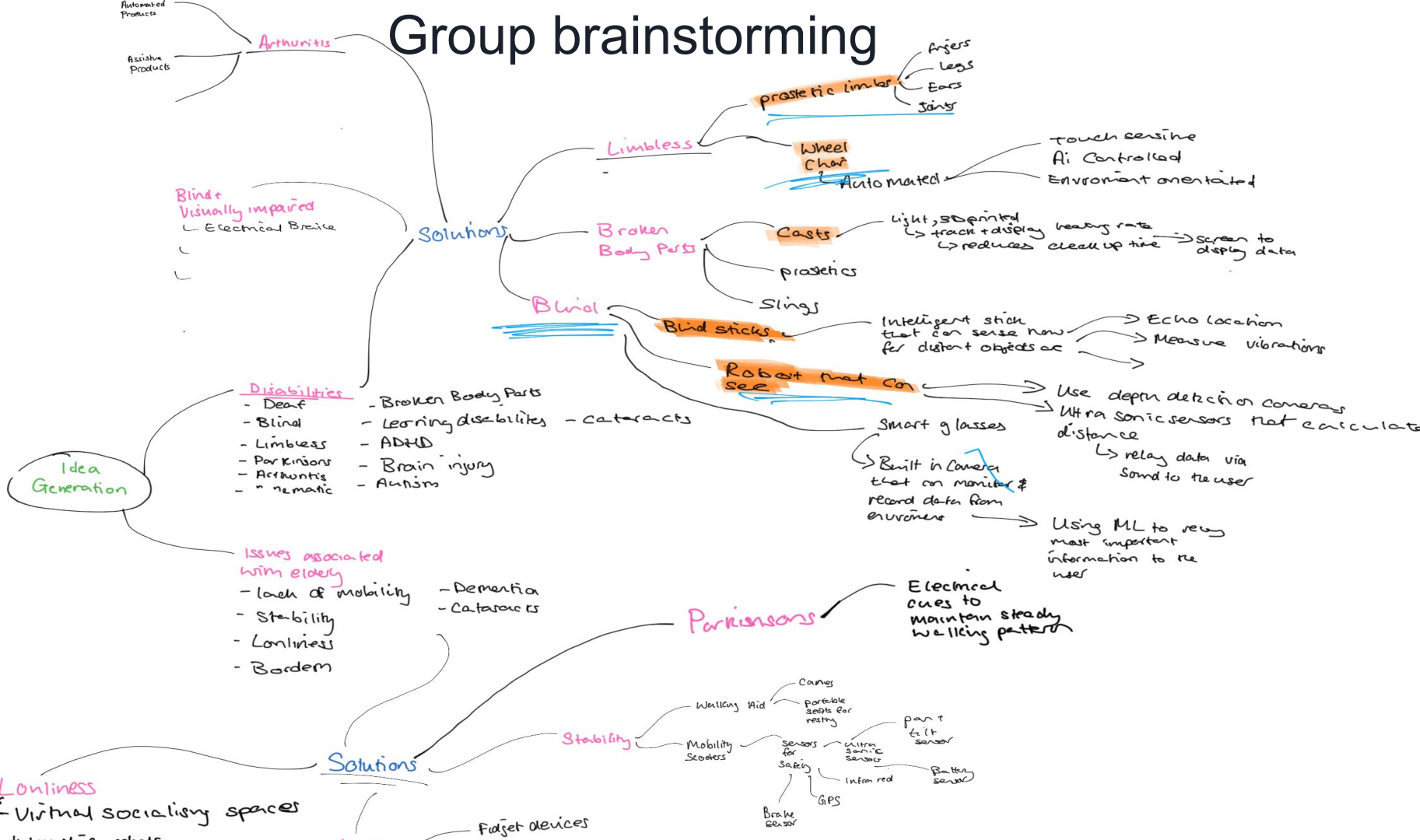
The Shell Slinger

Ryan, Morenike, Leo & Leon

Brainstorming

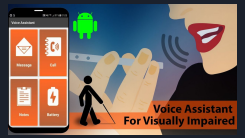
Group brainstorming



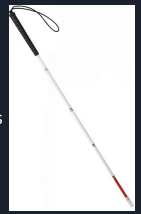
Existing product examples: Arthritis & Mobility

The Reizen Talking Watch is a crucial aid for those with visual impairments, offering an independent timekeeping solution. With a clear, natural voice, it audibly announces the time at the press of a button, ensuring effortless time awareness. Designed for accessibility, the watch features tactile, user-friendly buttons for individuals with dexterity challenges. Its various styles cater to both functional needs and personal preferences, seamlessly blending practicality with style. This discreet and efficient assistive device enhances the daily lives of individuals with visual impairments, promoting autonomy through reliable timekeeping

Voice assistants like Alexa, Google Assistant, and Siri are AI-driven technologies that understand and respond to spoken commands. They provide a hands-free way for users, including those with visual impairments, to perform tasks such as sending messages, setting reminders, and accessing information through natural language voice interactions. These technologies contribute to increased accessibility, independence, and convenience for users with diverse needs.



