I Just Wanted to Make a Pillow That Would Talk to Me

by

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Abstract

I Just Wanted to Make a Pillow That Would Talk to Me begins with a discussion of the rise in perceived isolation and paradoxical methods of treating loneliness, which is caused in part by less meaningful interactions through the use of technology, with social media platforms and sociable robots. This theoretical framework provides the context for *The Ultimate Pillow*, designed as an intervention in how technology is training us to be alone. The thesis presents *The Ultimate Pillow,* which offers emotionally supportive statements at the press of a soft fabric button as well as a visualization of volume when yelled into, as an example of critical design. By employing humor and an unexpected vocal response, the pillow encourages reflection and sparks debate about the implications of using connective technologies as a substitute for human interaction. Additionally, the text explores materials, Ardunio components, the design of *The Ultimate Pillow*, and the 2018 UC Davis MFA exhibition along with plans for future development.

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Introduction

As the presence of technology becomes more pervasive and principally since the advent of the mobile smart phone and social media platforms, communication has become less meaningful (Turkle 15). While the intentions of technological development are predominately aspirational, technology is conditioning us to be alone. Many people turn to social media or cultivate surrogate and parasocial relationships to try to achieve a desired level of social contact. Activity on social networks is equated with connection and friendship, yet this "connection" happens while we are alone, gazing at the screens of our various devices. Social media platforms provide the illusion of companionship as posts are confused with authentic communication (Turkle 1).

We try to paradoxically treat the symptoms of loneliness with more technology instead of addressing the social disease of decreasing empathy, the effects of the ideology of individualism which enforces and celebrates our social isolation, and the use of social media as a destination instead of a way station to facilitate actual social interaction. *The Ultimate Pillow* was created to raise awareness of the various ways in which technology is being employed in daily life as a substitute for genuine human contact.

This pillow has been enhanced with sensors, code, and micro-controllers, allowing it to offer words of encouragement when touched, to provide an engaging multi-colored LED volume meter when yelled at, and to play consoling messages when cried upon. The pillow is simultaneously humorous, therapeutic, and disconcerting. It is initially humorous or therapeutic but becomes tedious the repetition of inauthentic emotionally supportive statements. This interactive comfort object is intended to stimulate discussion and reflection about the ethical and social implications of existing and emerging technologies.

Section 1: Theoretical Framework

Technology Is Training Us to Be Alone

Advances in technology such as the invention of computers, the internet, mobile devices, and fitness trackers have had a huge impact on the way we communicate, work, and care for ourselves. The benefits of technology are numerous. Telecommunications have brought medicine to rural and underprivileged communities, the world is easier to navigate due to geolocation and mapping services, and telecommuting, which reduces pollution, has grown by 115% since 2005, nearly ten times faster than the rest of the workforce. (Lister)

Technology has enabled automation of many interactions which used to involve people. Voice response systems are used in customer service, auto-checkout lanes are increasingly used in grocery stores, and robots deliver food. Virtual assistants make appointments, anticipate needs, and sometimes even banter in conversation. Interaction with technology is not new but advances in Artificial Intelligence are greatly accelerating the ways in which technology is incorporated into daily life.

New connective technologies have had unintended consequences on the meaningfulness of interpersonal communication. In her 2011 book *Alone Together: Why We Expect More from Technology and Less from Each Other*, professor Sherry Turkle discusses how current technology is undermining human connection. She proposes that convenience and control are prioritized while diminishing the expectations human beings have of each other.

While we desire human contact, digital alternatives offer a seductive uncomplicated and non-transactional solution. We are lonely but fearful of intimacy. (Turkle, p. 1) Interpersonal relationships are messy - fraught with uncertainty and complex emotions. Technology offers dependable and consistently available interaction. It is easier to check social media than it is to

call a friend. This has resulted in more aspects of our lives becoming digital, which has subsequently reduced opportunities for social contact. (Allen) Digital interactions offer inauthentic and unfulfilling ways of communicating which contributes to a perceived sense of loneliness. We also have less physical contact with each other which is really important to us as a social species.

The short film, *I Forgot My Phone*, written by Charlene deGuzman and directed by Miles Crawford, offers an excellent distillation of the phenomenon. A woman navigates several experiences without a mobile phone and her lack of a phone draws attention to how much the people around her use their phones. When exercising on a trail, her sojourn in nature is ruined by a man having a loud, inane phone conversation nearby. At brunch, she is excluded and then ignored as others at the table all check their devices. People are more concerned with their online presence as opposed to being present. The film is bookended by scenes of a couple in bed cuddling, an intimate moment ripe for connection with a loved one, yet our phoneless heroine is ignored again as her partner stares vacantly at a screen.
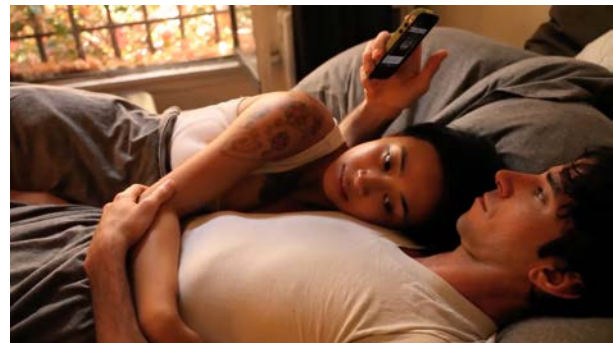
1 - deGuzman, Charlene. "I Forgot My Phone." YouTube, uploaded by charstarleneTV, August 22, 2013, https://www.youtube.com/watch?v=OINa46HeWg8

The scenarios in the film are familiar. The careless use of benign or helpful technology has become detrimental to personal relationships by undermining meaningful and connected conversations, contributing to the rise of loneliness.

Loneliness and Perceived Social Isolation

Psychologists define loneliness as a subjective, unpleasant experience that occurs when the desired level of meaningful social contact is less than what is available (Mann). Loneliness is a growing epidemic and a major public health issue (Adams). Since the 1980s, the percentage of American adults who say they're lonely has doubled from 20 percent to 40 percent (Khullar). In the US, loneliness affects one-fifth of the population. In the UK, it is experienced by more than a third of those over the age of 50 (Allen).

John T. Cacioppo, award-winning psychologist and an expert in social neuroscience until his death earlier this year, emphasized that the subjective sense of feeling loneliness or perceived social isolation is the most disruptive (Bergland). In an interview with Atlantic Magazine in 2017, Cacioppo states that, "being with others doesn't mean you're going to feel connected and being alone doesn't mean you're going to feel lonely... we need to take objective isolation and perceived isolation and separate those two." (Khazan)

Being surrounded by friends and family does not guarantee immunity from loneliness if the relationships are missing a strong emotional connection. What contributes most to perceived loneliness is the quality of these relationships and how meaningful they are to the individual. In either case, actual social isolation and perceived social isolation have the same ill-effects on the body and brain (Cacioppo & Patrick).

Loneliness causes an immediate and severe bodily reaction. The effects of loneliness are physically associated with a greater risk of high blood pressure, high cholesterol, cardiovascular disease and stroke, diabetes, increased stress levels, and inflammation in body. Psychologically, loneliness activates our stress responses, contributing to a greater risk of dementia, depression and anxiety, decreased memory, decreased learning, poor decision-making, antisocial behavior, depression, and suicide (Cacioppo & Patrick).

The conversation about loneliness is getting louder and people in government and healthcare are listening. In January of 2018, the UK appointed its first minister of loneliness and has developed several initiatives such as the Campaign to End Loneliness to improve quality of life for those suffering from chronic loneliness and to raise awareness about the issue (Hafner). Dr. Sanjay Gupta's initiated the "Just Say Hello" campaign encourages people in the U.S. to find more connections in their daily interactions. The Foundation for Art & Healing started the UnLonely Film Festival which aims to provide a sense of connectedness through creative expression (The Foundation for Art & Healing). The Loneliness Project features studies of loneliness through interactive storytelling in the hopes of building empathy and growing kindness (The Loneliness Project).

The effectiveness of digital initiatives has yet to be determined. "Our culture increasingly demands instant gratification and immediate relief," writes New York University Psychotherapy and Psychoanalysis Professor Galit Atlas in a 2015 New York Times article. She concludes by stating that there is no adequate substitute for human interaction (Atlas).

Paradoxical Remedies for Loneliness and Perceived Isolation

While lonely people desire authentic connection and human interaction, many turn to easily accessible digital alternatives. Turkle postulates that the use of social media platforms as well as the increasing use of anthropomorphized consumer products such as the Furby and interactive therapeutic companions such as the PARO robot, is providing a way to navigate intimacy by skirting it. She believes we are settling for interactions with technology rather than through technology (Turkle, p.138).

