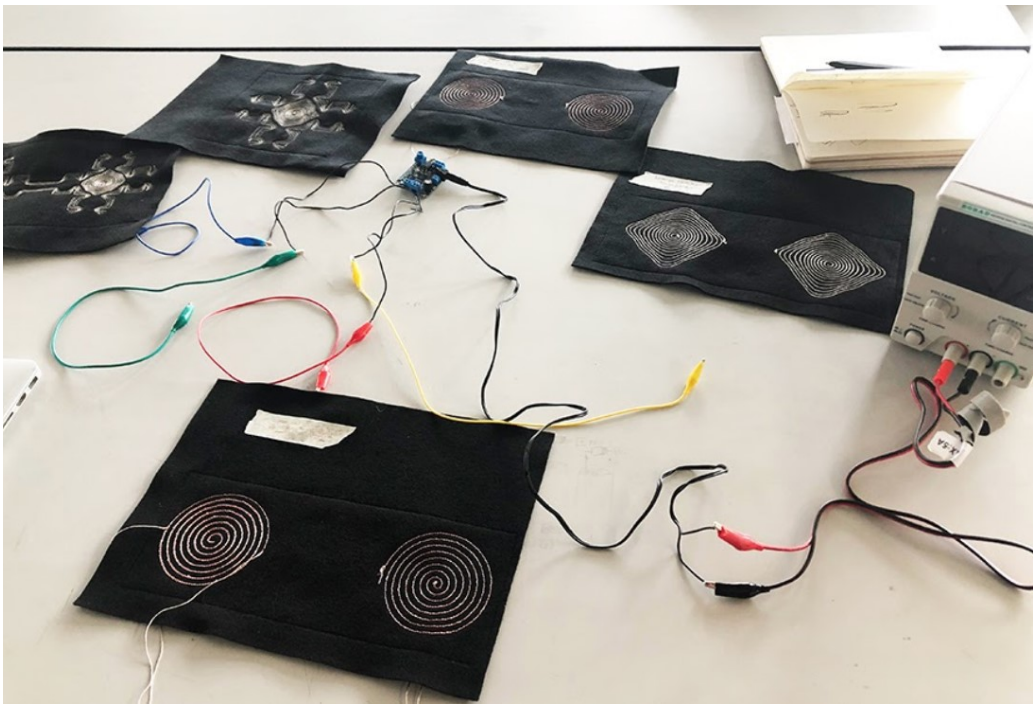


Figure 26 Further optimization of fabric speakers for best function and aesthetics, testing with different microcontrollers and experimenting with voltage

After settling the choice of what kind of amplifier would be integrated in the sound system, the following phase of experiments helped to design the final aesthetics of the embroidered speakers with all the technical considerations learned so far. Under observation and reflection, I drew my attention back to the theoretical framework to embed subtle cues of cultural information in the design of the fabric speakers. My intention was to provide a visual connection to the notion of duality to illustrate the ambivalent intermeshing of Armenian-Turkish cultural identities. This duality demanded the design language of symmetry to negotiate visual space for each culture and highlight their interconnectedness. At the same time, the design was conducive to putting in place a two channel audio system with a speaker to the left and another one to the right (See Figure 27).

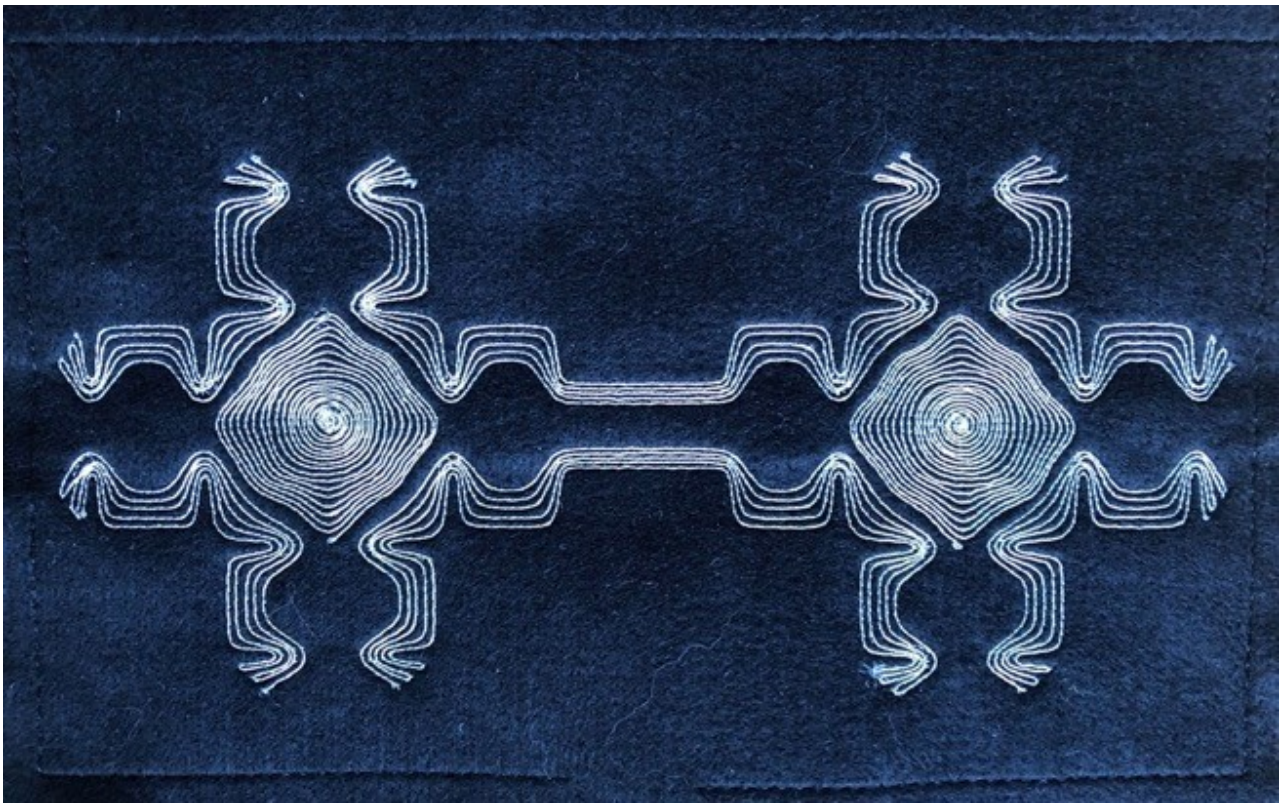


Figure 27 Symmetrical fabric speaker design and the test that offered the best overall result

The following stage of experiments served to refine the design of the patterns and to improve the quality of the laying of the conductive thread on the felt. The texture and thickness of the felted material presented complicated challenges. The tests showed that the Tajima machine had a hard time tacking the conductive thread onto the felt. Therefore, I had to resort to stitching the shape of the patterns with silk thread first, and then to lay the conductive thread on top (See Figure 28 and 29). This produced better results but aligning the stitches and threads necessitated extreme precision with handling the embroidery hoop and switching between the different needles on the Tajima machine. Finally, this series of experiments concluded with functional stereo fabric speaker prototypes ready to be integrated within the design of the electronic circuit of the garment.

Figure 28 Symmetrical fabric speaker design and the test that offered the best overall result

Figure 29 Symmetrical fabric speaker design and the test that offered the best overall result

The distinct materiality of felting

As the fabric speaker technology was developing, I turned my full attention towards prototyping with felt, and embarked on an experiential learning journey to produce the material itself. The art of making felt is an ancient textile practice preceding the art of spinning and weaving. In this project, I used wet felting and needle felting to fabricate the sonic garment. Wet felting entails the process of creating a felted surface that involves wool, soap, hot water, and the pressure of hands rolling and beating the fibers until they interlock. The fibers tangle together through various stages and multiple factors (type of wool, direction of fibers, number of layers, water temperature, the intensity of soap, hand pressure, and many more). Wet felting large surfaces requires a lot of physical strength and needs a fair amount of time to master. Naturally, there is a lot of planning, as well as numerous tests and trials and errors, involved in this process. Needle felting is another way of creating felt by interlocking fibers through a stabbing motion with a needle that has barbs. The repetitive movement helps the fibers to get caught in the barbs and entangle with other fibers and mat together. This technique is used for crafting three-dimensional objects and sculpting with felt.

At the Surface Lab, I underwent a series of two individualized workshops where I learned the fundamentals of wet felting and needle felting (as seen in figure 30 and 31). After understanding the process, a series of five prototypes were felted to test different thicknesses, textures, color palettes, and different types of wool. At this juncture, I was sampling between Merino, Bergschaf, Maori, and Scandinavian wool. Merino produced a consistently thick felted fabric with a soft texture, while the other types of wool were slightly coarser in texture. As a result, I chose Merino as the main felt material to work with moving forward. During the following stage, I experimented with different wool colors ranging from off white to black and navy blue. Using multiple colors allowed me to learn color mixing and batting with felt to create gradient and marbled textures, ultimately exploring potential aesthetic possibilities for the final garment.

