storment

Don’t weather your storm alone.

Critical Making: Provocation 3

Assets & Video: github.com/mimilei/storment

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Overview

Storment is a helmet that seeks to bring the largely invisible stresses of mental illness into the physical space and start a conversation about depression and mental illness at large.

Storment fabricates a “personal storm” around the wearer through a combination of fog, light, sound, and weight. These factors, which are designed to reflect the overwhelming mental state depressed individuals often experience, combine to create a suffocating, uncomfortable, and isolating space for the wearer. The longer an individual wears Storment, the more severe and overwhelming the environment becomes. Only when the wearer resolves to “open up,” represented by their opening the door of the helmet, will the storm finally calm.

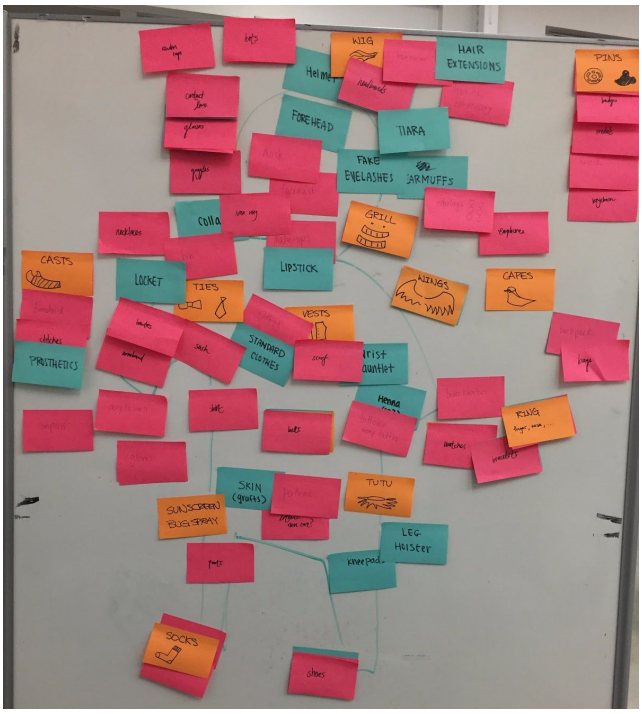
Depression is one of the most common mental disorders in the United States. However, there is a lack of consideration for and ignorance of people struggling with depression. Those with depression often find it difficult to articulate their emotions especially with the societal stigma involved.

Designed as a performance piece to help start conversation about depression, Storment gives public form to a very private and internal struggle. This project seeks to visualize the unseen, bring awareness to mental illness, and build empathy and understanding in individuals who have not experienced the weight and toll of mental illness.

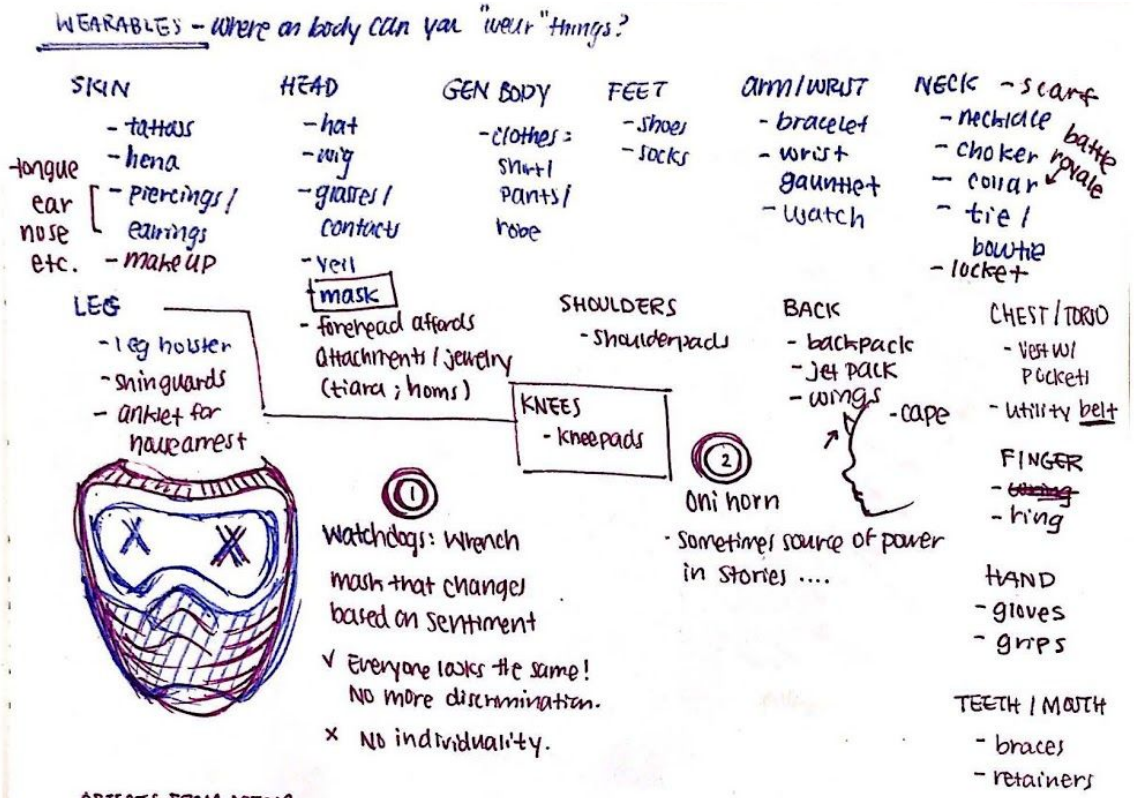
Brainstorming

Initial brainstorm

We began by brainstorming as many different types of wearables as possible, grouping overlapping types together, and putting them on a rough diagram of the human body. We wanted to push our boundaries and aim for more out-of-the-box ideas, and so temporarily relaxed feasibility to allow ourselves the freedom to generate novel, more creative ideas.



While our “bottom-up” brainstorming approach generated plenty of outlandish, fun concepts, we found this kind of brainstorming to be less effective, since the results were conceptually weaker and less critical than we would have liked.



Design Goals

At this point we established general goals for our projects--we wanted it to be *novel*, *focused on social issues*, and something more akin to a *critical art piece* than a consumer product.