In his interview with Atlantic Magazine in 2017, Cacioppo states that "If you use digital connections as a way station—kids tend to do this; they use Facebook so that they can then meet up somewhere—it's associated with lower levels of loneliness. If it's used as a destination—and ironically, lonely people tend to do this, they tend to withdraw socially because it's punishing, and interacting digitally perhaps as a non-authentic self, makes them feel more like they're accepted. But it doesn't actually make them feel less lonely" (Khazan).

In fact, data shows that people who spend more than two hours a day on social media have twice the odds of perceived social isolation than those who spend half an hour per day or less on those platforms. Fifty-eight visits per week or more, results in three times the odds of perceived social isolation than those who visit fewer than nine times per week (Primack).

Compounding the effects of time spent on social media platforms, evidence suggests that if face-to-face communication is not practiced, important social skills are lost. In a 2014 UCLA psychology study, researchers discovered that when children are indulged in extra screen time on smartphones, tablets, or otherwise, it resulted in lessening their ability to read human emotions (Uhls). Social media is making us lonely and time spent gazing at screens is making it harder to engage in meaningful communication in the physical world.

Social media platforms are not the only contributing factor to the decline in ability to empathize (Konrath). There has been a marked increase in documented parasocial relationships used as a form of social surrogacy. While parasocial relationships are not new, access to the internet has increased the opportunity to develop these one-sided pseudo-relationships.

Mukbang or social eating videos, first arose in South Korea in 2014 and has since taken the U.S. and other countries by storm (Choi). Large qualities of food are consumed while talking to the camera. In a 2017 article in Eater, author Amy McMarthy explores the popularity of these viral videos. Her interviews reveal that loneliness due to the lack of a dinner companion is the main reason for the appeal. Mukbang videos fill "a void" (McCarthy).

Unboxing videos on YouTube have soared 871% Since 2010. Research shows that people watching the unboxing videos feel as though they are getting to know the person doing the unboxing while also learning about the product. These relationships have been described as feeling effortless as the tension, anxiety, or discomfort that can accompany certain social situations is eliminated (Choi). Studies show that while parasocial relationships temporarily alleviate feelings of perceived isolation, they ultimately prove to worsen the condition (Wang).

As fundamentally social beings, meaningful connections with others is required to maximize health and well-being (Cacioppo). People who have fulfilling ties to family, friends, or coworkers have a fifty percent greater chance of outliving those with fewer social connections (Gupta). The Ultimate Pillow was created in an attempt to draw attention to this paradox of using technology as a substitute for human interaction which then only worsens the perceived sense of loneliness. The pillow is initially humorous or therapeutic, but one quickly tires of the generic, inauthentic emotionally supportive statements thereby The Ultimate Pillow becomes a tool to challenge norms.

Section 2: *The Ultimate Pillow* as Critical Practice

In *Speculative Everything: Design, Fiction, and Social Dreaming*, Anthony Dunne and Fiona Raby state that,

> the term critical design grew out of our concerns with the uncritical drive behind technological progress, when technology is always assumed to be good and capable of solving any problem. Our definition then was that critical design uses speculative design proposals to challenge narrow assumptions, preconceptions, and givens about the role products play in everyday life (2013, 260-262).

Building on the work of Dunne and Raby, Matt Malpass defines three distinct categories of critical practice in his 2017 book *Critical Design in Context: History, Theory, and Practices*. The first category Malpass define is associative design, "which takes a critical view of the design discipline itself by offering a criticism from within design the design practice." The second category defined is speculative design "which is concerned with the projection of sociotechnical trends and developing scenarios of product roles in new use contexts. It is linked to futures, scenario building, and technoscientific research." The third category of critical practice that Malpass defines is critical design which "focuses on present social, cultural, and ethical implications of design objects and practice and that it challenges conventional approaches in designing human object interactions. Humor is important in critical design but satire is the goal" (pp.102-107).

Based on the categories defined by Malpass, *The Ultimate Pillow* is an example of critical design as, through satire, it presents a commentary on the current way technology is substituted for human interaction and the impact that inauthentic communication has on loneliness, empathy, and society. The pillow also challenges recent approaches to the design of smart objects and products of the Internet of Things phenomenon. Perhaps in an

environment where sensors are embedded in a Kérastase hairbrush to provide feedback on correct brushing techniques or where a Griffin Technology Bluetooth toaster, called the Connected Toaster sends a notification when toast has reached a desired level of crispiness, a talking pillow is not absurd. The pillow functions as both a critique of and a product of the do-it-yourself Internet of Things trend as the components used to make it only exist due to the demand from the Maker Movement.

The Ultimate Pillow takes the shape of a familiar non-threatening object. It is thoughtfully crafted to hide its technology. Associations are evoked of home and childhood. Pillows are often transitional objects, used to provide psychological comfort in difficult times especially in childhood as greater independence is achieved (Winnicott). Pillows are also used as surrogates such as the Dakimakura pillows in Japan or the somewhat popular girlfriend and boyfriend pillows. Having the pillow look appear as an ordinary pillow, but then discovering the interactive features may prompt the participant to ask – What should a pillow be? Is this useful? Would I want this?

In *Speculative Everything*, Dunne and Raby write,

> the viewer should experience a dilemma: is it serious or not? Real or not? For a critical design to be successful viewers need to make up their own mind. It would be very easy to preach: a skillful use of satire and irony can engage the audience in a more constructive way by appealing to the imagination as well as engaging the intellect. Deadpan and black humor work best but a certain amount of absurdity is useful, too. It helps resist streamlined thinking and instrumental logic that leads to passive acceptance; it is disruptive and appeals to the imagination (2013, pp. 319-324).

2 - Hizamakura Lap Pillow, The Girlfriend pillow, and The Boyfriend pillow.
See references for citation information.

Mimicking both the transitional object and a surrogate, the pillow disarms the participant and then surprises them with a vocal interaction. The spoken phrases are complimentary, humorous, and are directed to the participant by using YOU, as in "you are an amazing friend." The phrases, while initially humorous, do not address or treat any underlying issues or symptoms of loneliness; rather they are generic and serve to merely stroke the ego. The participant may feel an emptiness when this is realized, echoing the perceived loneliness experienced people feel when disappointed by interactions on social media platforms.

In *Hertzian Tales*, Dunne states that,

> critical design allows the user to participate in situations that encourage reflection on the socializing effect of our encounters with everyday electronic products. It does this not didactically but in a more ambiguous and indirect way... electronic objects generate a conceptual space where interactivity can challenge and enlarge the scheme through which we interpret our experiences of using everyday electronic objects and the social experiences they mediate (Dunne 81).

The pillow was created to be both therapeutic and ironic. The tension between both domains creates a critique, a dilemma, and opportunity for reflection. The pillow utilizes what Anthony Dunne in *Hertzian Tales*, refers to as "para-functionality - a form of design where function is used to encourage reflection on how electronic products condition our behavior. (Dunne 43)

The pillow is light-hearted, humorous, and well-intentioned. In *Speculative Everything*, Dunne and Raby write,

> Critical design is positive and idealistic because we believe that change is possible, that
> things can be better; it is just that the way of getting there is different; it is an
> intellectual journey based on challenging and changing values, ideas, and beliefs. Here,
> there is a particular focus on how designers marry product design practices with satiric
> narratives to create dark, humorous, and often ambiguous objects that encourage
> users to engage with themes critiqued by the designers.
> (Dunne & Raby 2013, pp. 280-283)

An influential artist currently working in critical design is Kelly Dobson. In her series Machine Therapy, Dobson explores the "co-evolution of people and machines as companion species. The machines have expressive engaging behaviors, strength of character, and neurotic propensities (Dobson)."

3 - Dobson, Kelly. "OMO" YouTube, uploaded by oceanoperdido, 21 Spetember, 2010,
https://www.youtube.com/watch?v=YiG49OPq0qY

Omo is an egg-shaped machine with a soft rubber exterior that matches its breathing to a participant's, eventually synchronizing man and machine to a point where they can feed off each other. "It is interesting and important to think how our machines socialize us, teach us about ourselves and participate in our formations of our own places in the world," Dobson

says. "And this usually happens without us having any idea consciously that we are participating with machines, learning from them" (Ganapati). Dobson draws attention to how easily conditioning by machine occurs.

The second project in Machine Therapy is *Blendie*, a voice controlled Osterizier blender. To make it work, one must imitate the sounds of the motor, low guttural sounds for a soft blend and high shrill sounds for fast blending. The users must speak the language of the machine and connect with it on a more personal level (Ganapati). To use *Blendie*, one must step away from a simple switch mechanism and into a more uncomfortable performative space. It calls into question interactions with other machines and makes one reflect on the language of surrounding mechanical devices and the nature of language itself.