Figure 30 Learning how to wet felt (first prototype)

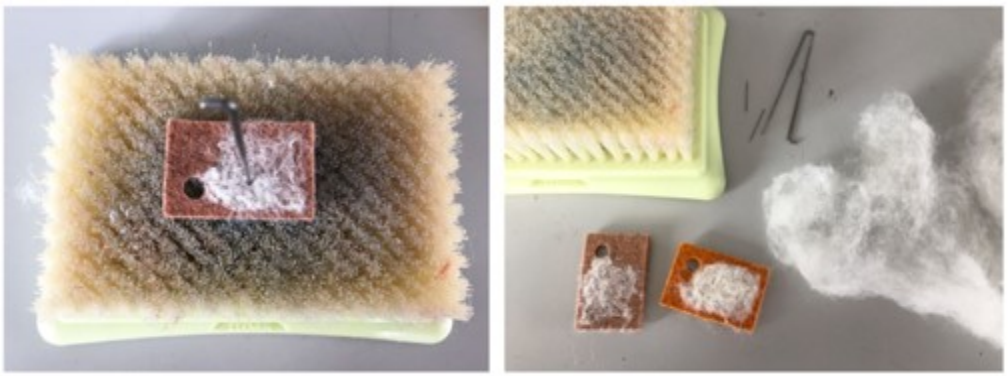


Figure 31 Learning how to needle felt

These felted prototypes were then embroidered with samples of the fabric speakers on the Tajima machine to test several factors at once. Felt thickness was crucial for the garment to have a solid architectural form. However, it appeared that the thicker the felt, the harder it was to embroider its surface on the Tajima machine. Going forward, there were two solutions – (1) either the fabric speakers would have to be embroidered on a thinner sheet of felt and then needle felted on the main garment or (2) the overall felted surface of the garment would have to be much thinner. If I were to adopt the first solution, this meant that the electronic circuit would additionally have to be embroidered on the same sheet of felt as the fabric speakers. In this case, the integration of technology would be tricky, because needle felting could easily fray the conductive thread, causing subsequent audio problems. The second solution also came with its own set of issues, namely that it clashed with the sculptural performance of the garment.

Needless to say, the original design of the wearable had to be rethought. At this stage, the previous aesthetics were sacrificed for technical feasibility. For an example, the elevated neckline was too arduous to felt, so it was eliminated and replaced with short sleeves instead. The prototypes additionally showed that conductive thread did not appear well on light colored felt. Hence, the color of the garment switched to black to ensure a beautiful contrast between the copper of the threads and the black fibers of the wool. Further, the sculptural stand-alone notion of the garment was dropped. Instead of being a wearable sculpture, the garment was reconceived as a wearable cloak. As such, it was imagined that the garment would be hanging on a stick similarly to a Kimono on display, so the wearer wouldn't need to carry its physical weight. This line of thought was inherently favorable for facilitating the technical integration of the fabric speaker technology developed so far.

The recent conceptual and aesthetic shifts in design changes were followed by a new phase of labor-intensive wet felting process. The objective was to wet-felt the large wearable as one

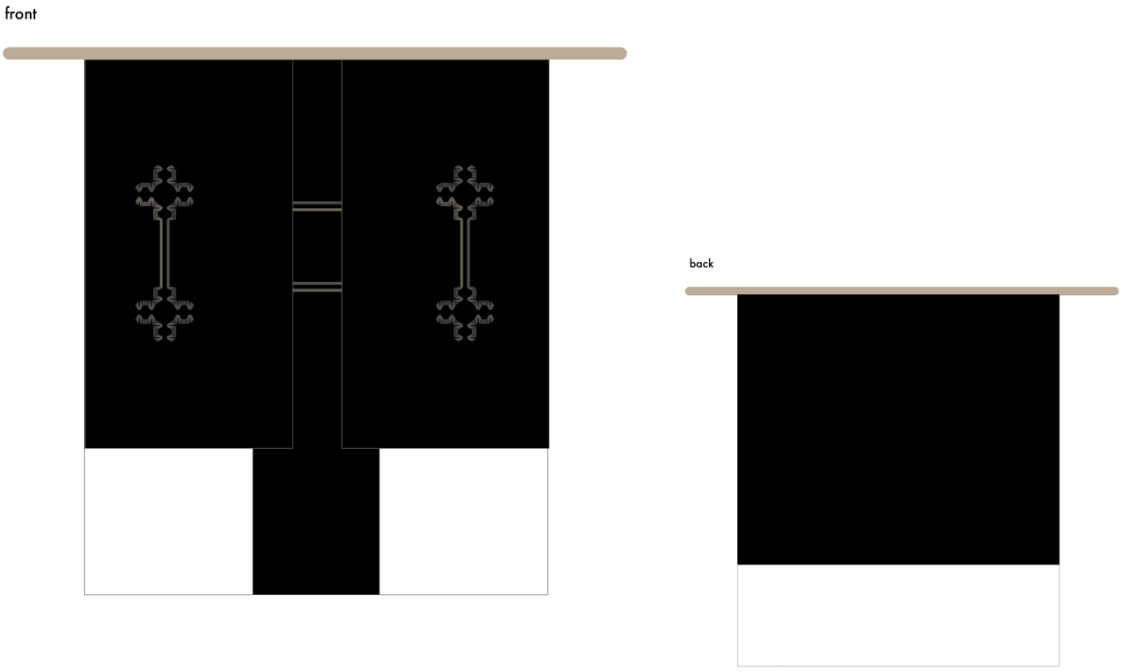
whole piece with the use of a resist. By definition, a resist is any material that creates three-dimensional space and acts as a separation layer to avoid fibers of wool to interlock together. In this case, the resist was made out of foam and carved into the desired shape of the garment. This resist would ensure that two layers were being wet-felted simultaneously. After the felting process is complete, an opening would be cut in the front and the resist would be removed (See Figure 32).

Figure 32 Wet felting the cloak prototype #6

Figure 33 Failed wet felting experiments (wet on the left side and dry on the right side)

Despite careful planning, there is always a risk of wet-felting not working even with more experienced practitioners. Unfortunately, this wet-felting process did not yield the desired results. Due to the large dimensions of the garment, it was harder to follow the basic steps of the felting process. Naturally, there were multiple reasons for the felting to fail. First, it was harder to control the crucial factors such as moisture, temperature of water, and pressure applied by the hands. Second, the fulling process of beating and rolling the felt was impossible to achieve, as my resist was very thick. Third, the felted surface was so large that it was physically laborious and hard to handle. The large tears seen in Figure 33 were likely caused by uneven layers of wool that didn't connect well with one another. Consequently, the felted surface turned out patchy and battered, and it was imperative to restart the felting process with a new technical plan.

These wet felting failures confirmed the powerful agency that felt as a material holds which makes it behave unpredictably. Moreover, new technical considerations needed to be incorporated in the design of the garment. At this stage, it was deduced that it was essential to achieve a level of pliability with the felted material. This way, the resist was eliminated, the sleeves were removed to avoid further felting complications, and the overall size of the garment was recalculated in correlation with the planning of the felting process. At this time, the ornamental designs of the garment were also developed and the design process was finally complete (See Figure 34).



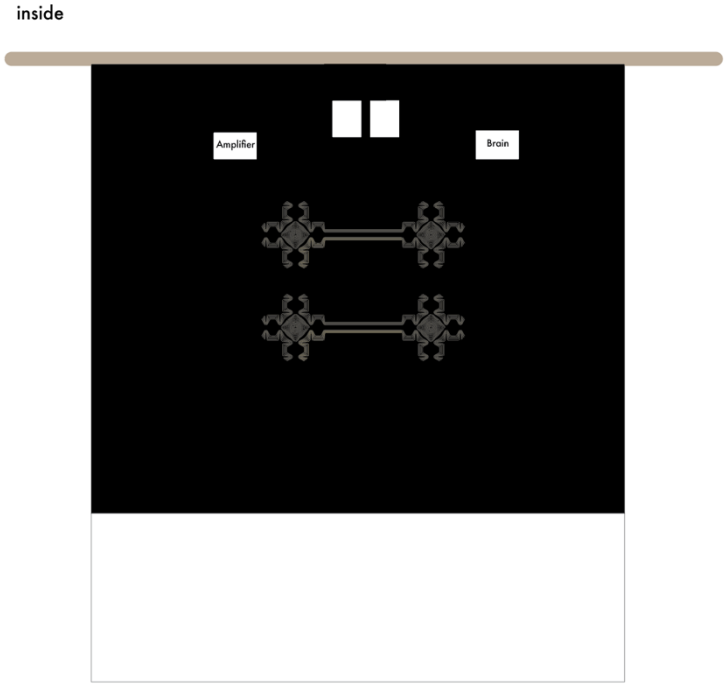


Figure 34 The new design of the sonic cloak

To save time and ensure the success of the next wet-felting round, it was finally decided that the garment would be made from several sheets, and joined together as a single piece. During the planning process, the garment was split into two zones based on the color of the felt. The black area was broken down into three rectangular sheets of 25 x 50 inches, and the white zone was fabricated out of three joined sheets of 14 x 12 inches. The dimensions of the sheets were also carefully calculated to account for any extra shrinkage that might occur during the fulling phase. With speculation and planning, the new round of wet-felting process was prepared. Great attention was paid to every step of the process, from laying down the fibers equally spaced out and perfectly angled, to making sure the water always had the right temperature, and monitoring how the soap effervesced with the wool. The rolling and beating were implemented patiently for supplementary hours to ensure the interlocking of the fibers. The following photos provide a glimpse of the different stages of this process (See Figure 35).