Further Concept Development

With these goals in mind, we took time to individually brainstorm ideas that we could realistically implement and reconvened a few days later. To change gears, we decided to take a more “top-down” approach where we instead brainstormed issues we wanted to explore. Some general conceptual clusters that emerged include:

- Subverting known objects/motifs
- Individuality / conformity
- Visualizing vice
- Mental illness
- Useless / unnecessary design; overengineering
- Creating a sense of community by exposing innermost thoughts / feelings
- Breaking down physical / mental barriers
- Extending senses
- Extinction
- Environment / sustainability conservation
- Race / discrimination
- Gender

- Perpetual connectivity
- Human agency / free choice
- Sources of emotional weight (ie student loans)
- Giving form to the invisible (ie privilege)

Concept Selection

Having gone through multiple brainstorm sessions without converging on an idea that we were fully happy with, we invited Adam to a group meeting where we established the general direction of bringing form invisible or private things like privilege, stress, social standing, and financial standing.

Some ideas from this meeting included a wearable scoreboard that projected an individual's student debt or bank information, or a weighted backpack that reflected their student debt and could be exchanged with others who wanted to experience their burden.

The recurring motif of making the private public kept coming up at meetings. We combined this along with our interest in the area of mental health to create our final idea of a wearable that sheds light on the experience of mental illness. Specifically, we decided to tackle major depressive disorder. This also set us on a track to design a more performative design piece.

Research & Context

In order to incorporate aspects of depression into a wearable, we first had to be able to explain depression and identify its core features. This was made especially challenging due to the fact that depression is not openly discussed.

Online Research

We conducted research online to better understand depression. At a glance, "depression is one of the most common mental disorders in the United States. In 2014, around 15.7 million adults age 18 or older in the U.S. had experienced at least one major depressive episode in the last year, which represented 6.7 percent of all American adults. At any point in time, 3 to 5 percent of adults suffer from major depression; the lifetime risk is about 17 percent." https://www.adaa.org/understanding-anxiety/depression

Interviews

As individuals largely removed from the actual experiences of depression, we were wary of trying to accurately represent the experience of depression in our project. It was extremely important for us to talk to those who had experienced depression.

Parallel to the prototyping process, we interviewed individuals with depression to better understand their personal experiences, examine our assumptions, and better navigate the sensitive subject matter we were trying to approach. Through our interviews, we found that,

as expected, depression is a tricky subject to understand and explain due to its complexity and variability.

We talked to four individuals who had been depressed about how they would describe their experiences. Interviewees recalled extremely different experiences of depression that varied from extreme emotionality to feelings of emptiness.

Extreme emotionality

One of our interviewees (henceforth referred to as C), shared that her experiences with depression "feels like attacking yourself" and the biggest characteristic was "loving hurting [her]self". She felt hypersensitive and hyper-critical of herself and had a constant desire to punish herself.

She described "feeling too much" and "feeling overwhelmed" by negative emotions like sadness, anger, self-hate, frustration and helplessness. She was often very emotional and cried a lot. She felt "a need to punish [her]self to move on". The causes and experiences of her episodes "were not one-dimensional" and she would often cope by "trying not to think about it" or "waiting it out. "

Most saliently, she said "vocalizing depression is okay in short run to get it off your chest but people don't realize what you're going through and can't help." More often than not, most people she opened up to couldn't understand what she was going through, and couldn't provide any help to solve the problem. She didn't want to share with people who "don't understand or can't understand" and "weren't prepared to deal with her emotions," since these conversations instead created discomfort and negativity.

That said, vocalizing what's wrong through talking or writing helped her "recognize what [she] needed to do to move forward. For her, talking to a counselor or people who have also experienced depression were most helpful in actually fixing her problems.

Lack of emotion

Another interviewee (who will hereafter be referred to as K) noted that depression does not merely consist of negative emotions, and described it as "a lack of emotion: a hollowness, an emptiness and detachment from experience." K also mentioned that they believe it incredibly difficult to spread understanding of depression: "The truth is, I don't think it's possible for a person who hasn't experienced an episode of moderate to severe depression to understand what it is like….Can you explain red to a person who has never seen red before?"