4- Dobson, Kelly. "Blendie: a voice controlled blender." YouTube, uploaded by akiin, 1 March, 2006, https://www.youtube.com/watch?v=6DDkwdPaYmk

Most related to *The Ultimate Pillow* is *ScreamBody,* a portable space for screaming where users can vocalize their emotions. One carries the *ScreamBody* on the person and when the need to scream arises, the soundproof *ScreamBody* is lifted to the mouth and stores the scream for release later. It acts as a psychotherapeutic outlet, personalizing the machine for the user (Ganapati). *ScreamBody* is both a therapeutic device and an ironic commentary on

social anxiety and the frustration of being a woman. It is not ladylike to scream or to show

frustration (H. Sherrie).

6 - Dobson, Kelly. "Screambody." MIT Media Lab, 2004, http://web.media.mit.edu/~monster/screambody/

5 - Dobson, Kelly. "Screambody." YouTube, 8 April, uploaded by stanfordblog, April 8, 2007, https://www.youtube.com/watch?v=6DDkwdPaYmk

The voice of *The Ultimate Pillow* is female and creates a dialog about the role of women as

caregivers, the gendered roles of virtual assistants, and the way in which femininity is

stereotyped. Service work, domestic labor, healthcare, and office assistants are heavily

feminized and are also often low paid and low status. Caregiving in particular is highly

feminized and underpaid (Weinstein). An estimated 66% of caregivers in the United States are

female and the average caregiver is a 49-year-old woman who works outside the home and

provides 20 hours per week of unpaid care to her mother. Although men also provide

assistance, female caregivers may spend as much as 50% more time providing care than male

caregivers. (National Center on Caregiving)

The Ultimate Pillow poses the question of whether the voice should be female and how this

effects the participant. How would the pillow be different if a male voice was used? Should

gendered roles be reevaluated?

Section 3: Materials and Technology Research

Soft Circuits

Utilizing a soft circuit for the button that would trigger the audio would enable this interactive pillow to look and feel identical to a normal throw pillow. The fabric button consists of two pieces of conductive material separated by a thicker, non-conductive piece of perforated fabric. The first piece of the conductive fabric is connected to ground via wires or conductive thread and the second is connected to power. When pressure is applied, the conductive fabrics touch and the circuit turns on.

7 - DIA. "Make Your Own Button." Sparkfun Electronics, https://learn.sparkfun.com/tutorials/ldk-experiment-4-make-your-own-button

8 - First soft fabric button

Conductive Fabric

The three main suppliers of conductive fabric are Adafruit, Sparkfun, and LessEMF. The latter sells materials to those who battle electromagnetic sensitivity and has an abundant selection of products including conductive tape, yarn, plastic, and various kinds of fabric. Several fabrics were sampled and although they had different levels of resistance and conductivity, each performed adequately in the fabric button. Short circuits can occur due to fraying as every loose thread is equivalent to a live wire. CIRCUITeX™ was initially used but this fine, slippery metallic fabric would get stuck in the throat plate when sewing. Placing tape over the stich plate offered one solution. SOFT&SAVE™ fabric was used later in development.

10 - Fraying conductive fabric
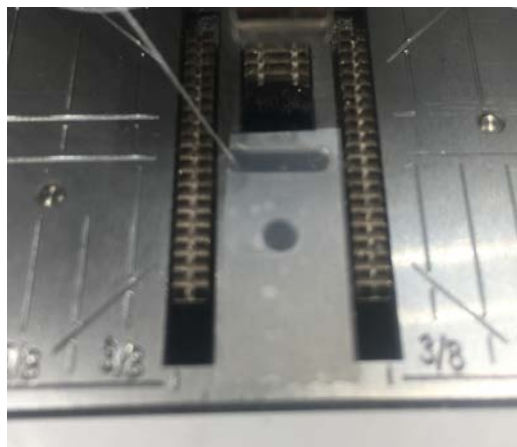
9 - Tape over the throat plate

Fabric and Conductive Materials Research

CIRCUITeX™
Pure Silver coated nylon.
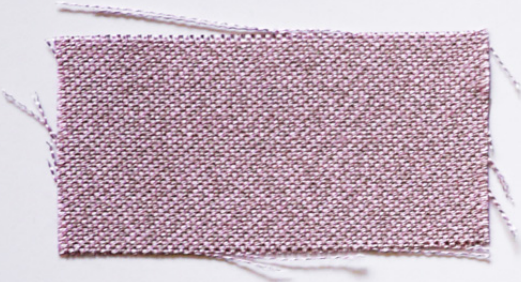Highly conductive (<0.2 Ohm per sq) on both sides and nearly 70 dB shielding from at least 1-10 GHz.
by LessEMF

PURE COPPER POLYESTER TAFFETA FABRIC
Conductor: Copper plated
Base: Polyester
Resistivity: 0.05 Ohm/sq
by LessEMF

SOFT&SAFE™ SHIELDING FABRIC
High conductivity (<1 Ohm per sq).
Made with a unique blend of natural materials: 70% bamboo fiber and 30% Silver.
Conductor: pure Silver threads
by LessEMF

Ni/Cu/Co FABRIC TAPE
Nickel, Copper and Cobalt coated nylon ripstop fabric (with anti-fray) offers excellent RF shielding properties (70 dB at 1 MHz, 100 dB at 1 GHz) and electrical conductivity (less than 0.1 Ohms/sq).
by LessEMF

HOOK & LOOP FASTENER
Similar to Velcro™ but conductive. One inch wide. Silver coated. Resistivity: Hook: 1.8 Ohm per sq. loop: 1.4 Ohm per sq. loop.
by LessEMF

SILVERSPUN YARN
Can be used to make smart textiles and simple circuits. Highly conductive, about 10 Ohm per inch. Light gray.
by LessEMF

11 - Conductive Materials Research A

ELECTRIC PAINT AND ADHESIVE
Great Way to Connect Leads to a Conductive Fabric.
The paint's conductive properties do not degrade over
time. The paint is slightly resistive- at approximately 55
ohms per square.
by Bare Conductive

VELOSTAT® by 3M
Carbon impregnated black polyethylene film. 4 mil thick.
Volume resistivity is <500 Ohms/cm.
by LessEMF

Woven Conductive Fabric
This woven conductive fabric is silver colored and made
of Copper+Nickel-plated nylon. This highly conductive
fabric has a resistance of less than 1 ohm per foot in
any direction across the textile.
by Adafruit

Knit Conductive Fabric
Plated with real Silver. This highly conductive fabric has
a resistance of less than 1 ohm per foot in any direction
across the textile.
by Adafruit

EeonTex Pressure Sensing Fabric
EeonTex Pressure Sensing Fabric is highly conductive
with a surface resistivity of 2K Ohm/sq. Additionally, it
features a dynamic range of 5g to 100kg, as well as a
data acquisition rate of 500 cycles per second.
by Sparkfun

EeonTex Conductive Stretchable Fabric
EeonTex Conductive Stretchable Fabric is highly
conductive with a tunable surface resistivity in the
range of 10E4 to 10E7 ohm/square.
by Sparkfun

Copper Tape
This copper tape is adhesive-backed, 5mm wide and
comes in rolls of 50 feet.
Thickness: 3 mil
by Adafruit

12 - Conductive Materials Research B

Physical Computing and Microcontrollers

Physical computing refers to the activity of creating physical artifacts and giving them behaviors through a combination of building with physical materials, computer programming, and circuit design (Gubbels). Sensors and electro-mechanical devices such as motors and servos (actuators) are connected to programmable circuit boards (microcontrollers) in order to create Interactive physical systems. Physical Computing intersects a range of activities often referred to as electrical engineering, mechatronics, robotics, computer science, and embedded development and is common among artists, engineers, and hobbyists. ("Physical Computing")

There are hundreds of boards available for use in physical computing. Examples of popular platforms include Arduino, Raspberry Pi, and BeagleBone. Computer languages used to program these boards include C, C++, Python, and Java. Some use full operating systems namely Linux, Android, and Ubuntu. Two invaluable resources to evaluate boards are the Make Magazine Maker's Guide to Boards and the Sparkfun Arduino Comparison Guide.

The Arduino platform which was first designed in 2003 to be a simple, low cost tool for creating digital projects by non-engineers, is utilized in *The Ultimate Pillow*. ("Arduino") Arduino consists of the programmable microcontrollers (MCUs) and an Integrated Development Environment (IDE) that is used to write and upload code directly to the boards using a USB cable. The active Arduino user community provides support for any level of expertise. The Arduino Forum, the Adafruit Forums, and the Arduino StackExchange offer opportunities to have code evaluated, to ask advice on how to approach a project, and to get help troubleshooting both hardware and software issues. There are numerous websites containing detailed tutorials for learning such as Sparkfun, Adafruit, Instructables, Hackster, and the Arduino Hub. This ubiquitous online support was crucial during development.