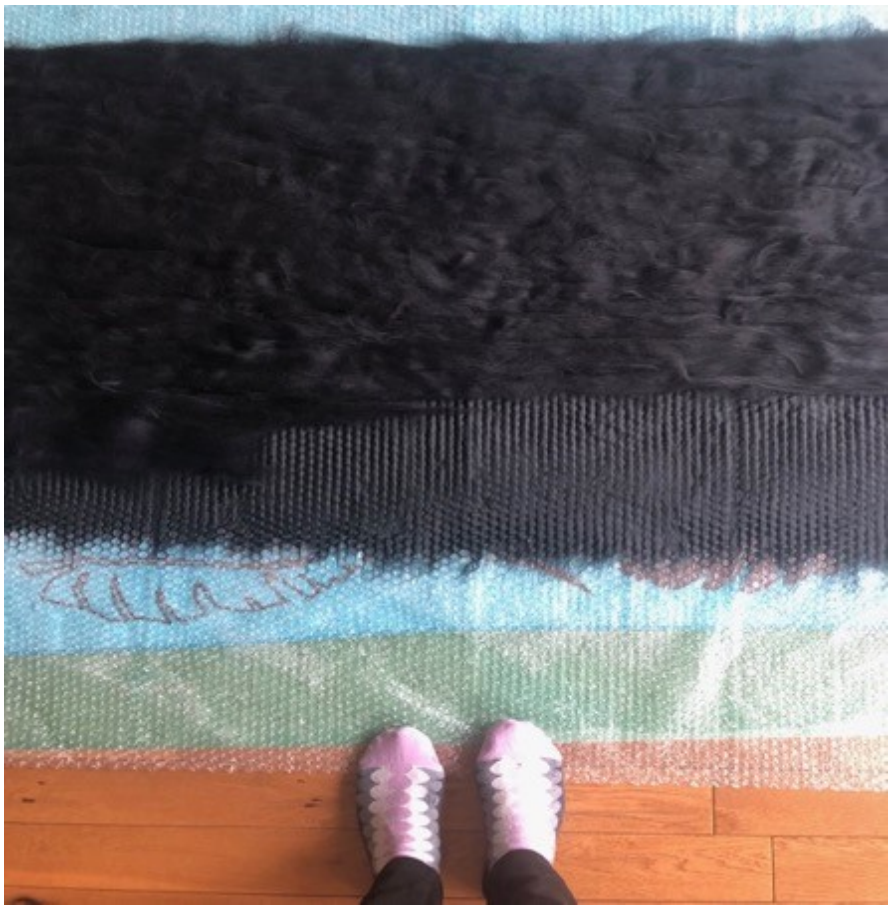


Figure 35 The physical implications of felting and the long process of turning fibers into felted fabric

Once the wet-felting process was complete, the felted sheets were joined together with needle-felting to construct the final garment (See Figure 36). By inserting dry wool between the different sheets, and matting the uneven felted surfaces with the barbed needle as far as needed, the sheets flattened and blended into one piece. This process was applied until the black and white sheets were felted into their exact dimensions. Afterwards, they were assembled together and hand-sewn with under-stitching to have a unified facing from the back. Next, the garment was ironed several times to secure the interlocking of the remaining loose fibers. Finally, the garment was felted and the fabric speaker technology was ready for integration.

Figure 36 The final felted garment

Development of an embodied sonic wearable interface

Along with the knowledge acquired and the work accomplished so far, I embarked on a new experiential learning journey which consisted of two distinct areas of research and practice. The first was situated in wearable electronics and computing, and the second in sound design. These two distinct phases of learning by doing overlapped to materialize the sonic interface in the felted garment. At the beginning of this period, I attended a series of workshops in interactive textiles at the Milieux Institute to learn about basic electronic components when building soft electronic circuits, including capacitive sensors, soft switches, and sound transducers. These workshops provided a stimulating environment in which I was exposed to new interaction design possibilities and introduced to other electronic components for body-responsive wearables.

Designing an electronic circuit

At first, my goal was to figure out the mechanism of interaction design and the desired way to activate the sonic wearable interface. Sound could be triggered via two distinct ways – either with capacitive sensors, using someone's physical proximity of the garment, or with soft switches necessitating the use of human touch. I chose the latter, as touch is the most intimate and soothing of the six senses. Incorporating soft switches in my electronic circuit would require the wearer to press the soft switches to activate a haptic communication with the garment, and conceptually enter in a non-verbal dialogical exchange with the hidden Armenians. Next, I learned the entire process of making soft switches from the design and preparation of the files on the Tajima software, the planning needed with all the different materials and operating the Tajima laying machine to produce the final switches.

Alongside these prototypes, I was exploring all the possible options to uncover the other electronic components of the circuit. By now, I had the fabric speakers and amplifier figured out. I had already been experimenting with various microcontrollers for months. However, in one of these workshops, I was introduced to the WAV 3 trigger which quickly became essential to my electronic circuit. The WAV 3 was unlike other audio players, as it was a polyphonic microcontroller that allowed playing and mixing 14 tracks simultaneously. Finally, it was down to choosing a power source. So far, I had been planning to have two Lithium Ion Polymer batteries in the electronic circuit. However, in this case there was no need for mobility, as the sonic wearable would be hanging like an aerial sculpture. Hence, it made sense to eliminate the batteries and simply go with a power adaptor with a long cord. At last, all the components of the electronic circuit were determined.

The next phase entailed taking a series of individualized workshops with the technician at the Textiles and Materiality Research Lab to learn how to design a soft electronic circuit on different types of software, and how to prepare the final files for the laying process on the Tajima machine. The Figure 37 below illustrates the circuit diagram which was comprised of two fabric speakers, the WAV 3 trigger, the Adafruit amplifier, and four soft switches.

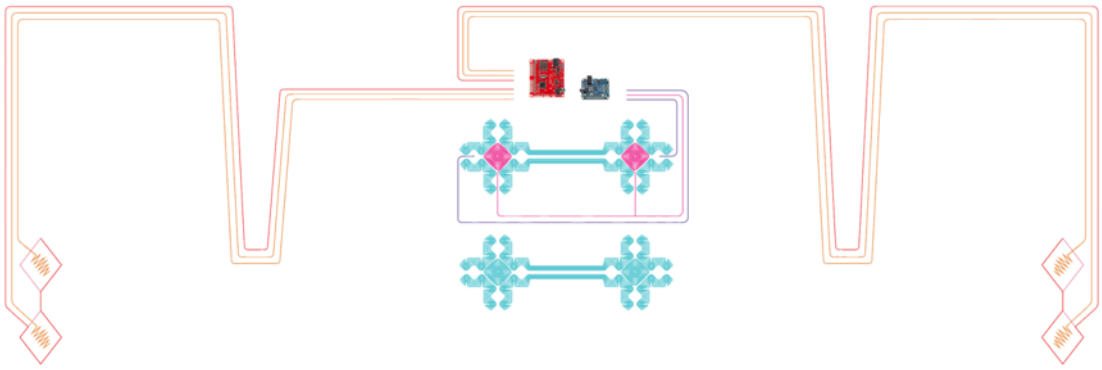


Figure 37 The final circuit diagram sketch on Illustrator

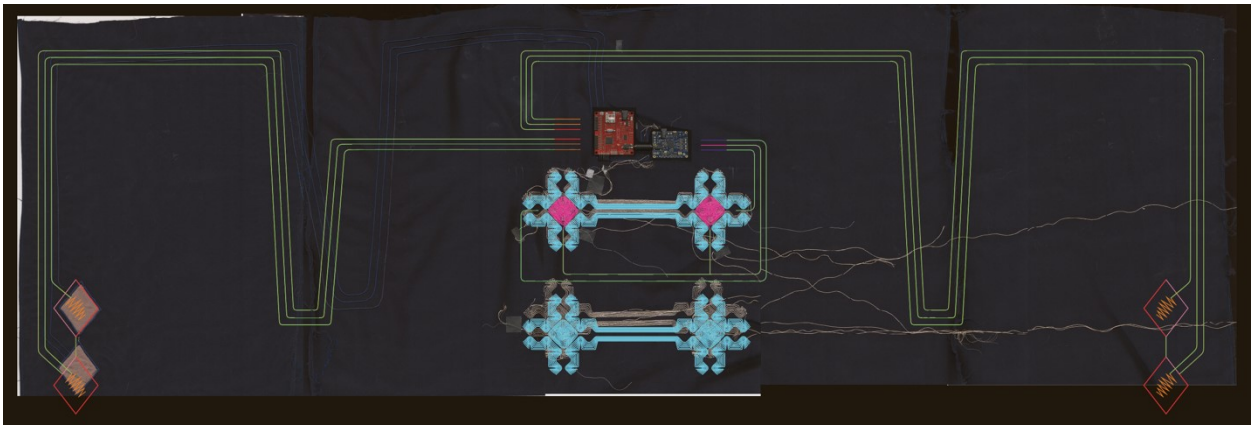


Figure 38 Fabric speakers embroidered on the duplicate garment. The embroidered garment was then scanned in three dimensions and exported to Photoshop to allow the digital superimposition of the electronic circuit diagram to figure out all the exact technical and aesthetic specs needed for final implementation.