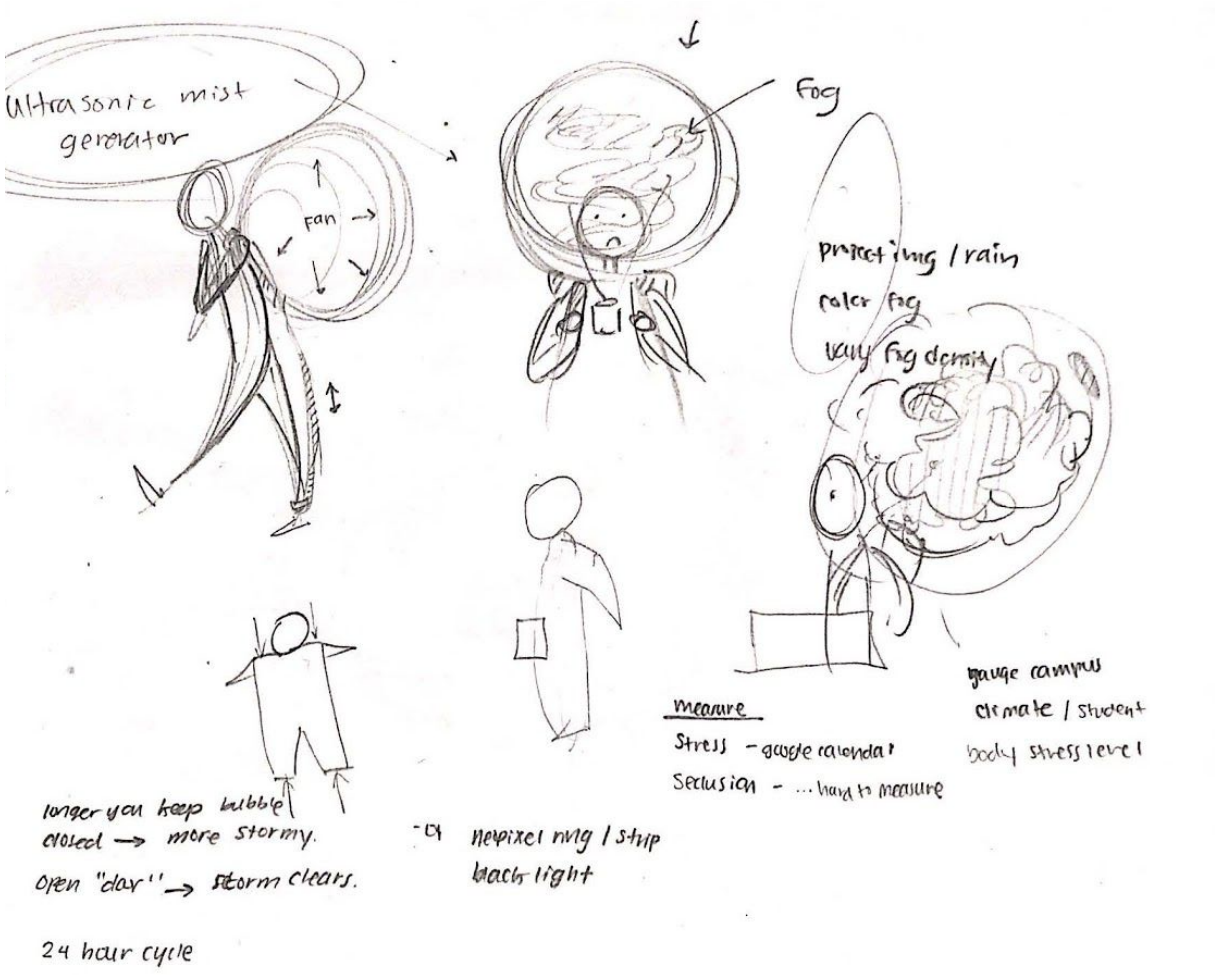
Metaphor Search

In our interviews, we asked interviewees how they would describe their experiences with depression. We also searched for depression metaphors used in media and literature online. There is no universal experience of depression, and as a result, there are multiple metaphors out there, such as "feeling like drowning but you can still breathe", "suffocating", "vacuum",

“being wrapped in some type of thick haze”, “and empty void”, and a “hurricane”.

Across our interviews and online prowling, the most iconic and recurring metaphor was rain — the persistent storm cloud that darkens your day — and so we decided to design a wearable that emulates a storm cloud.

Final Concept

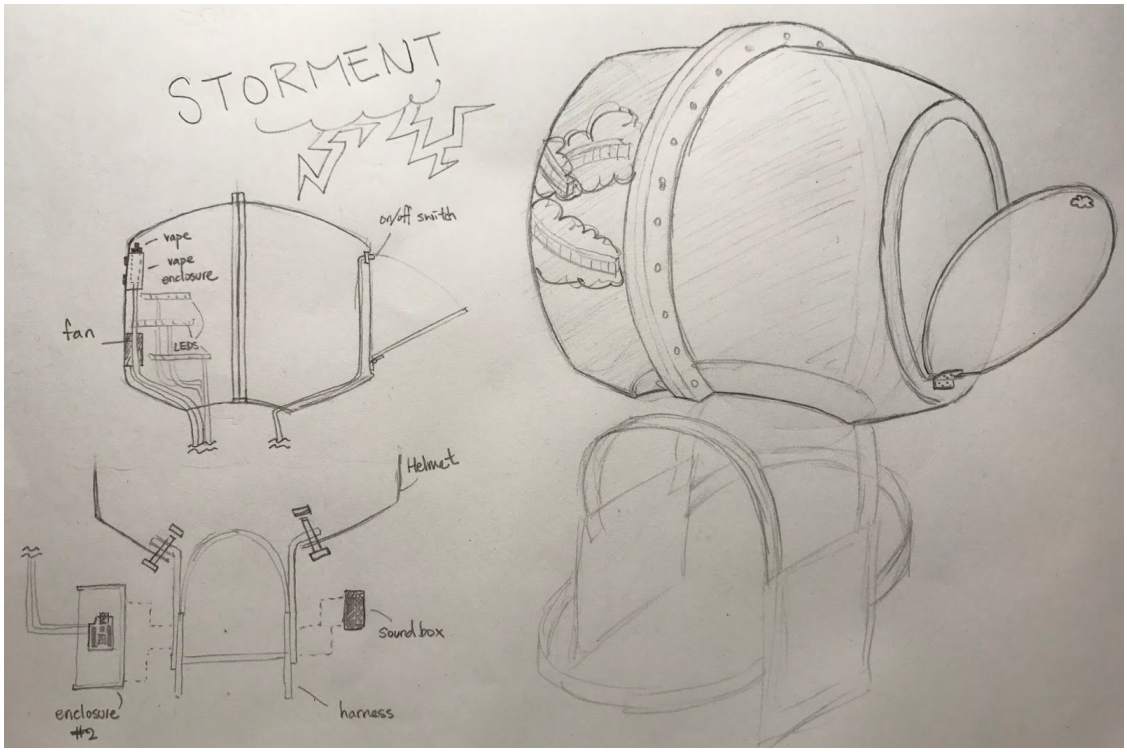


Our final concept was a helmet that creates a personal storm around the wearer, physically and mentally isolating them in a bubble of self-deprecation. In order to create a straightforward and easily-recognizable performance piece, we abstracted away parts of mental illness and designed with the assumptions that negative feelings associated with depression are related to stress and isolation — that opening up and talking with others will provide some form of relief.

While wearing the helmet, the individual is exposed to a barrage of stimuli: lightning crashes and booming thunder, fog, and flashing lights. The fog feeds through a tube into the helmet which builds up over time to create a thick, hazy vapor cloud which conveys the overwhelming mental strain those with depression must constantly endure. The storm intensifies the longer the wearer stays isolated, symbolizing that the longer someone with depression stays secluded from others, trapped with their own thoughts, the worse their condition becomes. When the wearer resolves to “open up,” extend themselves socially, and leave their isolation, they can open the helmet. In response, the storm will dissipate.

Through this piece, we want to start a conversation about depression. Those suffering from depression can wear the piece to draw attention to their ailment and invite others to talk with them about depression to increase their understanding. Those without depression can, through the experience of wearing the helmet and conversing with others, begin the journey of empathizing with those suffering from mental illness. While Storment does not directly solve issues, such as the stigma surrounding mental illness, we believe that it can still play a role in sparking conversation about the topic as talking about issues is an important avenue for bringing about change.