Adafruit FLORA

One board initially tested was Adafruit's wearable electronics platform, FLORA designed from the ground up for Adafruit's community of makers. It is built around the Atmega32u4 chip and has a micro-USB port. The FLORA power system is specifically designed to control and power a large quantity of addressable NeoPixels. It can drive 100 pixels directly from the onboard power supply, or up to 500 with the pixels externally powered by a separate 5V supply. The FLORA is relatively inexpensive and extremely versatile and is used in the sound visualization function of The Ultimate Pillow.
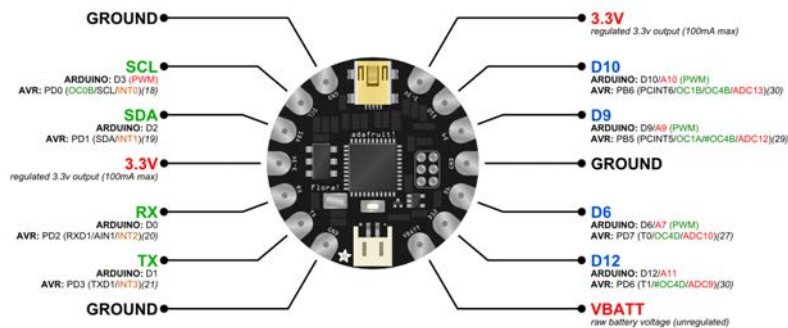
13 - Becky, Stern. "FLORA pinout diagram." Adafruit, https://learn.adafruit.com/getting-started-with-flora/flora-pinout-diagram

LilyPad MP3

The desired features of the pillow included warm stereo sound. This meant using a board that would support stereo audio, would have an onboard amplifier, an onboard SD card holder, support for MP3, and a board that could be powered by rechargeable 3.7V Lithium Polymer (LiPo) batteries. The LilyPad MP3 board was selected.
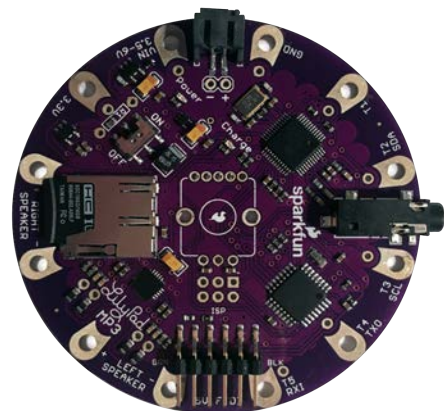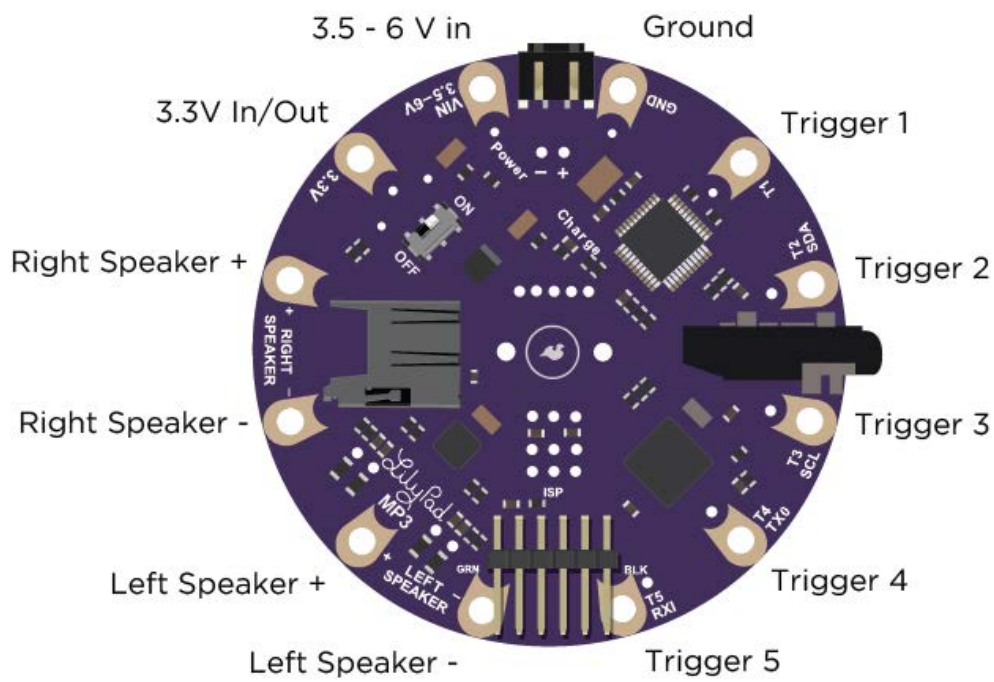

14 - LilyPad MP3

The LilyPad system, which launched in 2007, was invented by Dr. Leah Buechley and then collaboratively developed by Dr. Buechley and Sparkfun Electronics. LilyPads dominated the e-textile segment of the Arduino market until the invention of the Adafruit Flora and Gemma boards in 2012. LilyPads are purple, usually circular boards, and are made with big copper filled

holes to allow the boards to be sewn to fabric using conductive thread.

The LilyPad MP3 was released in 2012 and is the only LilyPad to feature project sound integration out of the box. A Trigger Sketch comes preinstalled on the board which uses five pins to trigger five different MP3s. This sketch served as the basis for the final pillow code. The board has a stereo headphone jack which is useful for prototyping as it offers an easy way to plug in speakers or headphones instead of having to solder wires to the speaker pins. The board has two power options - 3.3 volts for use with a LiPo battery or a high voltage option of 3.5 volts to 6 volts for use with an external supply. The micro SD card holder is easy to access and means that files can be loaded at any time from a computer using a micro SD adapter. The LilyPad MP3 is the main board used in The Ultimate Pillow. Two of the pins are used as triggers for the main button and the saline circuit and the speakers in the pillow are powered by this board.

15 - LilyPad MP3 pin diagram

Velostat™

Velostat is a thin, flexible, and conductive material that is used a sensor in many physical computing projects. When flexed or when pressure is applied, the resistance of the Velostat changes. If used in a soft fabric button, the amount of pressure applied could be measured and used to trigger different interactions in the code. Below is an example of a circuit using an Arduino Uno, Velostat, and the Pure Copper Polyester Taffeta Fabric from LessEMF. The serial port in the Arduino IDE logs the types of touches.
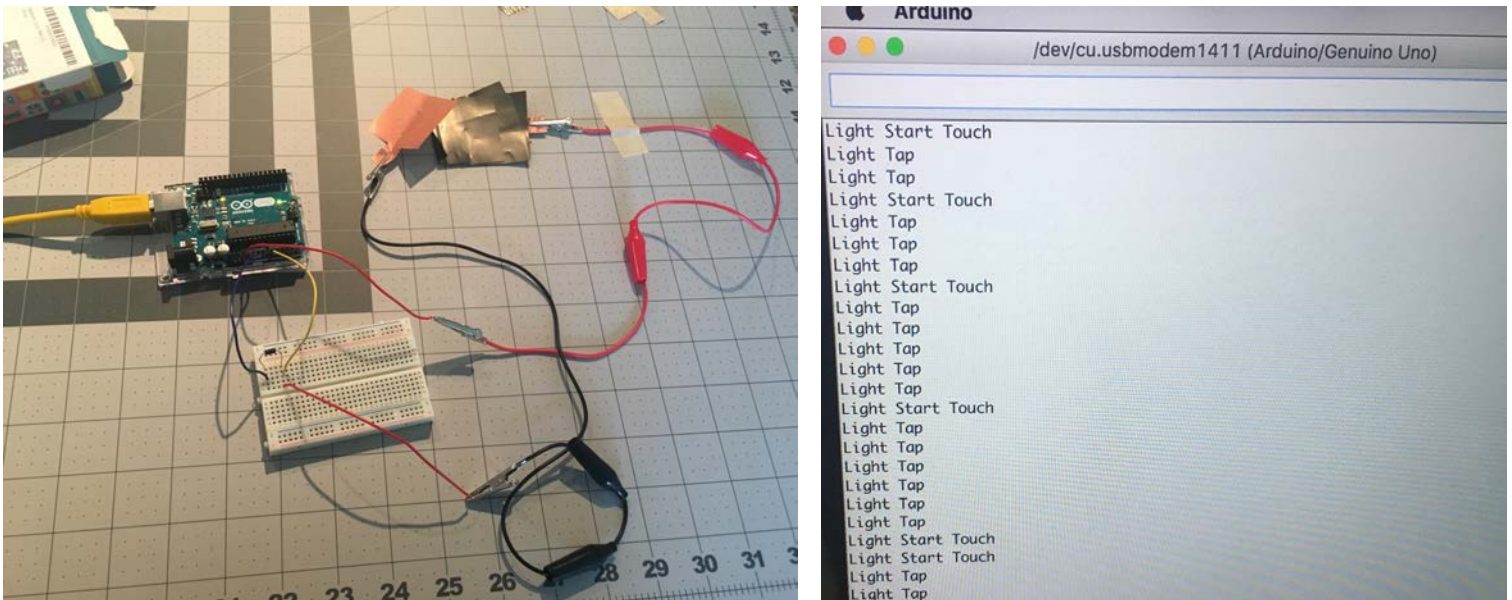
16 - Velostat button test

Once placed into the actual soft button used in the first prototype, the Velostat was observed to have a plastic sound and feel. This interfered with the illusion of the interactive pillow as an everyday throw pillow and was eliminated as a material.