A cane serves as a vital mobility aid for individuals with visual impairments, facilitating safe and independent navigation. Its primary uses include detecting obstacles and changes in terrain through sweeping motions, maintaining a straight path for walking, identifying surface changes, and providing tactile feedback about the environment. The audible cues created by tapping the cane enhance safety and awareness, signaling obstacles to the user. Additionally, the cane enables independent travel, promotes spatial orientation, and can be used as a communication tool by signaling for assistance or alerting others to specific situations. Overall, a cane is a versatile tool that enhances the daily mobility and autonomy of individuals with visual impairments.



Existing product examples: Visual Impairments

Braille displays are tactile devices that convert digital text into Braille, allowing individuals with visual impairments to read through touch. Used with computers or mobile devices, these displays facilitate access to digital content, promoting literacy and independence. The dynamic updates of the Braille cells provide real-time feedback, empowering users in educational and professional settings by enhancing their ability to navigate and interact with the digital world.

The MagnaReady Magnetic Adaptive Shirt is a practical solution for individuals with arthritis and disabilities, featuring magnetic closures instead of traditional buttons. By eliminating the need for intricate maneuvers during dressing, it addresses challenges related to limited dexterity and joint pain. The secure and efficient magnetic closures facilitate easy dressing and removal, emphasizing accessibility and independence. This innovative design not only simplifies the dressing routine but also boosts confidence for those with physical limitations, showcasing how adaptive clothing like MagnaReady enhances the daily lives of individuals with arthritis and disabilities, promoting a sense of autonomy.

The My Weigh Vox 3000 Talking Kitchen Scale is a crucial tool for visually impaired individuals in the kitchen. With a clear, audible voice, it announces ingredient weights in real time. The scale's design includes a large, easy-to-clean platform and tactile buttons for user-friendly operation. By delivering spoken weight readings, it promotes independence and precision in cooking, empowering users to measure ingredients confidently. The My Weigh Vox 3000 exemplifies how innovative technology makes essential household tasks accessible, fostering greater autonomy in daily activities.

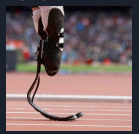
The Nike Adapt BB 2.0 is a high-tech, self-lacing basketball shoe designed for peak performance. While not explicitly designed to aid disabilities, its adaptive technology, allowing for easy adjustments via buttons or a smartphone app, can benefit individuals with mobility challenges or limited dexterity. This innovative footwear reflects Nike's commitment to advancing technology in shoes, offering potential accessibility and customization for those with specific mobility needs.

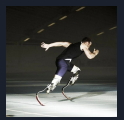
Existing product examples: Amputees

The iWALK2.0 Hands-Free Crutch revolutionizes mobility for those with lower leg disabilities. Serving as a hands-free alternative to traditional crutches, it offers independence during recovery. Specifically designed for lower leg amputees or individuals [illegible] securely straps to the [illegible]t without the need for [illegible]ovative solution allows [illegible]activities with increased [illegible] reducing physical strain. Ideal for those recovering from lower leg injuries or amputations, the iWALK2.0 enhances mobility and overall well-being by providing the freedom to engage in hands-on activities.

The Nike FlyEase redefines athletic footwear for individuals with disabilities, featuring an easy-entry system replacing traditional laces. With options like zippers or wraparound straps, it caters to those with mobility or dexterity challenges. Promoting independence and inclusivity, the design is stylish and functional. Integrated into various athletic shoe models, Nike FlyEase exemplifies how thoughtful and inclusive design enables individuals with disabilities to comfortably engage in sports and physical activities.

The Össur Flex-Run Prosthetic Foot is designed to transform the mobility of individuals with disabilities, especially those leading active lives. Engineered for running, it offers remarkable energy return and flexibility, enhancing the overall running experience for amputees with a smoother gait. This advanced prosthetic empowers users to confidently engage in athletic activities, bridging the gap between functionality and performance for those with limb differences. Össur Flex-Run not only improves mobility but also underscores a commitment to enhancing the quality of life for individuals with disabilities, enabling them to fully participate in physical activities.