Prototyping & Technical Challenges

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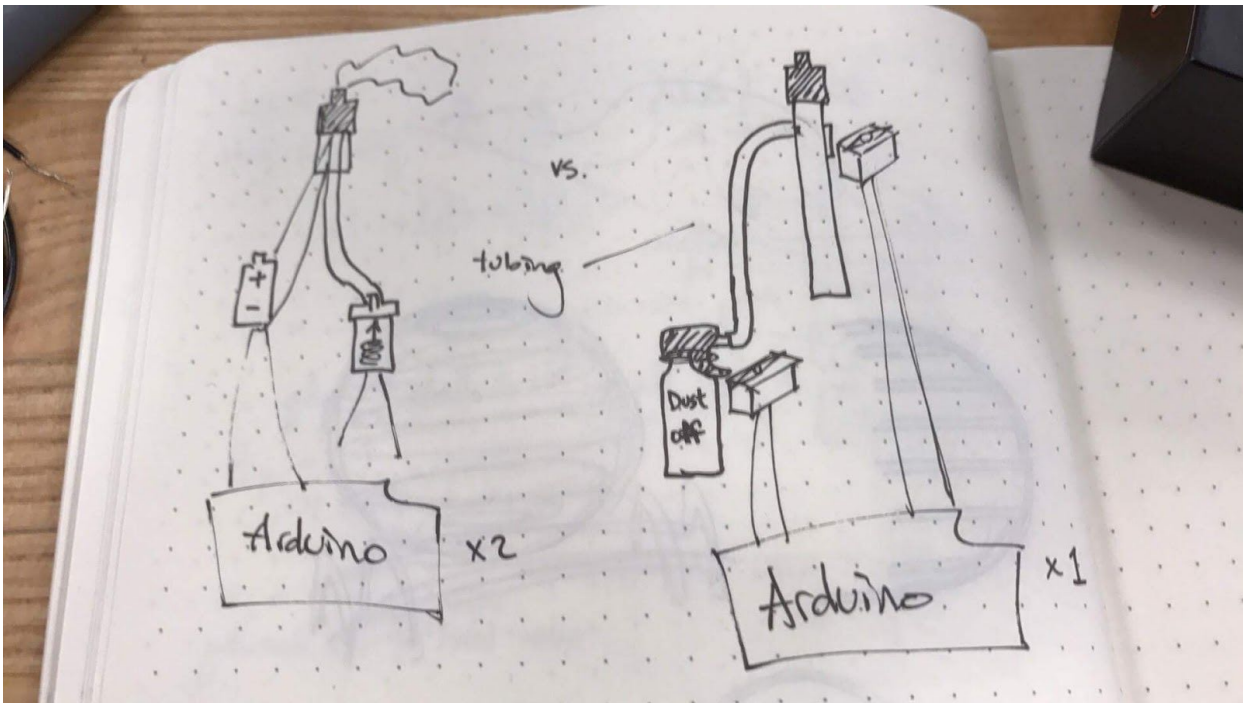
vs.
tubing
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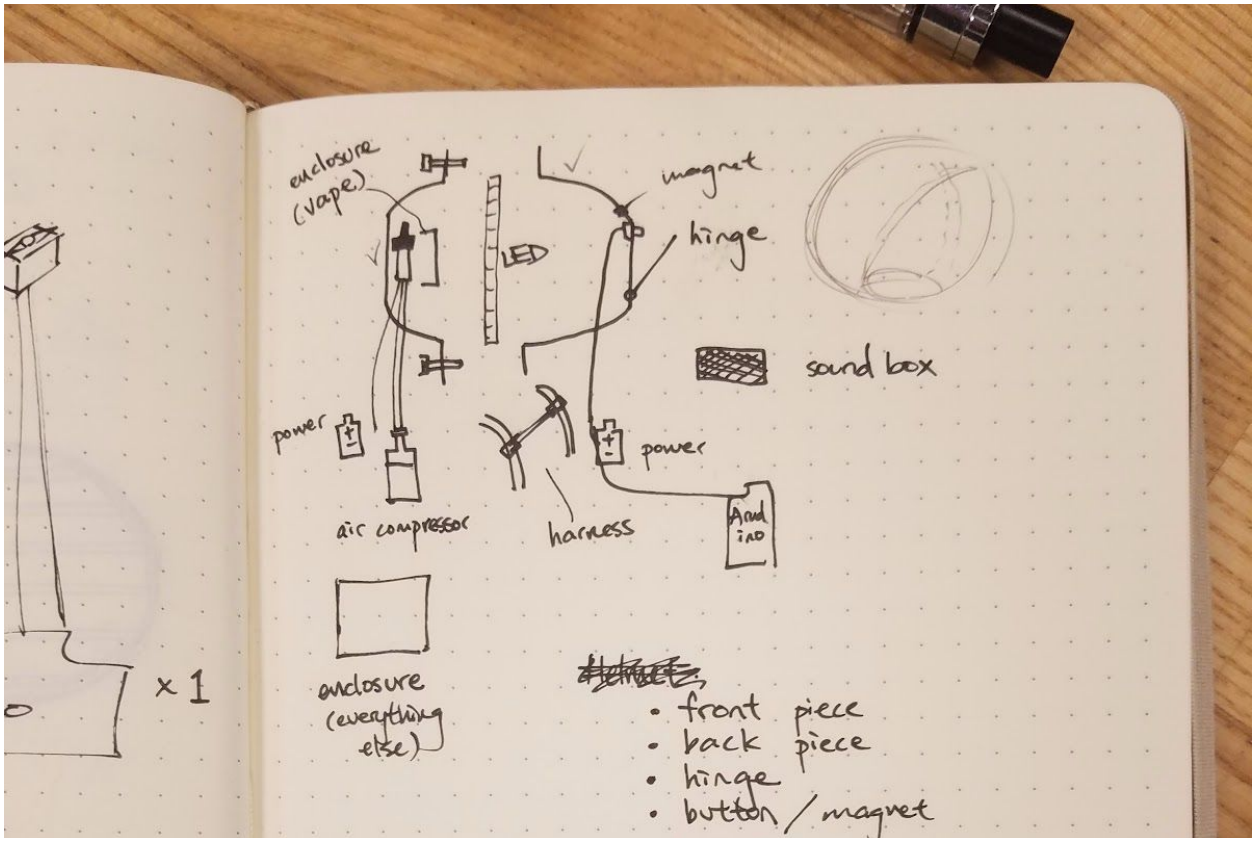
enclosure (vape)
LED
magnet
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power
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enclosure (everything else)
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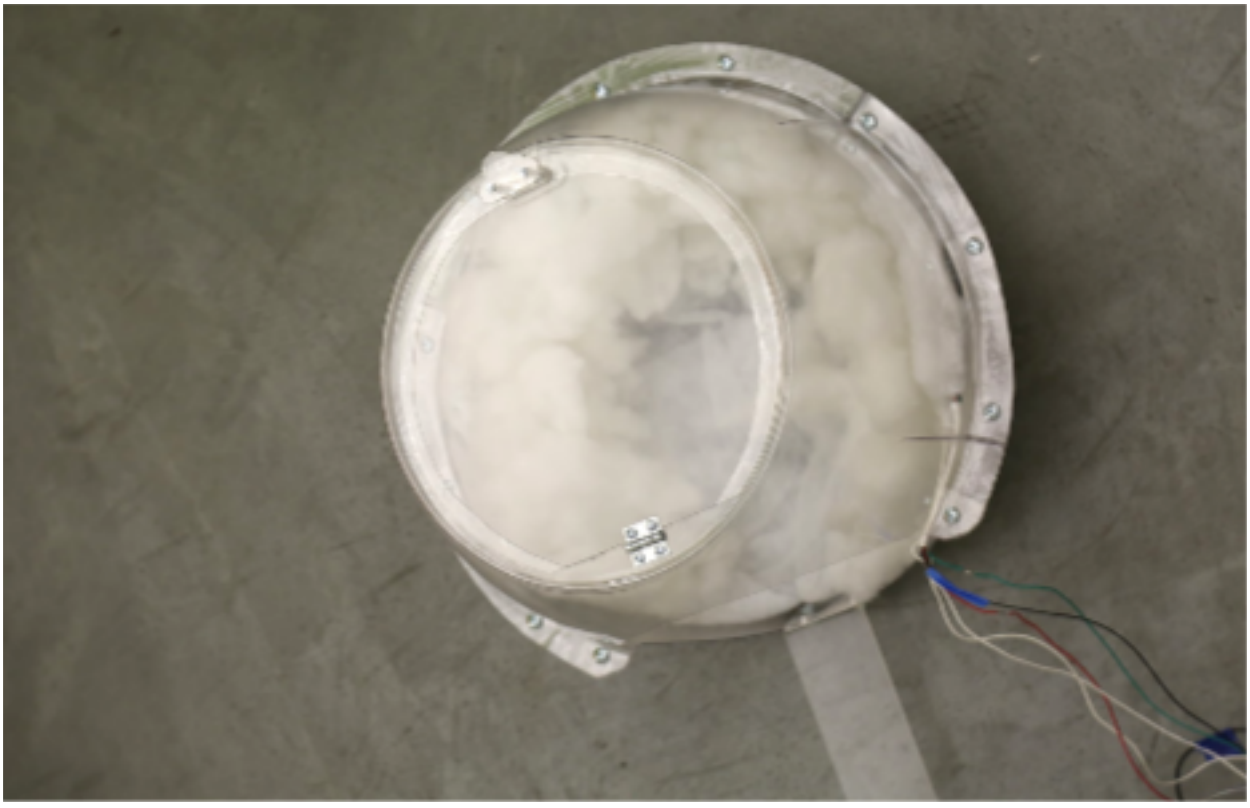