Speaker Research

The LilyPad MP3 has a TPA2016D2 stereo amplifier which is capable of driving a watt of power into each audio channel. There are a number of small, light speakers available for electronic projects. The ideal speaker was one which produced a rich quality sound, could be powerful enough to be heard in a loud room, yet could be small enough to be hidden inconspicuously inside the pillow. Creating custom speakers using surface transducers was also explored.

17 - Speaker research

1. 3" Diameter, 8 Ohm 1W Speaker from Adafruit

2. 3" Diameter, 4 Ohm 3W Speaker from Adafruit

3. White Golf Ball Portable Speaker, 8 Ohm 3W from Amazon

4. Mini Hamburger Speaker 1.8W from Amazon

5. The Thin Speaker from Sparkfun

6. Mini Metal Speaker 8 Ohm 0.5W from Adafruit

7. Breadboard-Friendly PCB Mount Mini Speaker 8 Ohm 0.2W from Adafruit

8. Small Surface Transducer from Sparkfun

9. Large Surface Transducer from Sparkfun

There are several speakers on the market designed to fit into pillows. These pillow speakers are used to treat insomnia, tinnitus, track sleeping habits, and some boast a more restful night's sleep. Mainly they are more comfortable than wearing headphones to bed and are

designed not to disturb a partner. The LilyPad MP3 board has a ¼" headphone jack making

using these speakers an option. While flat and flexible, none of the pillow speakers could

produce an adequate volume for the goals of this project.

18 – A selection of flat pillow speakers. See references for further citation.

After testing a variety of speakers, the 3" diameter, 8 Ohm 1W speakers from Adafruit was selected. Besides being embedded in a thin metal frame which makes it easy to attach to materials, the speaker offered a wide range in volume, did not distort the voiceover, and did not produce a metallic sound like the smaller flatter speakers that were tested. These Adafruit speakers were also a suitable shape to be concealed inside the pillow.

Batteries and Switches

To enable portability of the pillow, batteries were implemented. A number of battery options were explored, ending with a deliberation between Alkaline Cell and Lithium Polymer (LiPo) batteries. Alkaline Cell batteries are less expensive than LiPo batteries, but the holders are bulky and heavy. LiPo batteries are thin, light, and rechargeable.
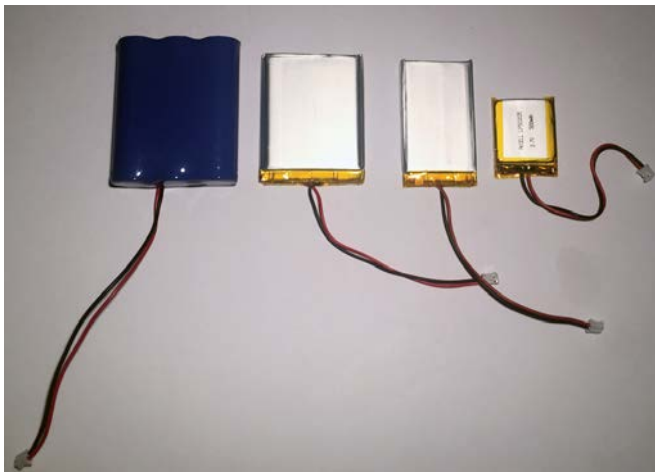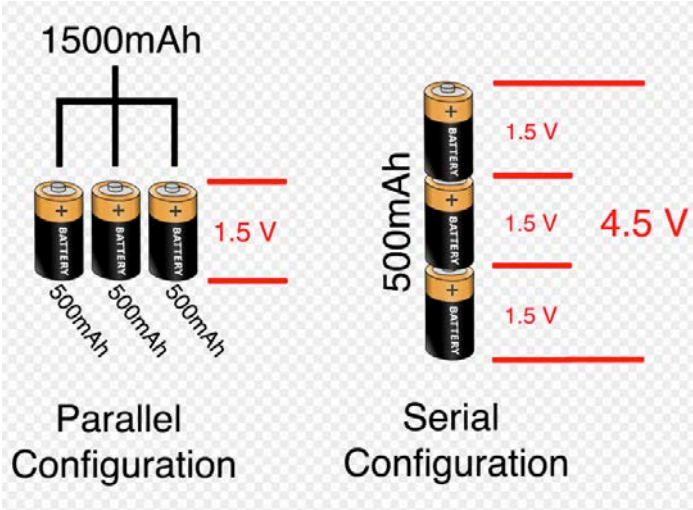

19 - LiPo batteries

20 – Alkaline Cell battery holders
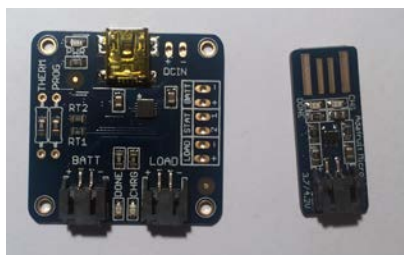
21 - LiPo battery chargers

The LilyPad requires 3.7 Volts for power. This achievable by using one LiPo battery or a few Alkaline cell batteries arranged in a serial configuration.

22 – "Parallel and Serial Battery Configurations" http://www.farsens.com/en/2013/11/22/series-introduction-batteries-wireless-sensor-networks/

A serial configuration adds the voltages of each battery together but maintains the output of the battery's milliamps per hour (mAh). In other words, by using a serial battery holder the correct voltage is achieved but still provides power at the milliamp per hour equivalent of one of the batteries. In the case of the triple A, that would be for 1000mAh and in the case of the double A that would be for 2400mAh. Using Alkaline batteries in serial does not compare to the power of using one 3.7V LiPo battery.

Battery Type	Capacity (mAh)	Typical Drain (mA)
D	13000	200
C	6000	100
AA	2400	50
AAA	1000	10
N	650	10
9 Volt	500	15
6 Volt Lantern	11000	300

23 - Battery capacity comparison

It can be difficult to reach the small on/off switches on any board. By adding a push button switch with JST 2-pin extender, a more user-friendly way of turning the pillow on and off was implemented. These switches from Adafruit are stiff and quite long but make operation of the pillow more straightforward. Smaller, similar switches can be made from scratch but there was ample room in the pillow to hide the pre-built switches.

24 - "JST 2-pin Extension Cable with On/Off Switch - JST PH2".
https://www.adafruit.com/product/3064
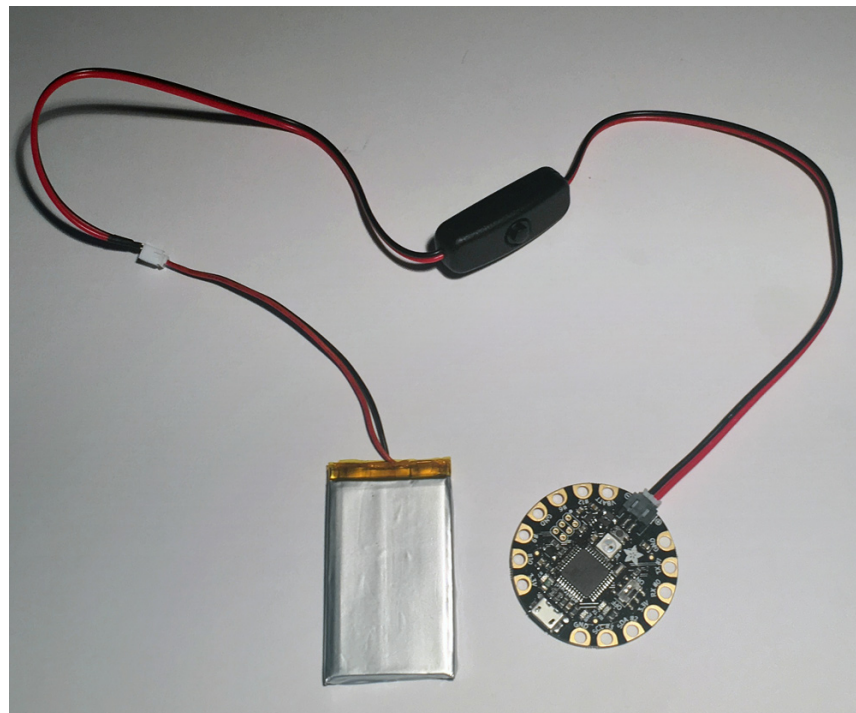
25 - JST switch in a circuit

Wire

Methods of connecting electrical components can be often be overlooked or not carefully considered. Time can be wasted by having to re-wire circuits due to inflexibility of certain gauges of wire. The gauge is defined by the diameter of wire and is used to determine the amount of current a wire can carry. The higher the gauge number, the thinner the wire.