At this time, a replica of the felted garment was developed in satin, purposely for the next round of testing and prototyping, to finalize all technical and aesthetic specifications for final implementation. The duplicate garment informed the design process of the electronic circuit with accuracy and precision, and ultimately helped to simulate the final sonic wearable experience. It was later scanned and reconstructed on *Photoshop* to design the electronic circuit, taking into consideration the limitations of the Tajima machine (Figure 38, 39).

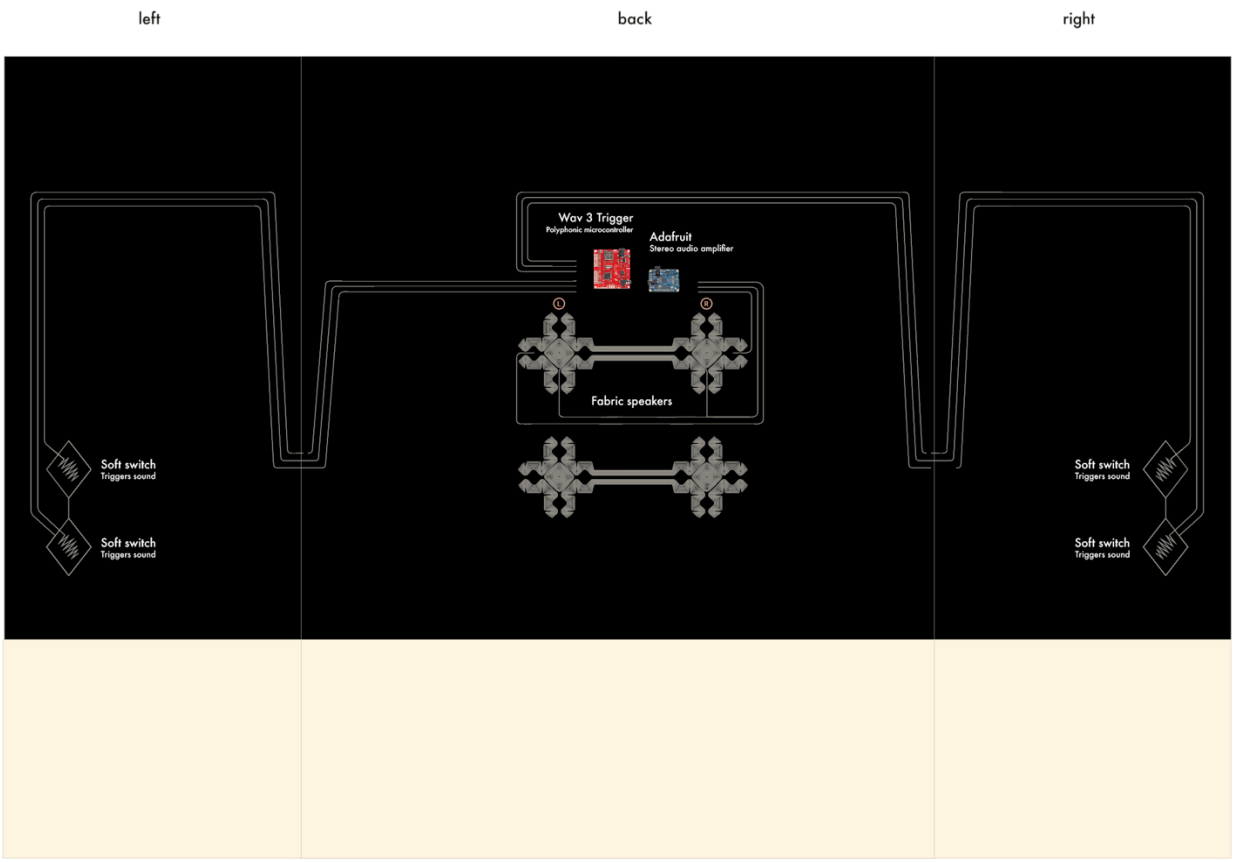


Figure 39 A graphic interpretation of the final circuit diagram (with all its components), soft switches and fabric speakers to be embroidered on the felted garment.

In order for the electronics to work, the circuit would need to be embroidered all across the entirety of the garment, inside and out. In effect, the electronic circuit was 69 x 22.5 inches long. However, the Tajima machine operated within a surface of 44 x 26 inches, insinuating it was impossible to embroider the entire circuit at once. Hence, the process of laying conductive thread needed to be broken down into pieces, and necessitated a lot of planning and speculation on the computer. This was nerve-racking and time-consuming work which necessitated precision. Additionally, a high level of expertise was needed to operate the Tajima machine in such a way that would align the different embroidered sections, so that at the end, the circuit could be uninterruptedly laid with conductive thread.

During this phase, I conducted several other rapid prototypes building up for the final execution. These experiments served essentially as a last round of polishing and testing. Since the surface of the electronic circuit was significant, it was imperative to protect the fragile conductive thread from fraying. A small test was conducted to determine the thickness of the steil stitches and the

soft switches were reproduced with felt in order to finalize their aesthetic details (See Figure 40 and 41).

Figure 40 Steil thickness tests covering conductive thread and soft switches aesthetic prototypes testing different colored stitches

Figure 41 How are soft switches made? On the left: technical diagram of materials involved in a soft switch. On the right: final soft switches on the sonic felted garment

The making of the sonic interface on the Tajima machine

The final laying process was a long operation of over 35 hours, and executed over the course of three separate sessions on the Tajima machine. The first session consisted of laying down the fabric speakers. The second session was dedicated to tacking down the electronic circuit. Lastly, the third session served to put the finishing touches such as the ornamental embroideries and soft switches on the lapels of the garment. In the following section, I will illustrate this operation with a series of photos from these sessions, to provide a glimpse of the determining elements and

moments of production.

The first session entailed embroidering and laying the fabric speakers with the Tajima machine.

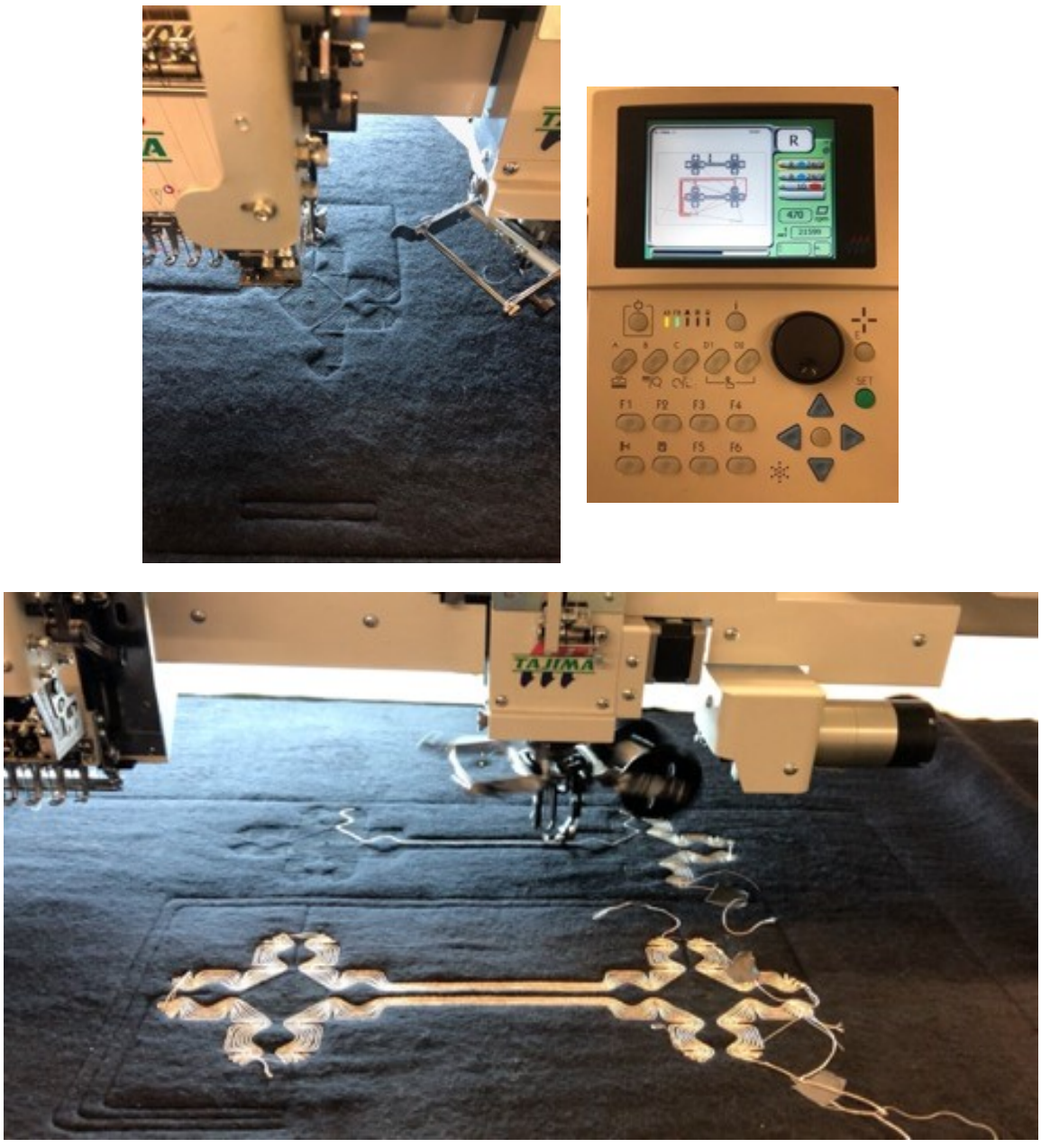


Figure 42 The laying of the fabric speakers with satin stitch first and conductive thread on top