Helmet

For the helmet, we wanted to create a form that visually resembles a storm cloud and can securely house the other components. It needs to be clear for the lights to be visible and airtight to trap the fog in. There also needs to be a way to release the smoke (mainly for safety reasons) when the fog becomes too dense for the user.

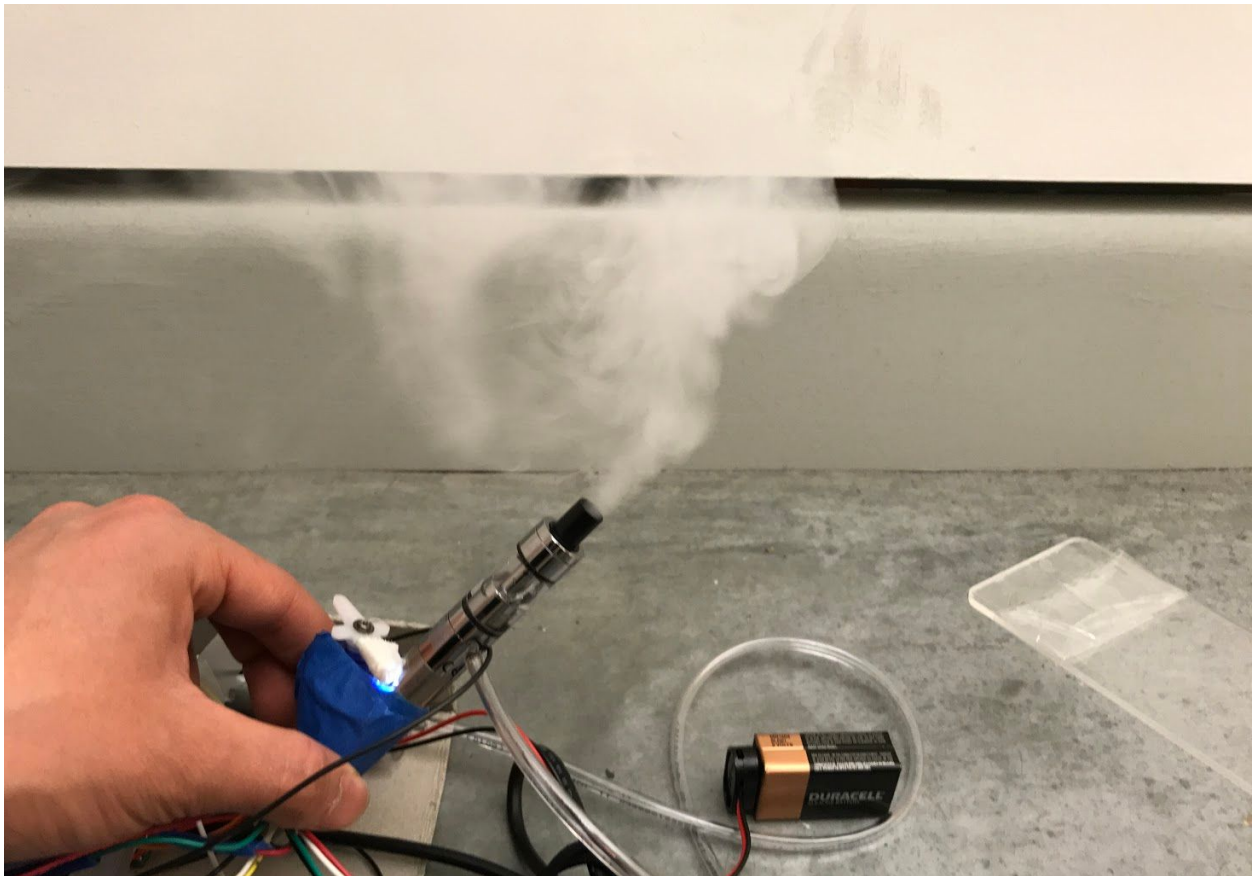
We brainstormed about different manufacturing processes that can be used to make the helmet and decided on vacuum-forming because of its ability to achieve more organic and three dimensional forms. We also liked the transparency of the PETG which makes the lights and fog more visible for our audience. To obtain the vacuum-form mold, we modified an IKEA lamp by sawing off the top half keeping the semi spherical curved half.