26 - https://learn.sparkfun.com/tutorials/working-with-wire/wire-thickness
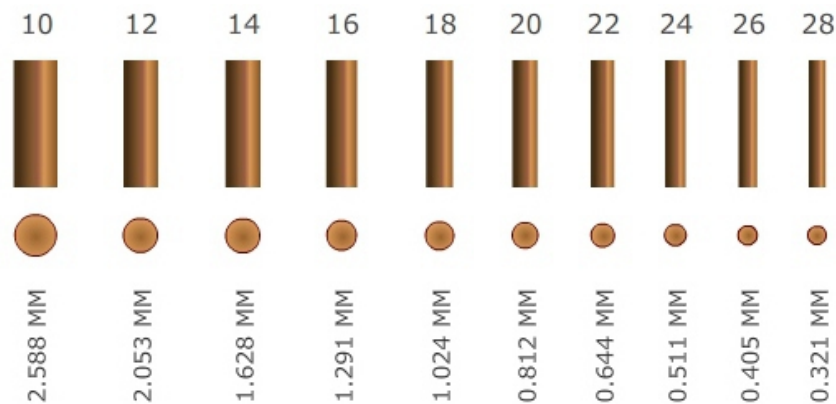
Adafruit is a reseller of a unique pliable silicon coated wire for use in wearables. This wire comes in two gauges of 26 AWG and 30 AWG and in several colors. It is stranded wire as opposed to solid core wire which allows for utmost flexibility.
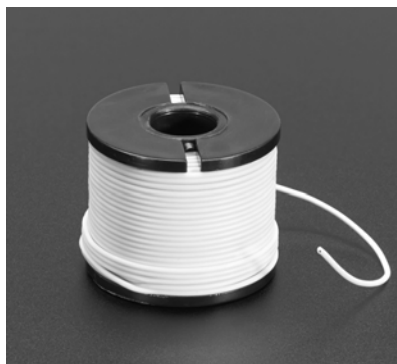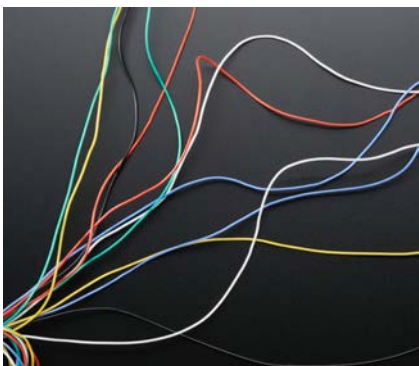
27 - Adafruit 30 AWG Silicone Wire - https://www.adafruit.com/product/3166?gclid=CjwKCAjwgYPZBRBoEiwA2XeupRtPNhy64N9Ba1ew4w0B2Ldwi-wyedBGWuh99q9gf4tTm4Z3oVl9ahoC3KIQAvD_BwE

Section 4: Design of The Ultimate Pillow

There are four functions in the Ultimate Pillow.

1. A main button - when pressure is applied, an audio file is triggered to be played.
2. An audio visualizer – when yelled at, volume is displayed by two LED volume meters.
3. A saline function- when cried upon, audio files are triggered to be played.
4. A lonely function – when no buttons have been trigged for 30 minutes, audio is played.

Structural Design

Over several iterations, placement of the soft interactive fabric button, speakers, overall pillow shape, and best methods of interaction were evaluated. From the exterior the pillow seems like an average throw pillow. All the electronics have been carefully hidden inside, including the speakers which have been covered in foam. The foam also provides structure for the buttons and components. The face of the foam contains the main button, bilateral LED strips, a hole in the center to allow sound to access a microphone placed on the back of the pillow, holes at the top to allow sound from the speakers to be clearly heard, two smaller pieces of conductive fabric used in the tear function, and soft electronic leads from each piece of conductive fabric which go to the back of the pillow.
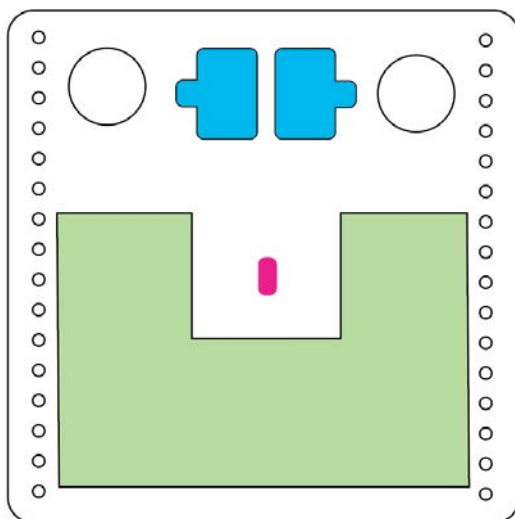
29 - Design diagram of pillow face
28 - Implemented design of pillow face
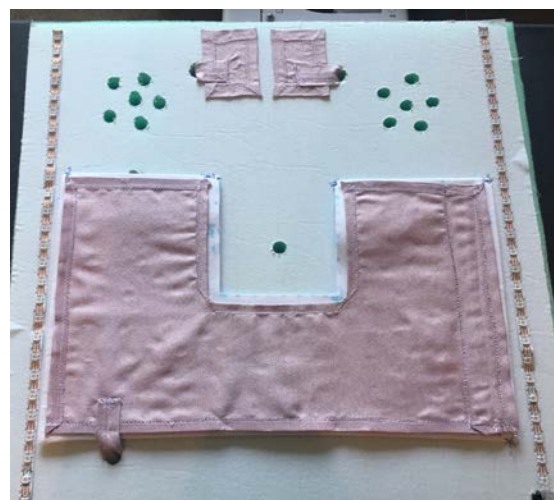
The back of the foam contains the speakers, a Flora board, a LilyPad MP3 board, two switches, two battery pockets which house two 2500mAh LiPo batteries, a microphone in the center of the pillow, and the wires. Fabric guides are used to hold the wires in place. The design of the back of the foam is primarily motivated for quick access to the boards for code updates and to the batteries for replacement. The speakers are at the top of the pillow to allow the audio to be heard clearly when held.
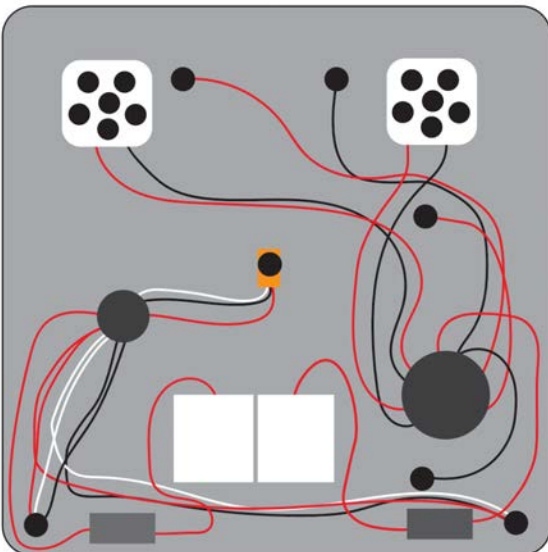
31 - Design diagram of wiring
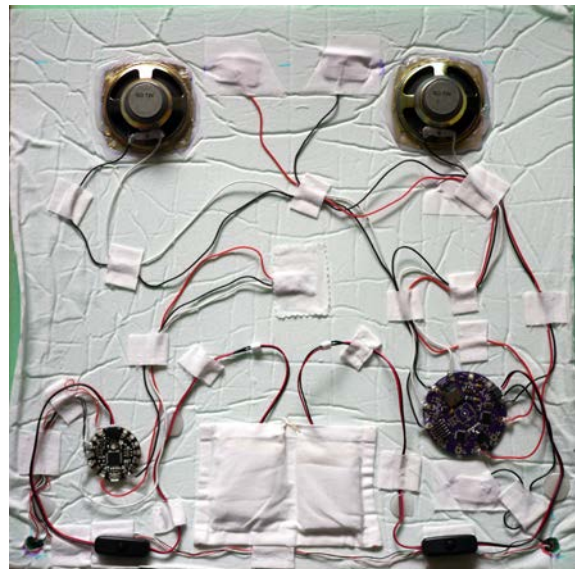
30 - Implemented wiring

The speakers, the saline circuit, and the main button are connected to the LilyPad MP3. Depending on which button is triggered, MP3s are selected from one of two folders on the SD card on the LilyPad. If the main button is pressed, one audio file is triggered to play. If pressure is applied continuously, audio play is maintained. If the main button is pressed while audio is playing, the audio currently being played is not interrupted. If the saline button is triggered the main button is switched off.