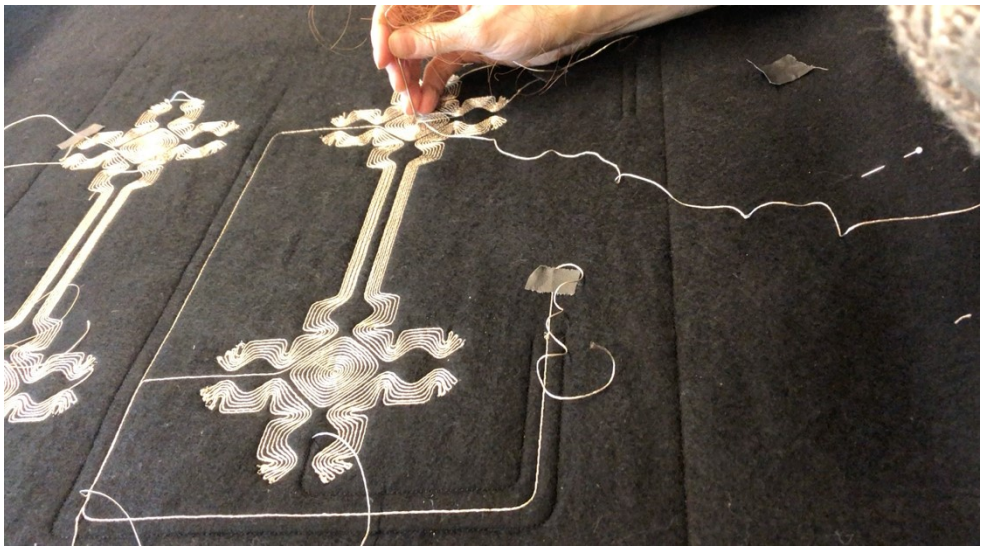


Figure 43 Technician Gen Moisan needling the fabric speaker to separate power and ground threads

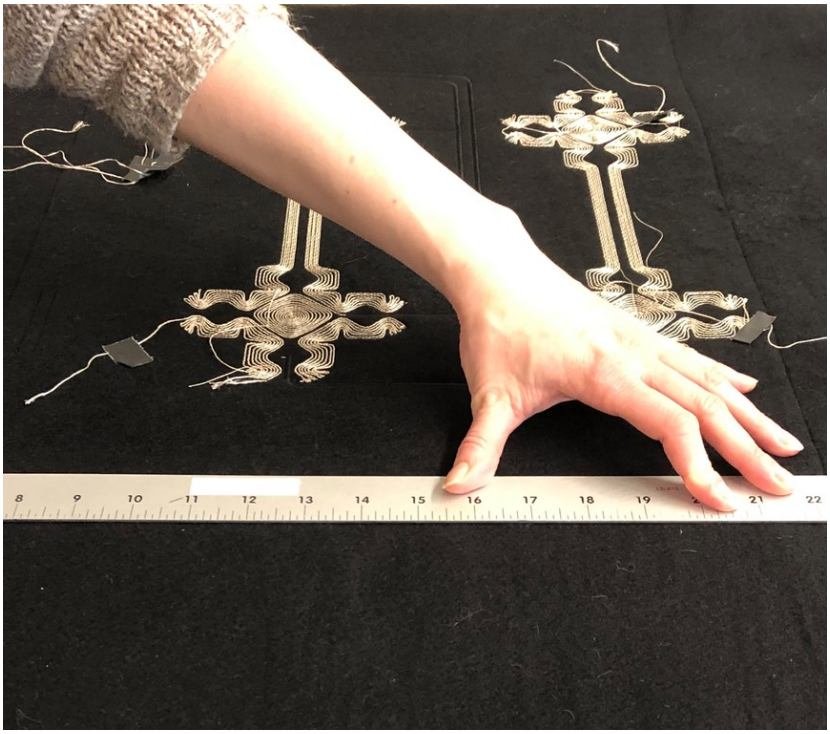


Figure 44 Technician Gen Moisan measuring and aligning the garment in the embroidery hoop in preparation for the electronic circuit

The second session consisted of the laying of the electronic circuit and a part of the soft switches. The electronic circuit was embroidered in two parts as previously planned and prepared during

the experiments. Each side of the circuit included two sets of soft switches and the connections to one microcontroller.

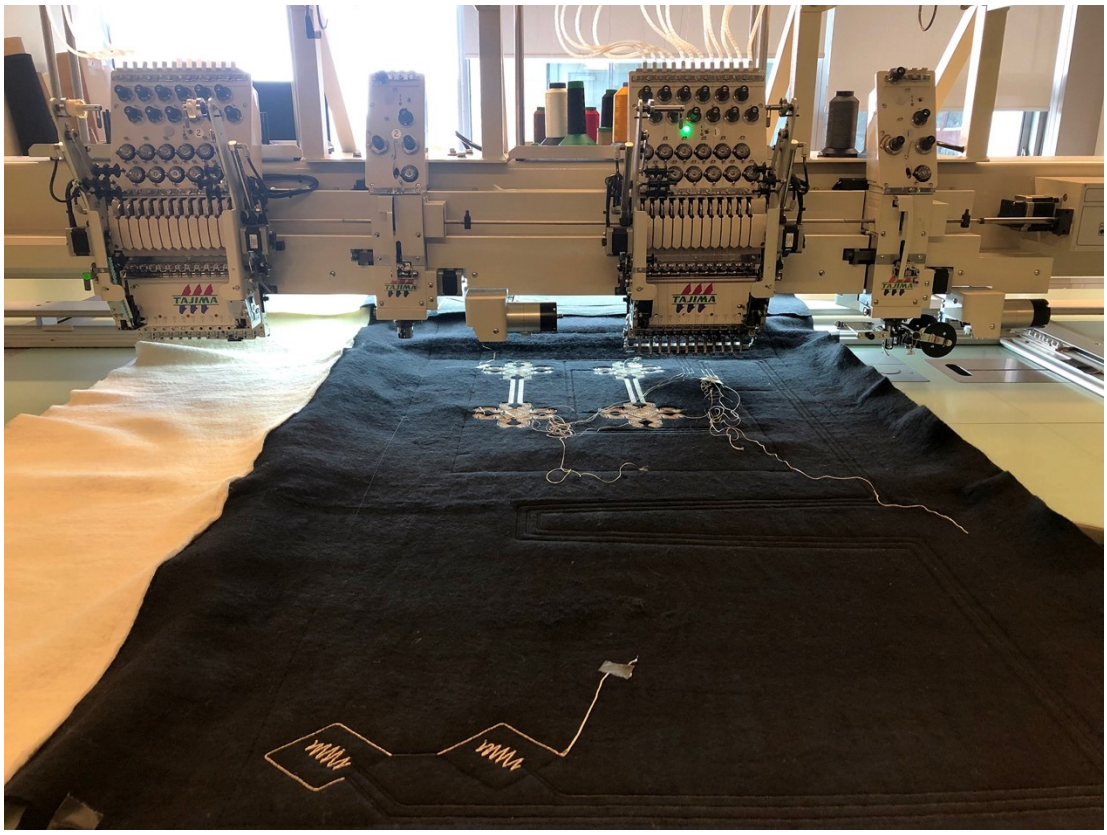


Figure 45 Laying and steiling the electronic circuit

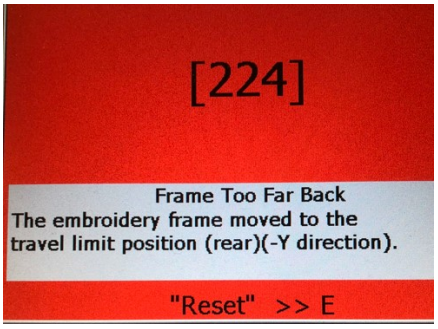


Figure 46 Technician Gen Moisan maneuvering, operating and troubleshooting the Tajima machine.