We first tried to vacuum form the IKEA lamp with a piece of cardboard covering the top opening but found out the force of the vacuum was too strong which bent the cardboard and ripped the PETG. We then laser cut a circular piece of plywood with proper support to cover up the opening and it was able to withstand the force of the vacuum to create our final form. We first vacuum-formed the front half and trimmed the mold two inches shorter for the back half to create directionality for the helmet.

After both halves have been molded, a circular hole (0.5” offset from the circular edge) is cut on the front half of the helmet. Lasercut a clear acrylic circle (0.5” offset outwards from the opening) as the door. There are attachment holes on the door for the hinge and handle. Magnets are attached to both the helmet and door to allow the hatch to be tightly sealed when closed. The handle is converted into a switch by connecting the two bolts on the door with a wire, with two more wires on the helmet. When the hatch is closed, the circuit is complete which triggers the electronics. Around the circular edge where the door and helmet overlaps, a layer of vinyl is glued to reduce the amount of fog leaking out.

The two halves of the helmet are lined up and trimmed before the two halves are combined. Once the two halves are trimmed and aligned, a layer of vinyl is sandwiched between the two halves to provide a better seal for the helmet.

We temporarily clamped the two helmet halves together and mark the screw holes on the perimeter of the helmet and hole for the user’s head. Once marked, drill the hardware holes with a power drill while keeping the two halves together. Then separate the two halves to cut out the hole for the user’s head with scissors. Insert bolts in each of the screw holes and secure the two halves together.



Fog

A key component of our original design was to essentially create a storm cloud that loomed over the user, reflecting their inner climate. Initially, we imagined that the helmet would be swirling with a thick, grayish fog that would then clear up and turn wispy and white when the user's mood took a positive turn. However, as we set out to research methods to bring this into reality, we quickly realized that our options were fairly narrow due to the various constraints of our project:

1. The fog must not harm the wearer in any way.
2. The fog generator must be fairly portable: able to be contained in a backpack or set on top of the helmet with little hassle.
3. Fog created must be dense enough to be visible.

The fact that the fog must not jeopardize the wearer's health ruled out traditional fog machines and dry ice, as traditional fog machines run on fuel that contains gasoline and other toxic substances and dry ice will cause suffocation. Steam was also out of the question, as the temperature required to create it would undoubtedly harm the wearer. Further, fog and smoke cannot be colored without resorting to techniques that are seriously detrimental to one's health. These facts limited our options to water vapor or some other non-toxic gas.

While we considered the idea of using a mist-maker (a device often used in decorative fountains to create a semblance of natural haze), we quickly realized that such a device would lead to further complications. Mist-makers must be completely submerged in water to work properly; the mist generated emerges by separating from the pool, similar to steam. In order to leverage a mist-maker, we would have to design an open-ended enclosure to house a considerable amount of water without spilling it.

We turned to Google in search of more attractive options. As it turns out, a surprising number of people have tried using e-cigarettes (also known as “vapes”) to create portable fog machines. Further research revealed that vegetable glycerin is a relatively safe substance that can be vaporized by e-cigs to create a fog effect. Given the compact nature of e-cigs and that with this method, we would not need to worry about water spilling all over our electronics, we decided to move forward with this option.

CONTROLLING THE VAPE

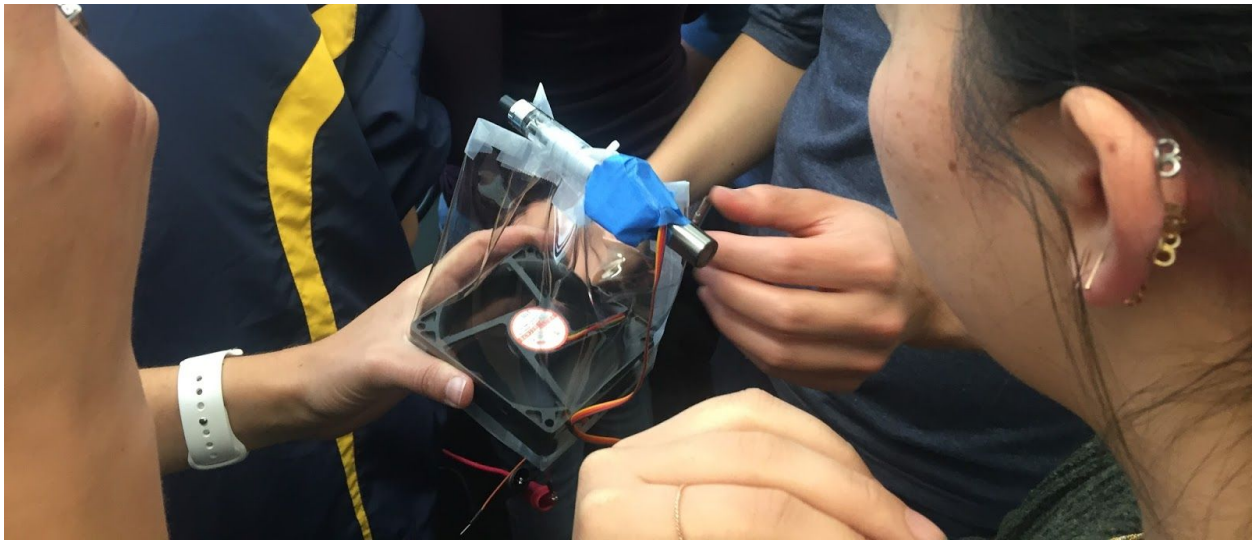
Getting the vape to create the effect we’d imagined during the design phase was actually more difficult than we expected. The most ideal and elegant outcome would be if we could directly apply voltage to the vape via Arduino; being able to remove the vape’s battery would halve the size of our fog generator. But to do this, we needed to know where power and ground were in relation to the vape’s heat coil. Because this differs with brand and model, and because the instruction manual certainly did not display such information publically, we had a surprisingly difficult time trying to identify the proper place to solder the ground and power wires to. Further, we worried that if the vape became too hot (as it is wont to do after frequent presses of the activation button), it might melt the solder and cause the user to breathe in toxic fumes.