The Yelling Function

Some consider screaming to be an excellent way to relive stress and or even treat to neurosis caused by repressed pain of childhood trauma (Janov). Throw pillows and standard pillows are rated as the best pillows to scream into (Collier). The hypoallergenic Ultimate Pillow is specifically designed to be shouted or and screamed into. Not only can it help to muffle screams for privacy, but it provides a playful visualization of the volume of a scream.

32 - LEDs in action

This circuit is inspired by the Ampli-Tie tutorial by Adafruit (Stern). The FLORA board receives data from the microphone which acts as a volume sensor. The LEDs light up according to perceived volume as the data is sent by the FLORA. The volume is visualized in a linear way, with louder shouting resulting in all the LEDs lighting up. There is an entertaining descending animation as the LEDs and volume is normalized.
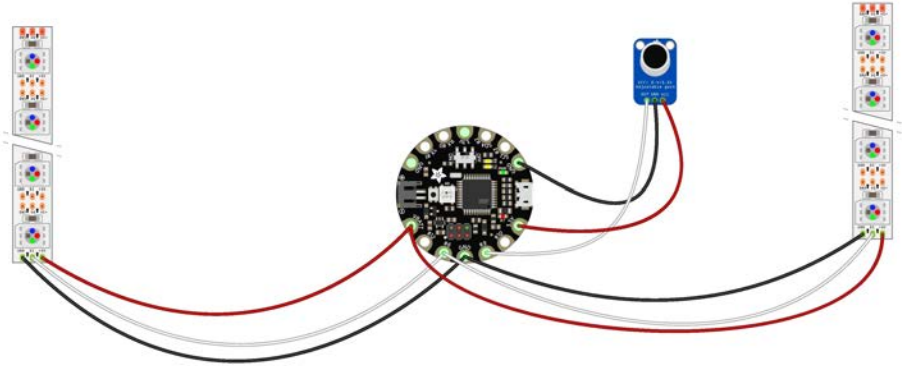
33 - LED circuit diagram

34 - LED descending animation sequence

The code for this function includes an input floor and an input ceiling. The floor is the lowest

volume received and the ceiling is the highest. These inputs define the range volume to be

sampled. As the pillow's main feature is to emit sound, the yelling circuit input ceiling and input

floor were modified to react to a limited range of louder sounds. This way the LEDs do not

react when the emotionally supportive statements are triggered from the main button. The

image below shows the concept of the audio range and that it is adjustable both in size and

space. Number three is the model used in the yelling circuit.
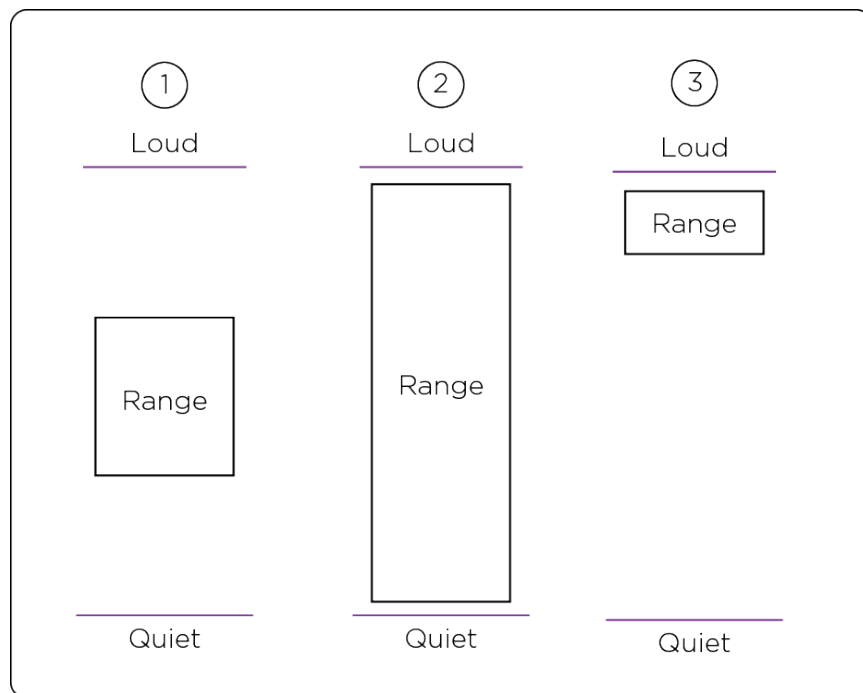
36 - Audio range

```
#include <Adafruit_NeoPixel.h>
#include <math.h>

#define N_PIXELS  27  // Number of pixels in strand
#define MIC_PIN   A9  // Microphone is attached to this analog pin
#define LED_PIN    6  // NeoPixel LED strand is connected to this pin
#define SAMPLE_WINDOW   10  // Sample window for average level
#define PEAK_HANG 16 //Time of pause before peak dot falls
#define PEAK_FALL 4 //Rate of falling peak dot
#define INPUT_FLOOR 600 //Lower range of analogRead input - raising this number for the shouting volume response
#define INPUT_CEILING 1023 //Max range of analogRead input, the lower the value the more sensitive (1023 = max)
```

35 - LED audio code

The Tear Function

The Ultimate Pillow features a unique interaction where tears trigger audio in an attempt to console an emotionally distraught person. As previously mentioned, the growing interest in connected devices has produced many ineffective products. Smart refrigerators send egg depletion alerts, a smart toilet paper dispenser sends a notification when paper is running low, and a smart condom rates performance (Watson). These products are advertised as life-altering and as making life better, when actually they offer solutions to non-problems.

The tear function offers a meaningful solution to a highly charged emotional state. This trigger, like the main button, operates in both a therapeutic and ironic way. The statements currently programmed to play are read in a cheerful manner and broadly apply to a large, undefined audience. If *The Ultimate Pillow* were to become an actual product, these statements could be made more specifically consoling.

Ironic tear script:

Cry as long as you need to, I can take it.
Let it out!
You are not alone!
I'm here for you :)
You feel deeply and that's a good thing!
The average length of a cry is six minutes - let's do this!
Crying is good for you :)
Yes! Remove those toxins from your body!
Crying lowers your blood pressure.
If I could, I would cry with you.
Those bitches, be cray.

37 - Vial of collected tears

Occasionally the script infers that the pillow has agency, the ability to understand human emotion, or that it is a personal advocate when actually none are true. At the MFA exhibition participants commented that even though they knew this to be the case, they still found the

pillow to be consoling and mood lifting. This speaks to Sherry Turkle's idea that technology is seductive when what it offers meets our human vulnerabilities. She proposes that we are lonely but fearful of intimacy hence digital connections and sociable robots are seductive in that they offer the illusions of companionship without the demands of friendship (Turkle 1).

The tear circuit is comprised of two pieces of conductive fabric separated by 15 millimeters. When conductive saline water is placed on the pillow face, the pillowcase distributes the water and connects the two pieces of fabric. The circuit is then switched on and audio is triggered. Because the switch remains on until the water has dried, code was added to turn this switch off after 37 seconds which is equivalent to one cycle of the tear related audio files.