Research-Prosthetics

Online research

Ryan

Why are prosthetics useful:

Restoration of Functionality:
Prosthetic limbs are designed to replicate the functions of natural limbs, restoring a significant level of mobility and functionality. This allows individuals to perform daily activities, such as walking, holding objects, and carrying out various tasks.

Advancements in Technology:
Ongoing advancements in prosthetic technology, such as bionic prosthetics, offer users more natural control over their artificial limbs, further enhancing their usefulness.

Improved Independence:
Prosthetic limbs enable greater independence for individuals who have lost a limb. With a well-fitted and functional prosthetic, individuals can perform many activities on their own, reducing dependence on others for assistance.

Adaptability to Daily Tasks:
Prosthetic arms come with various attachments and components that allow users to adapt to a wide range of daily tasks. Specialized attachments can be used for activities like typing, cooking, or even participating in sports.

Psychological Well-Being:
The restoration of a limb, even if it is prosthetic, can have a positive impact on an individual's psychological well-being. Prosthetics help individuals regain a sense of normalcy, boosting self-esteem and confidence.

Improved Quality of Life:
By restoring functionality and mobility, prosthetic limbs contribute to an overall improvement in the quality of life for individuals who have experienced limb loss. This includes increased participation in social, recreational, and vocational activities.

Enhanced Mobility:
Prosthetic legs provide amputees with the ability to walk and move more freely. This contributes to improved mobility, allowing individuals to navigate various terrains, climb stairs, and engage in recreational activities.

Ryan

How to test prosthetics?

Functional Testing:

Range of Motion: Evaluate the prosthetic limbs ability to mimic natural joint movements and ensure a full range of motion.

Load Bearing: Test the limb's capacity to bear the user's weight during different activities such as standing, walking, running, and climbing stairs.

Durability Testing:

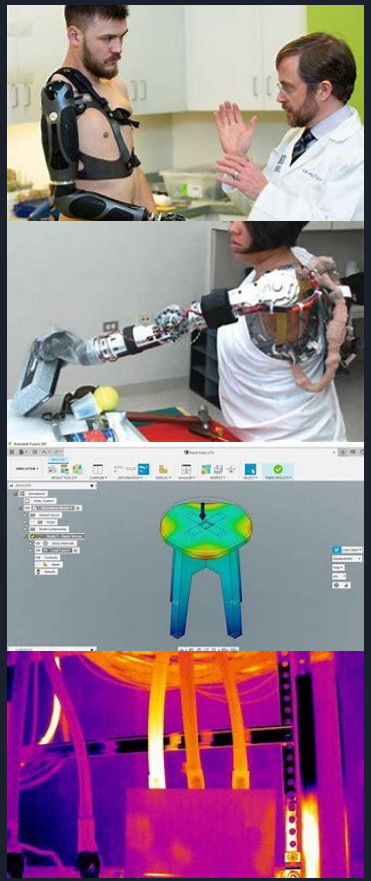
Wear and Tear: Simulate the effects of extended use by subjecting the prosthetic limb to repeated stress, impact, and friction to assess its durability over time.

Material Strength: Test the strength and integrity of materials used in the prosthetic limb components to ensure they can withstand everyday activities.

User Trials:

Fit and Comfort: Collect feedback from users regarding the fit, comfort, and overall feel of the prosthetic limb during real-world use.

Usability: Evaluate how easily users can put on and remove the prosthetic limb, adjust settings, and perform daily tasks.



Safety Testing:

Failure Modes: Identify potential failure modes and conduct tests to ensure that failures are rare and, when they occur, are not catastrophic.

Emergency Situations: Assess how the prosthetic limb performs in emergency situations, such as sudden stops or falls.

Biomechanical Testing:

Gait Analysis: Evaluate how the prosthetic limb affects the user's gait and overall biomechanics during walking and other activities.

Balance and Stability: Assess the prosthetic limbs impact on the user's balance and stability, particularly during dynamic movements.

Environmental Testing:

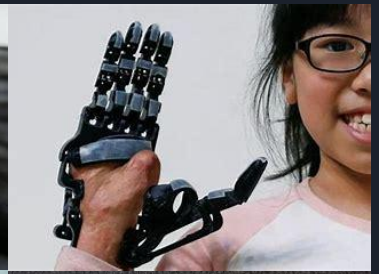
Temperature and Humidity: Assess the prosthetic limbs performance under different environmental conditions, including extreme temperatures and humidity.

Water Resistance: Test whether the prosthetic limb can withstand exposure to water, and in some cases, whether it can be used in aquatic environments.