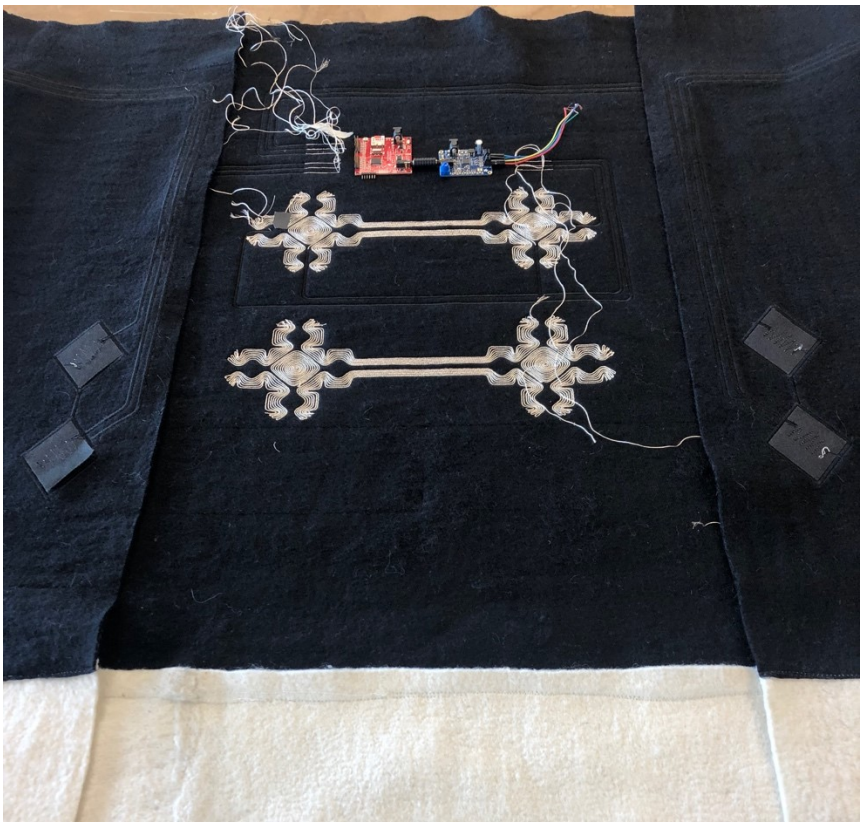


Figure 47 Phase 1 and 2 embroidered

At the end of session two, the entire fabric speaker technology system was integrated, and the electronic circuit with the conducive parts of the soft switches were embroidered on the felted garment. Before moving on to the embellishment phase, I tested the fabric speakers and made sure the electronics were functional as planned.

The third session of embroidery consisted of putting together all the finishing touches. At this point, the ornamental patterns were embroidered on the front lapels of the garment along with the patches of the soft switches.

Wiring the electronics

The following stage entailed connecting the loose conductive threads to the audio player and amplifier. I learnt how to solder and make wire loops to connect conductive thread to the microcontrollers. Essentially, the two speakers were hooked to the Adafruit amplifer. At the same time, the amplifier was connected to the WAV 3 trigger through a male jack adaptor. Both electronic devices were hooked with a two-way splitter power cable which was then plugged into

the power adaptor. Subsequently, the four soft switches were all connected to the WAV 3 trigger, so that, if pressed, they would trigger sound.

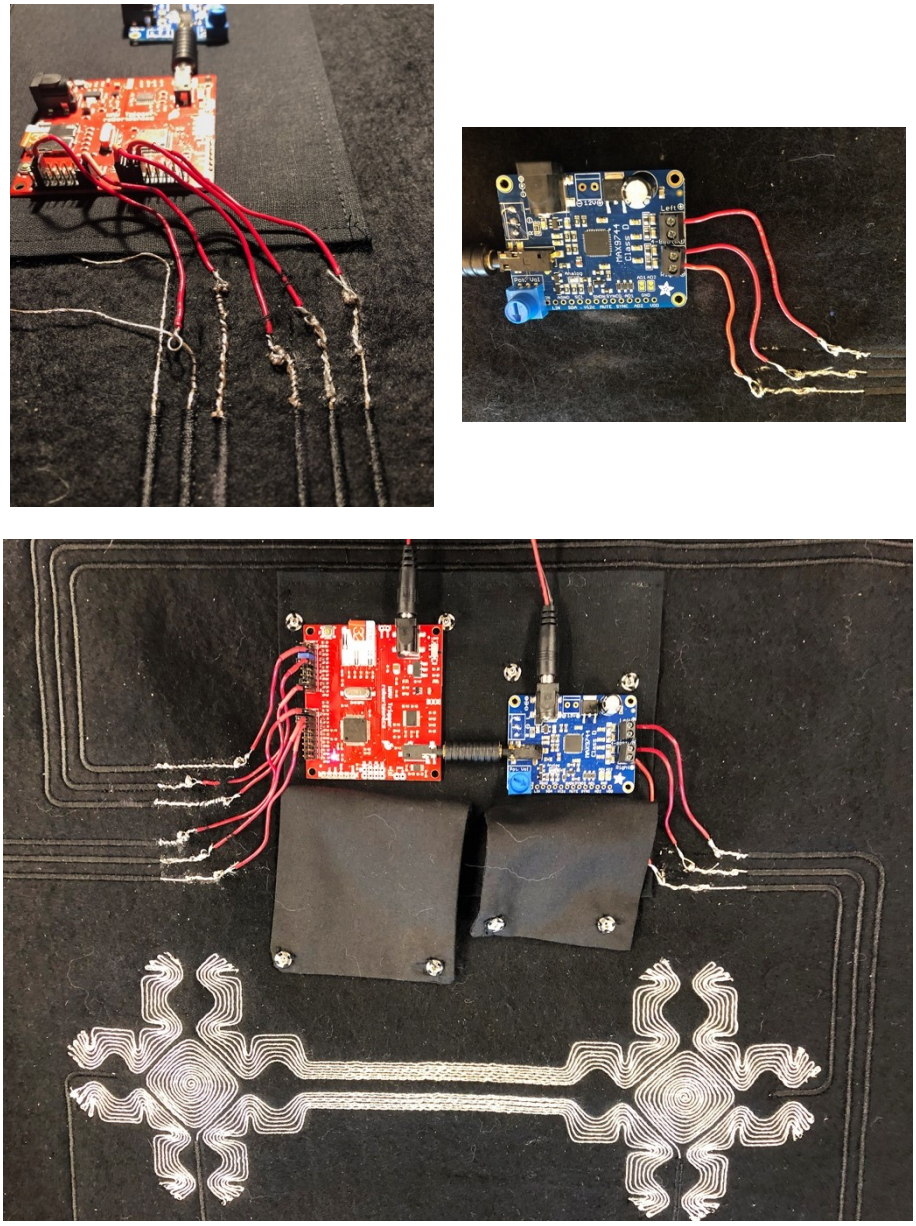


Figure 48 Connecting the fabric speakers to the microcontrollers

At this point in time, supplementary pieces of felted fabric were used to make different sized pockets to house the electronics. For each of the speakers, a set of six rare-earth magnets were inserted in a felted pocket and carefully hand sewn on the felt between the conductive threads.

Additionally, a larger piece of fabric was needle felted right above the speaker circuit to hide the main electronics pouch. At last, the garment was a functional musical instrument.

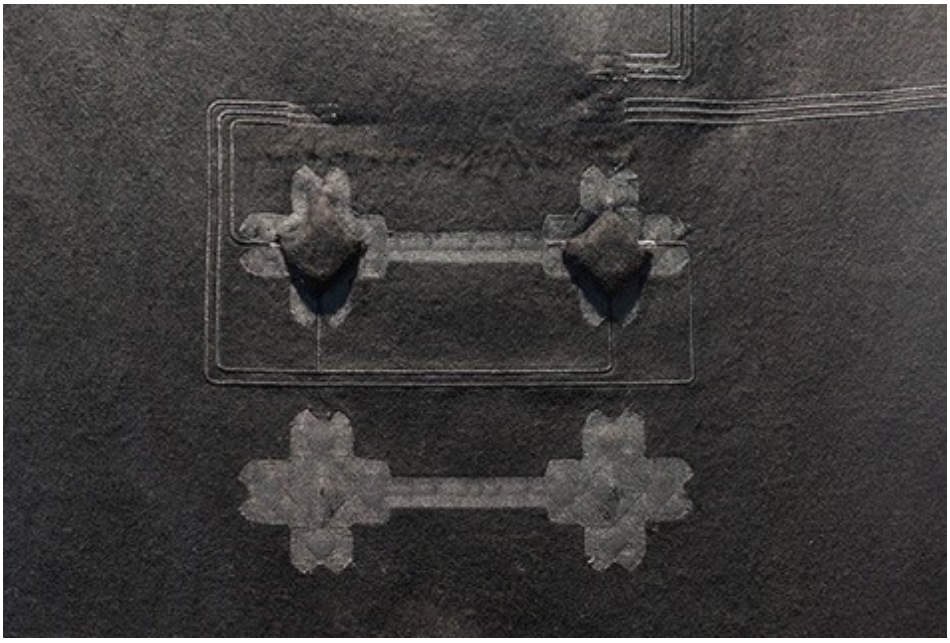


Figure 49 The felted pockets carrying the magnets inside, seen from the back of the cloak