39 - Tear circuit conductive fabric
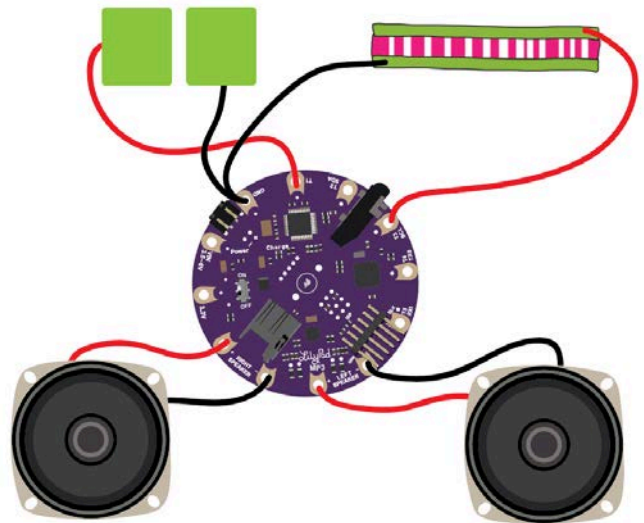
40 - LilyPad circuit diagram

38 - demonstrating the tear circuit during the MFA exhibition

The Lonely Function

When the two buttons on the pillow remain untriggered for thirty minutes, the pillow will play an audio file from a third folder on the SD card. This is an unsettling reminder that the pillow is more than it appears to be. One file is played every thirty minutes until five files are played and then this function is disabled. The script is non-transactional, meaning that the pillow does not need or want anything. Rather, this function serves as a reminder that emotional support is available on command.

Lonely script:

I'm here for you whenever you need me.
I'm still here for you whenever you need me.
I hope you are having a good day.
Just wanted to let you know that I'm thinking about you.
I hope everything is going ok out there.

Fabric and Cover Design

Explorations for the design of the pillowcase included creating original fabric through Spoonflower.com. This fabric contained thematic elements such as teddy bears to represent comfort objects and little grey clouds offering emotional support. After an early prototype was placed in a decorative case, it was determined that this disguised the pillow too well. *The Ultimate Pillow* is not pedestrian and the cover design needed to look a little strange and to inspire discovery and interaction.

41 - Little grey supportive cloud

42 - Decorative pillow cover

A thick fabric was needed to disguise the main button as and to hide the holes in the foam that had been drilled to allow unmuffled speaker audio. The only fabric that suited this task was upholstery fabric. Thick cotton duck fabric was discovered at Joann Fabrics in Sacramento. This smooth white fabric inspired the idea to add words to the cover.

The Cricket Explore Air 2 was used to dye cut foil words which were then ironed onto a pillowcase. The first words chosen were, "HOLD ME" to try to communicate that the pillow should be held. This proved unsuccessful in an early exhibition.

45 - Cricut Explore Air 2

44 - Foil iron-on colors

43 - HOLD ME cover

The title of my thesis is *I Just Wanted To Make a Pillow That Would Talk To Me* but my committee and I began referring to the physical pillow as *The Ultimate Pillow* – a pillow that could satisfy emotional needs like none before. The thesis title serves to contextualize the impetuous for the project while the pillow title explains the goals of the pillow. Cover previsualization of both *The Ultimate Pillow* and *I Just Wanted to Make a Pillow That Would Talk To Me* showed that the shorter title inspires discovery and challenges the idea of what an ultimate pillow would be or that such a thing could or should exist.

46 - Cover previzualizations

Voiceover

The script and tone of the voiceover is integral to the satirical element of the pillow. The affirmations are generically emotionally supportive and simultaneously apply to everyone and no one specifically. Using a human voice was imperative to make the pillow seem less like a programmed device and to create the illusion of empathy. The voice is female, deep, and reminiscent of the type of voice used in mediation.

Examples of the main button script:

You look great today!
The work you produce only gets better.
You are an amazing friend.
Have you lost weight?
I've missed you all day.
That color really brings out your eyes.
Your parents are proud of you.
When you are near me, I feel complete.

In the early stages of prototyping, the system was coded to pull an audio file randomly from the SD card on board the LilyPad. This resulted in repetition and while that might have been desired in a different version of the pillow, the goal of this pillow was to have the participant experience a dilemma and wonder if the pillow was serious or satirical. The repetition ruined the ambiguous narrative.

Code was modified to play the files sequentially. While familiarity would enable one to predict what files would be played next if the pillow was an actual product, this was not a concern for the exhibition. The files were arranged to minimize redundancy.

MFA Thesis Exhibition

47 - All I Wanted to Do Was Make a Pillow That Would Talk to Me at the 2018 Arts and Humanities Graduate Exhibition, held at the Jan Shrem and Maria Manetti Shrem Museum of Art from May 30th to June 17th.

The pillow was exhibited in a manner to inspire a sense of loneliness and to place emphasis on the pillow as a comfort object. The setting was uncomplicated visually with spotlights on the chair and an instruction poster. The poster communicates that the pillow should be picked up and held as it is rare to be able to physically interact with objects in museums. It features a nonspecific human-like figure which like the generic emotionally supportive statements, represents everyone and no one. The figure is reminiscent of the figures IKEA uses in furniture assembly instructions and demonstrates the three interactive functions of the pillow to invite participation. The poster was designed by UC Davis Design Undergraduate Christie Neo under my art direction.

48 - Instruction poster

The chair on which the pillow sits is feminine and plush, yet simple. The aqua color is unique and is matched in poster. The chair invites people to sit and become acquainted with the

pillow. One participant said he loved the pillow so much, that he kept listening until the audio started to repeat. The chair creates an atmosphere of home, comfort, and casualness. The pillow is not on a pedestal or behind a case. It is intended to be touched, experienced, and discovered.

The Ultimate Pillow does not try to bridge a gap by replicating a person. It is an unpretentious and non-transactional comfort object. It does not try to deceive. There is no interface, the interaction is simple, and it is clear that the voiceover is simply feeding the ego of the participant as opposed to addressing the root of any problem.

Many requests to make *The Ultimate Pillow* into an actual product have been made. People are emotionally affected by the pillow. Even though the pillow is obviously programmed and the emotionally supportive statements are generic and repetitive, the pillow works both as a therapeutic device and as ironic project. One comment was, "I know it's not real, but it still makes me feel good" while another participant said, "being with it is simultaneously comforting and disconcerting."

The exhibition was successful with the museum reporting that *I Just Wanted to Make a Pillow That Would Talk to Me* was a crowd favorite.

Rachel Max
MFA, Design

*I Just Wanted to Make a Pillow
That Would Talk to Me,* 2018
Cotton, LEDs, fiber fill, and electrical components

49 - Project title for exhibition

Photos from the opening night on May 31st, 2018.

50 - Participants listening to the tear function

Future Development

I completed a Release of Invention form and met with Andrei G. Chakhovskoi who is the Senior

Licensing Officer for Intellectual property for UC Davis. Besides qualifying for "non-assert" of

ownership, UC Davis is not interested in the pillow as an invention. I have obtained the

necessary documents enabling future development of the Ultimate Pillow.

There were several other ideas explored over the duration of this project which could be

developed further. These include an interactive quilt, a robot that follows you, and an

interactive sound environment using conductive paint. These projects would offer

opportunities to continue to research and practice critical design and to pair humor with

critique.

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Images requiring further reference:

Image 2 - surrogate pillows:

Hizamakura Lap Pillow

http://www.japantrendshop.com/hizamakura-lap-pillow-mini-skirt-p-

64.html?language=en&utm_source=googlebase_en_USD&utm_medium=referral&utm_campaign=google

base_en_USD&gclid=CjwKCAjwgYPZBRBoEiwA2XeupYCWn_C46_ju_XrY70BGVXJL3PaBcpwXNTECnJ

-ux_tPE2-dGOlLQhoCLLkQAvD_BwE

DeluxeComfort Boyfriend Body Pillow Pink and White

http://www.sears.com/deluxecomfort-boyfriend-body-pillow-pink-and-white/p-

SPM7910952313?plpSellerId=DeluxeComfortcom&prdNo=2&blockNo=2&blockType=G2

DeluxeComfort Girlfriend Body Pillow Pink

http://www.sears.com/deluxecomfort-girlfriend-body-pillow-pink/p-

09613104000P?plpSellerId=Sears&prdNo=3&blockNo=3&blockType=G3

Image 18 – flat pillow speakers:

Oittm Smart Headrest, Aid-sleeping Muisc Player with Sleep Tracker and Intelligent Alarm Clock Function

Ultra-thin Soft Pillow Mat

https://www.amazon.com/gp/product/B071Z8GQVP/ref=oh_aui_search_detailpage?ie=UTF8&psc=1

Stereo Bedroom Pillow Speakers - Say Goodbye to the Headset Say Goodbye Hearing Loss

https://www.amazon.com/gp/product/B01DXB24II/ref=oh_aui_search_detailpage?ie=UTF8&psc=1

Sangean Pillow 3.5mm Aux Portable Speaker

https://www.amazon.com/gp/product/B002O4I1PG/ref=oh_aui_search_detailpage?ie=UTF8&psc=1