A row of heat coils.

Two destroyed heat coils later, we finally realized that the ground wire in our e-cig is placed deep within the heat coil, in a location that may lead to melted solder and that is much too small and narrow to solder to. Further, we found that without the vape's power source, which makes up the lower half of the e-cig pen, vegetable glycerin leaks out the heat coil and weakens the adhesives around the fog generator. In response, we opted to control the vape indirectly by programming a servo to press the vape's activation button when prompted by an Arduino.

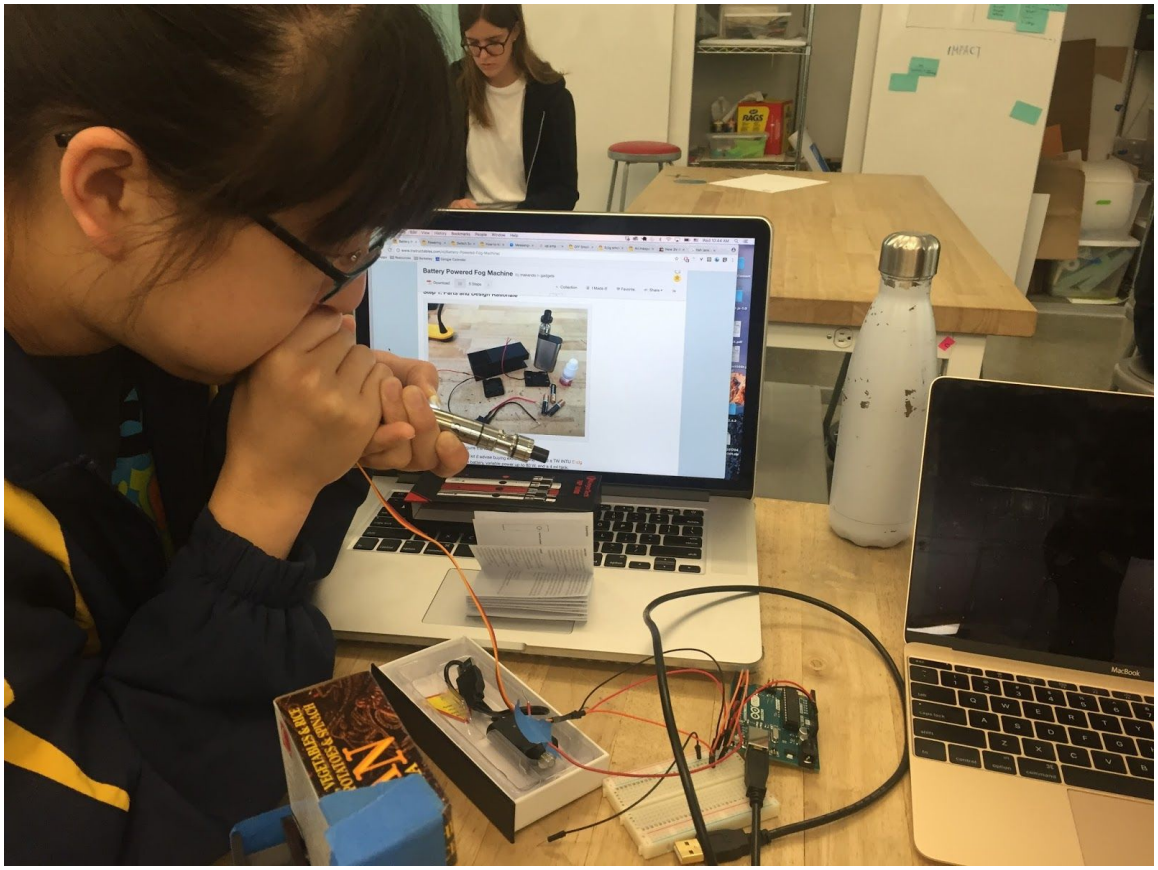
GENERATING FOG

The fog we visualized in our heads was dense, resembling cumulonimbus clouds before a violent thunderstorm. However, we soon realized that generating a visible amount of smoke at all was a feat in itself. In order to properly draw smoke out of a vape without physically sucking it in, air must be artificially drawn out of the opening or blown out.



The computer fan and vape test configuration.

Initially, we followed the attempts of hardware hackers online and tried to use 12V computer fans to draw out the air. This technique, however, is likely more suited for larger vape models that produce considerable amounts of smoke even without the user's intervention. After failing to get this technique to work, we fell back to trying to identify where our model's air holes were located.