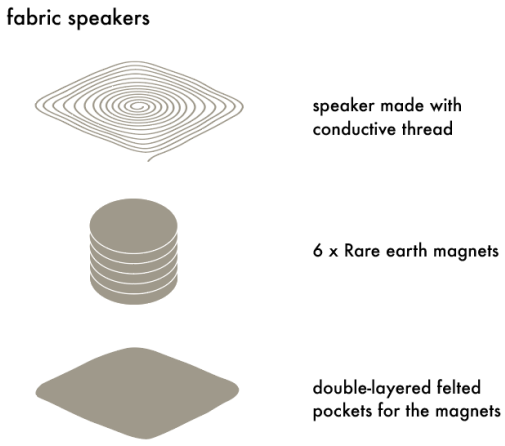


Figure 50 Felted pockets for the magnets

Sound design and production

The sonic experience of this garment was certainly not an afterthought at the end of this "critical making" process. In fact, my exploration with sound design, as well as, my collaboration with Marc-André Cossette for audio production, had effectively begun in tandem with the narrative analysis of Fethiye Çetin's book. With the same iterative approaches applied in the previous chapters, my journey into producing sound came from the desire to evoke a sonic context that could reminisce and commemorate the unknown histories of the hidden Armenians through the act of listening. This sonic context would be created through a polyphonic experience that sought to instill a feeling of being surrounded by a body of sounds that de-territorialize the listener from the here and now. Furthermore, the presence of sound intended to add an additional layer to the overall aesthetic and emotional communication of the garment.

At the beginning of the sound design process, narrated events of Heranoush/Seher's biographical story were selected, organized, and associated accordingly to different sounds. These sounds were used to accentuate the sensorial and affective components of Çetin's story. The narrative analysis produced an initial sound track with a recording of my voice reading modified excerpts from the book, mixed with sound effects and traditional folkloric songs (See Figure 51 below).

Modified excerpts	**Analytic structure**	**Associated sound effects**
My name is Seher and I am a child of Anatolia. All my life, I have been longing to tell this story I never shared with a soul.	Abstract and context setting The beginning of the narrative	Radio recording sample Whispers
Sometimes deep inside, I begin to ache. When my mother wanted us to know that she was in great pain, she would put her hand on her left breast and say, 'I ache here, just around here.' Somewhere deep inside my heart, I ache in just the same way when I think about my mother.	Orientation and flashback The beginning of the narrative	Traditional Armenian folkloric song Whispers Cleaning and swiping sound effects Water running sounds Heartbeats
Did you know that my name is Heranoush? I was born in another family but that was so long ago, before…	Complicating action The turning point of the narrative	Long sighs

Muhtedi is a word for the leftovers of the sword who convert to Islam by force…Muhtedi was written on my birth certificate. Anyway, shall I tell you something? In the place where I come from, it's hard to find anyone without "impure blood" – there's no one with any other kind.	Evaluation The denouement of the narrative	Mosque prayers Market and city soundscapes Fire cracking
One warm day in the spring, the gendarmes raided our village. One of them threw me on his horse and galloped off with me on its back. The roads parted for me and my family, never to come together again. I later found out that they had marched on in the direction of Siverek and eventually found their way to America. I still look at the mountains of Siverek every day and cry.	Evaluation, resolution The denouement of the narrative	Heavy breaths Foot steps Gallops
During the death march, I was taken away by force. They took me to a garden. It was brilliant green. There were eight girls from my village in that garden; all of them had been taken away the way I'd been. I was a girl from a family that had seen the world, and now I was a servant girl who was no longer allowed to speak Hayeren, my mother tongue. I was told to erase my memory and forget who I was before, so I learned Turkish and Muslim prayers quickly, because I wanted to stay alive.	Resolution and recap The ending of the narrative	Distorted birds chirping Traditional folkloric dance song

Figure 51 Sonification of narrated events inspired by Rejnö, Berg and Danielson's narrative structure analysis (2014)

With insights gained from this prototype, the sonic experience was restructured around three main objectives: telling stories, building a spatial and cultural soundscape, and modernizing folkloric music. The latter was possible with the use of machine learning algorithms in the audio production process. The traditional folkloric songs sampled in the previous prototype were reinvented, recomposed, and rearranged in real time with a spatial encoder in MAX MSP software. Nevertheless, the first sound track brought forward the need for more abstraction and

generalization. Hence, Çetin's story was replaced by recordings of informal conversations recounting stories of people searching for the hidden Armenians. To build an intermeshed Armenian-Turkish spatial, environmental, and cultural soundscape, everyday sounds constituted an essential part of the sonic experience (See Figure 52).

Objectives	**Sonic interpretation**
Telling stories about the hidden Armenians	Informal conversations (in Armenian) Whispers (in Armenian and Turkish) Radio recordings (in Armenian)
Building an intermeshed Armenian-Turkish spatial, environmental, and cultural soundscape	Market sounds (in Turkish) Mosque prayers Birds chirping Fire cracking
Modernizing traditional folkloric songs through machine learning algorithms	Ambient instrumental music

Figure 52 The objectives and components of the sonic experience of the Leftovers of the Sword

In addition, auditory content was fragmented into different sound sources in order to create a surrounding experience. In effect, multiple tracks were assigned to the soft switches. Through a multi-layered superimposition of 8 different sound tracks, the wearer would be able to curate their own sonic experience. Each layer of sound was designed to add up on top of the other other in a melodic way, regardless of the order it appeared. The sound volume was intentionally designed to be low enough to reflect the intimate setting needed for these voices to manifest themselves.

Finally, *The Leftovers of the Sword* garment was enjoyed as a visual, tactile, and sonic experience. Together with the story it unveiled, this garment provoked a "paradox of emotion" (Stead, 2005; p. 187) and pleasurable wonder at the same time – almost as though one was wearing a musical instrument. The interactive design of the garment allowed one to physically enter it and envelop themselves within it by fully closing the folds. Alternatively, one could simply peak through into the insides by opening the folds. This intimate experience was captured in the photos below (Figure 53).

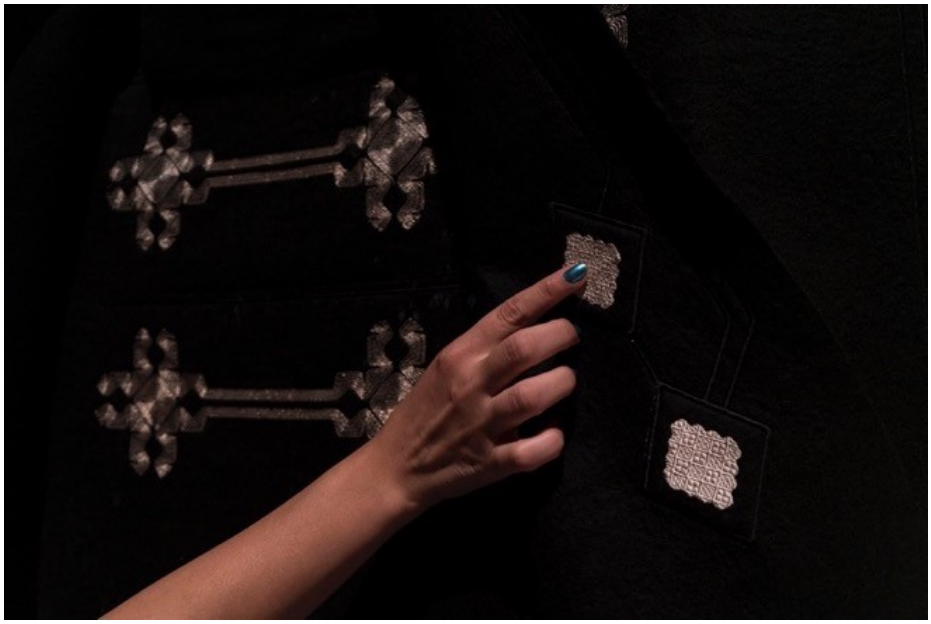


Figure 53 The Leftovers of the Sword – Photography by Agustina Isidori and modeling by Çeyda Yolgormez

REFLECTIONS

When I first embarked on this research-creation journey, I ultimately sought to generate alternative knowledge about a largely unknown part of history by storytelling through socially-engaged and material approaches. My fascination for telling stories with fibers led me to consider the clothed body as an archival interface that could hold the truth of the hidden Armenians. At the same time, my work sought to bring a sense of modernity to the traditional textile practices and technologies of the past. Through this process, I strived to bring innovation to offer new pockets of imagination through materiality, corporeality and sensorial engagement. Hence, my focus on wearable technologies stemmed from the desire to design "a cultural phenomenon, one embedded in social behavior, communication and display" (Ryan, 2014; p.3). With an underlying spirit of poetic social justice, this textile apparatus embedded a system of meaning that created transcendental interpretations of wearable space. As such, *The Leftovers of the Sword* offered the possibility of finding oneself virtually present among hidden Armenians through its sounding textile interface.