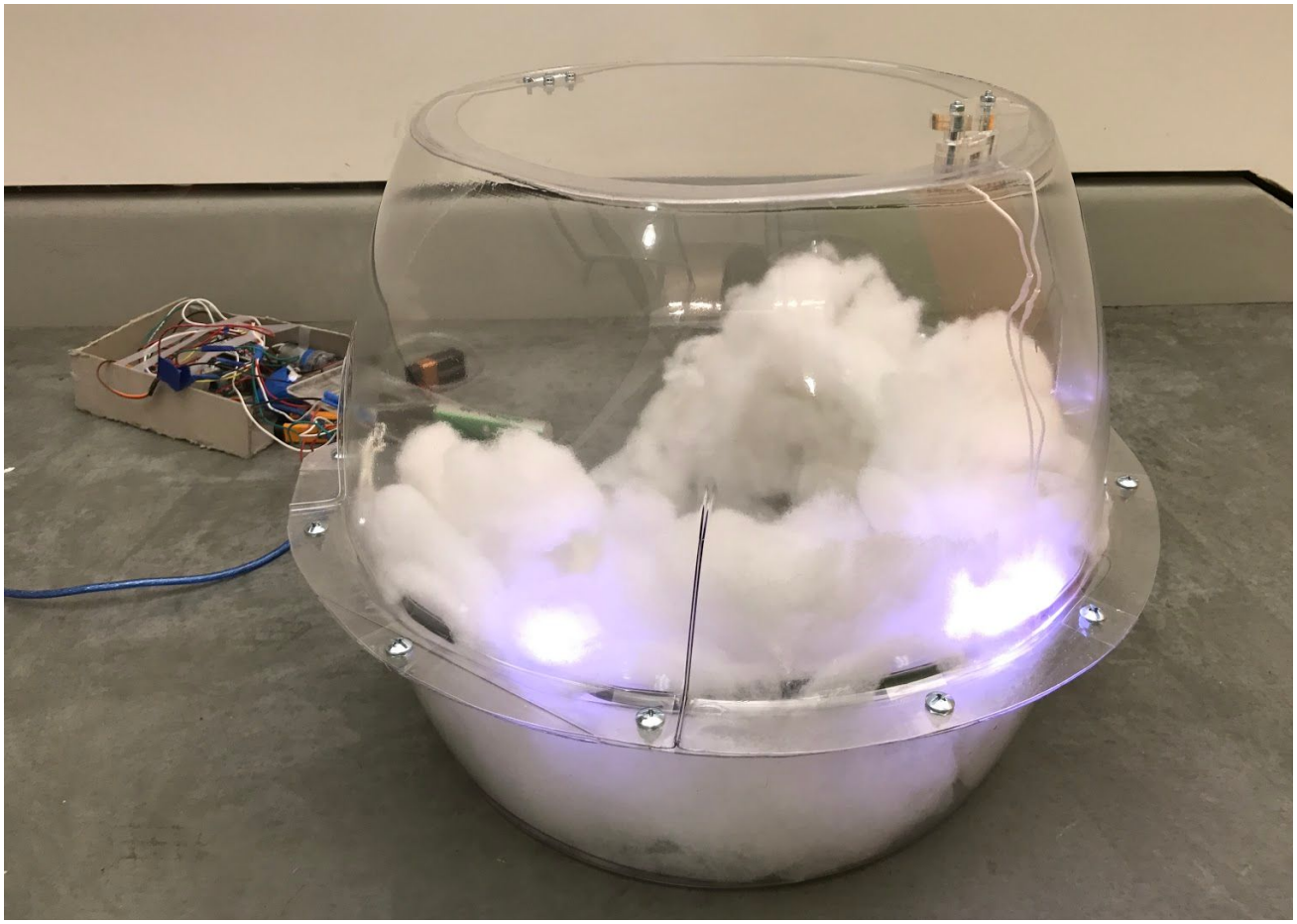
We found, by blowing into various parts of the vape, that the three holes located around the intersection of the vape's power source base and the heat coil are effective for inducing airflow. However, merely taping a rubber tube to one of the holes and sealing the others was still not enough to create the desired amount of thick smoke; the issue was inconsistent airflow. It was only later, when we tried to enlarge the air hole by drilling through the opening, that we were able to create the desired amount of vapor.

Sound

The creation of our sound system was considerably smoother in comparison to the helmet and fog generator. Our initial system consisted of an Arduino Feather and Music Maker Featherwing. The idea was to compile a set of various thunderstorm sound bites and to play one at random whenever lightning was triggered. We quickly realized, however, that we needed a way to make make the lightning sounds seem uniform, as if they were coming from the same storm. Further testing also revealed that the Music Maker is unable to play more than one sound file at once, and that there is an inevitable one second delay between files.

To combat this, we moved operations to the Raspberry Pi, which has the ability to run mpc, a music player program that allows for seamless transitioning between sound files as well as randomization. In order to unify the sounds, we threw them into Adobe Audition, added a looped rain backing to each sound bite, and normalized each file.

In the final system, our main Arduino controller sends a signal to the Raspberry Pi via serial when the helmet door closes, which the Pi takes as a cue to begin playing the thunder sound bites in a randomized order. It ceases playing sounds when the Arduino tells it that the door is open. The volume of the thunder sounds is adjusted according to the amount of time the wearer has the door closed; the longer the wearer is isolated, the louder the sound becomes.



Lightning Simulation

Creating the illusion of lightning was unexpectedly smooth, due to the existence of similar projects such as *Cloud* by Richard Clarkson. In particular, Molly Nicholas has generously made her code for lightning simulation public, and we built off of her existing code, modifying it to adjust the probability of lightning strikes in relation to time.

Reflections & Next Steps

With Storment, we focused more on starting a conversation around depression and bringing form to the invisible via a more performance-based angle, as opposed to accurately representing depression. We are interested in improving our current design with a more seamless spherical helmet form and finding ways to make Storment more immediately responsive to users, as well as more accurately reflective of users' inner climates. From an engineering standpoint, we'd also like to polish the electrical packaging and wiring of the device into a form that is more manageable and less chaotic.

One of our key constraints was the absence of a "prototypical" or "universal" form of depression. However, in future explorations, it would be interesting to design

hyper-individualized pieces that reflect individuals' experiences with depression. These hyper-individualized helmets could have the individual narrating their personal experiences with depression as a sound element. We could also explore more immersive variations of our design through form factors such as a suit or room. We could also expand our subject matter beyond depression to other mental illnesses like anxiety, schizophrenia, bipolar disorder, ADHD, and OCD.

Further, through undertaking this project, it has come to our attention that there are cross-cultural differences in how depression is experienced, perceived, and discussed. We presented Storment to individuals living in Western, individualistic cultures and would be interested in exploring how our design would be received in collectivist cultures such as those in East Asia.