The overall aesthetic of the garment was designed to have a spiritualizing and enigmatic quality, with its power lying in the tensions existing between hiding and revealing "cultural signifiers" (Barthes,1983) and mitigating the complex interlacing of Armenian-Turkish identities. These "sublime negotiations" (Carroll, 2017) are quite subtle and more recognizable to those familiar with Armenian and Turkish cultural aesthetics (The Kepenek, for an example, is a well known garment in Turkey). Further, the ornamental embroideries on the lapel of the garment reflect perceptual similarities with Armenian Khachkars[5]. By the same token, the cultural interlacing described above informed the design, development, and integration of the fabric speaker technology in the garment. This is illustrated in the motifs of the fabric speakers and soft switches. Equally, the material technology was designed to be as integrated as possible, with its visible components used as the ornamental elements of the garment. However, the microcontrollers were concealed in fabric pockets and additionally required to be hidden by a layer of felt, due to their susceptibility to physical shock. Inside the garment, the fabric speaker

[5] Khachkars (literally translated from Armenian as cross-stones) are carved stones with Armenian high-crosses and other ornamental motifs such as rosettes, interlaces and botanical motifs. Khachkars are on Unesco's list of intangible cultural heritage since 2010. Today, a large portion of them are endangered in the possession of neighboring Turkey and Azerbaijan, due to an ongoing systematic eradication of Armenian built heritage since the genocide.

technology was almost invisible. On the other hand, in the back of the garment, the traces of the electronic circuit and the felted pockets containing the rare-earth magnets were apparent. As it was black on black, these add-on elements were strategically left to reveal the presence of the fabric speaker technology.

Against this backdrop, the fabric speakers were insulated in an environment fabricated with felt. However, the sound-absorbing qualities of felt proved to be double edged, as volume was compromised in the process of ensuring the electronics were applied in a safe manner. Generally, the materiality of felt contributed intricately to the final outcome on conceptual, aesthetic, technical, and experiential levels. Although felting requires a considerable amount of work, when successful it can produce a very resilient and durable fabric. Conceptually, the process of compressing felt and recurring pressure to permanently mesh the fibers, can be compared metaphorically to the forced assimilation of Armenians into Turkishness, the result of which produced a dense demographic of individuals interlocked in a compressed existence over many years. The use of felt specifically helped add an additional layer of cultural durability and resilience to the garment. Technically, felt was beneficial to constructing emotional scenarios in three dimensional spaces, and enhanced the narrative and aesthetic communication of the garment. Evidently, the corporeality of felt was increasingly palpable due to the large scale of the garment. The latter encoded with sonic material had a soft yet wrinkled surface with edges that were naturally formed during the felting process.

Nevertheless, the marriage of concept, material, technique and process was accomplished through the interdisciplinary nature of my work which consisted of a series of complex yet divergent investigations. As a graphic designer and a visual artist, materializing this sonic garment necessitated skills that were outside my existing areas of expertise. However, driven by the aesthetic and conceptual narrative of the garment rather than the choice of technology, I embarked on an experiential learning journey to meet my different research objectives. In this process, I gained knowledge and new skills. Naturally, an iterative design methodology emerged which simultaneously defined my work and informed the concept, context, and use of technology (Stead, 2005). The crux of my “critical making” relied firstly, in planning and constructing prototypes to hone my understanding and learning curve in diverse practices such as garment construction, felting, electrical circuitry and wearable computing. Secondly, these investigations helped me to experiment to find alternative design solutions to the technical problems I was confronted with. On a personal level, designing outside of my comfort zone allowed me to be self-reliant and bolder in my design decisions. Beyond that, I enjoyed being an avid learner and felt empowered with the acquisition of technical skills. However, my working method of designing by learning proved to be quite challenging in varying aspects. Despite at

times struggling as a result of tight time frames and a lacking in material and technological understanding, it also taught me to rely on the expertise of others for collaboration and technical guidance.

I am grateful to have been able to work with lab technicians who were instrumental in my learning journey. Each one of them, in their respective areas of expertise, facilitated the development and implementation process during the different phases of "critical making". Notably, reflective conversations and troubleshooting technical problems together with the technicians contributed a great deal to the design process, all the while maintaining my creative autonomy. It was a truly enriching experience to have access to state of the art equipment and be surrounded by talented researchers and practitioners. At times, however, with the looming pressure of tight deadlines, it was frustrating to rely so heavily on the resources of the labs to get my work done. For an example, the simple task of booking my time slot on the Tajima machine was often a complicated process that needed to be coordinated on many levels. Similarly, the practical execution of the project seemed to be subject to the availability of the lab technicians.

On a technical level, most difficulties tended to stem from the desire to generate a decent volume and quality of sound. Most of the conceptual and aesthetic compromises and technical experimentations were to achieve a polyphonic sonic experience. Throughout my experiments it was deduced that if more than four tracks are mixed together, the rate of distortion is higher, and as a result the quality of sound is compromised. The result is that the final sonic performance of the fabric speaker technology is not without faults, including the fact that at times there is a delay between the pressing of the soft switches and the activation of sound.

In general, *The Leftovers of the Sword* was met with a positive response, inciting people's curiosity. This conceptual show piece evoked an array of conversations, in which people expressed further interest in hearing and learning about stories of the Armenian Genocide. This suggests that the garment succeeded in engendering a significant social and cultural impact. One constructive critique that seemed to be unanimously echoed was that it was unclear to people how sound could be activated without being explicitly told what instructions to follow. I therefore concluded that, alongside descriptive curatorial texts, other creative ways of engaging an audience to optimally explore and interact with the garment would need to be conceived and put to the test.

One of the most fascinating outcomes that resulted from the dissemination of this research-creation to a larger audience, happened during my talk at Mutek in September 2019 when I met, amongst the audience present, a person who had once been a hidden Armenian. Here we were, in Montreal, miles away from their native land, and my work on representing stigmatized identities

through wearable sound had been able to connect me with someone whose history had been the protagonist of my work. This not only brought the project full circle, but it also brought me, in turn, a sense of unparalleled gratification and fulfillment.

CONCLUSION

A century after the genocide, the scattered nation of Armenians is on the path to resolving past traumas, all the while searching for a more global and inclusive cultural identity. As a diasporic Armenian myself, this thesis attempts to contribute to this shared quest through my own voice. By using "the language of cloth" (Nickell, 2015; p.236), I weave together stories that can bring new perspectives, critical reflections, and social commentaries on complex Armenian historical, cultural, and political issues. My initial explorations stemmed from the desire to uncover innovative modes of cultural transmission that can articulate "bits" and capture the "feel" of Armenian culture with social justice approaches (Bateson, 1987, p. 84). This early stage of the research strived to curate and design cultural information as non-linear, stratified and self-organizing communication systems that are negotiated onto material and physical objects (De Landa, 1997).

The next phase of research sought to regenerate stigmatized facets of Armenian identity and declining textile heritage through research-creation and the use of contemporary technologies. The art of storytelling stretched further to embody corporeality and sensory engagement. These stories were contextualized on the clothed body using textiles sonically enhanced with wearable technologies. It was at this point that the subject matter of the hidden Armenians came to be the focus of the research-creation project at the core of this thesis. Accordingly, I explored how such textiles could represent invisible struggles through wearable sound. Using tactility and sonification, I attempted to transform the clothed body into a safe dwelling space in which hidden Armenian identities could manifest themselves inside a cloak of Turkish origin.

Through a practice-based and practice-led process, my work evolved with an iterative design methodology that combed craft and technology as a creative process to interweave interactive storytelling and textile design. Nevertheless, the marriage of concept, material, technique, and process was achieved through an overlapping series of empirical investigations and iterative prototyping, or what I refer to as "designing by learning". Knowledge produced was thoroughly assessed, evaluated, and integrated, prompting either a return back to research, or up to the next cycle of "critical making" until the desired outcome was achieved.

Two opposite approaches orchestrated the design and fabrication process which consisted of negotiating a set of compromising decisions that would define the final form of the garment. One entailed relying on technological functionality to configure the design of the garment, and the other prioritized aesthetics and semiotics over the latter. Within this context, my aim was to also mitigate the technical limitations and affordances that emerged out of the interlacing of artisanal

textile practices with electrical engineering and wearable computing. Nonetheless, the integration of technology in this project was acceptable, and succeeded in augmenting the garment's potential for communication. At the same time, *The Leftovers of the Sword* accomplished its main purpose of consciously embedding semiotic, visual, tactile, and acoustic cultural information. Through this thesis, I hope to transfer the knowledge I gained as a result of my research-creation with the "articulation, explanation and documentation of my process as methodology" (Stead, 2005; p 206) to other practitioners and researchers also interested in experimenting with wearable sound.

By delving into Armenian cultural histories, my intention was to bring intangible elements from both the past and present to produce an immersive experience that offers forms of relational, emotional, and spatial knowledge. In this thesis, I operated from the starting point of wishing to explore possible desirable futures, rather than offering any concrete, set-in-stone solutions. My work therefore seeks to inspire new questions and ideas on the different ways research-creation can engender alternative modes of cultural durability and transmission.

In closing, I find it apt to recite a traditional ending to many Armenian fairy tales that poetically reflects the nature and purpose of this work: "Three pomegranates fell down from heaven: one for the story teller, one for the listener, and one for the whole world".

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