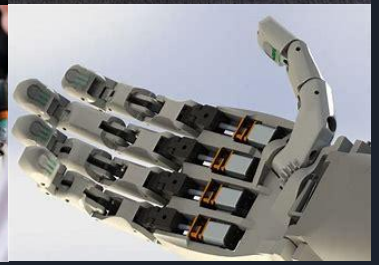
Ryan

Generative ideas- prosthetics

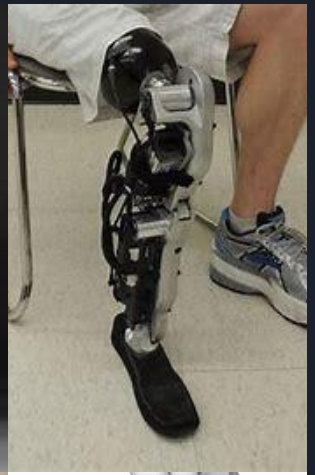
Arm

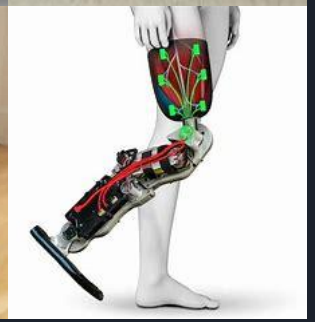







Leg



Others

Specification

User profile

Name: Franklin Franklyn
Age: 48
Job title: carpenter
Location: Gieben, Germany

Franklin, a 48-year-old carpenter in a small town who leads a rugged lifestyle with a workshop filled with tools and unfinished projects. His days are physically demanding, starting early and often involving heavy lifting and intricate detailing. Despite a recent arm injury requiring a cast, Mr Franklin remains optimistic. He enjoys quiet evenings with his dogs, explores the woods, and spends weekends teaching woodworking to his kids. Even though the cast has slown Franklin down his desire for a new cast with better fitment features and technology has been greatly awaited.

Day in the life

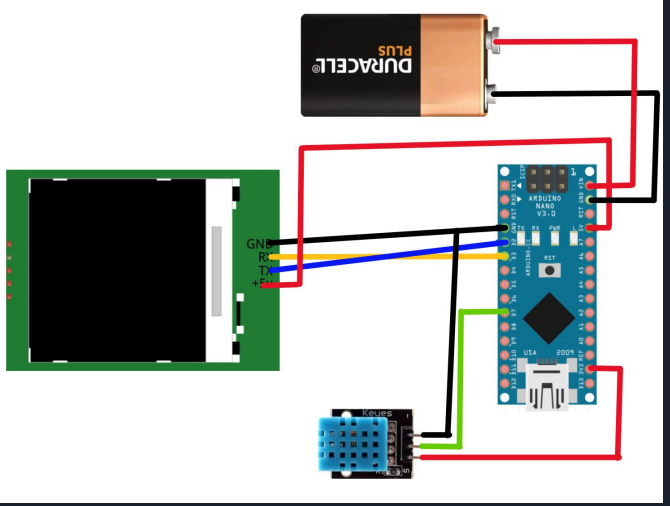
- Wakes up and goes to carpentry shack
- Plans his day of products and services
- Works 6am-4pm sweating and straining his arm
- Depressed because he can’t spend time with kids because of arm issues
- Comes home aching and tired
- Arm hurting every day but need to proceed to the next with no time to rest
- And low pay means he can't afford a better cast

ACCESS FM	Specification Point	How it will be measured/tested
Aesthetics	-**Futuristic design**- sleek & streamlined with a modern and aesthetic appeal -**Ergonomic Aesthetic**- Smooth flowing lines for a visually appealing form -**Slim Profile**- thin/lightweight profile for a modern & tech forward aesthetic	- Customer reviews on the look of the product - Product comparisons - Product analysis
Cost	-Affordable: should be available in stock Use common materials that are readily available and can used in manufacture to reduce variable costs	The cost will be measured and decided after the material/ production costs of the product are finalised.
Customer	-The targeted customer audience are those that suffer from blindness or are severely visually impaired -The customer should have at least a singular functional arm with a working hand	Those that struggle with visual impairment problems from a day to day basis can use the product to somewhat improve their daily life
Environment	-Eco-friendly: Use as much recyclable material as possible -The materials and the structure of the product are able to withstand wear and tear throughout different terrains and environments -The materials should be somewhat rust resistant and able to be used in wet weather	It will be tested over time to see how the product withstands hard use on a daily basis
Size	- The size should be proportional to the users height and anthropometrics. - Size should meet environmental specifications - should fit users arm accordingly to achieve comfort	- Take trial walks - Should promote good posture, upright and comfortable. - Make sure adjustment mechanism is locked.

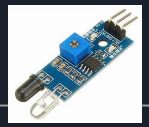
Specification

ACCESS FM

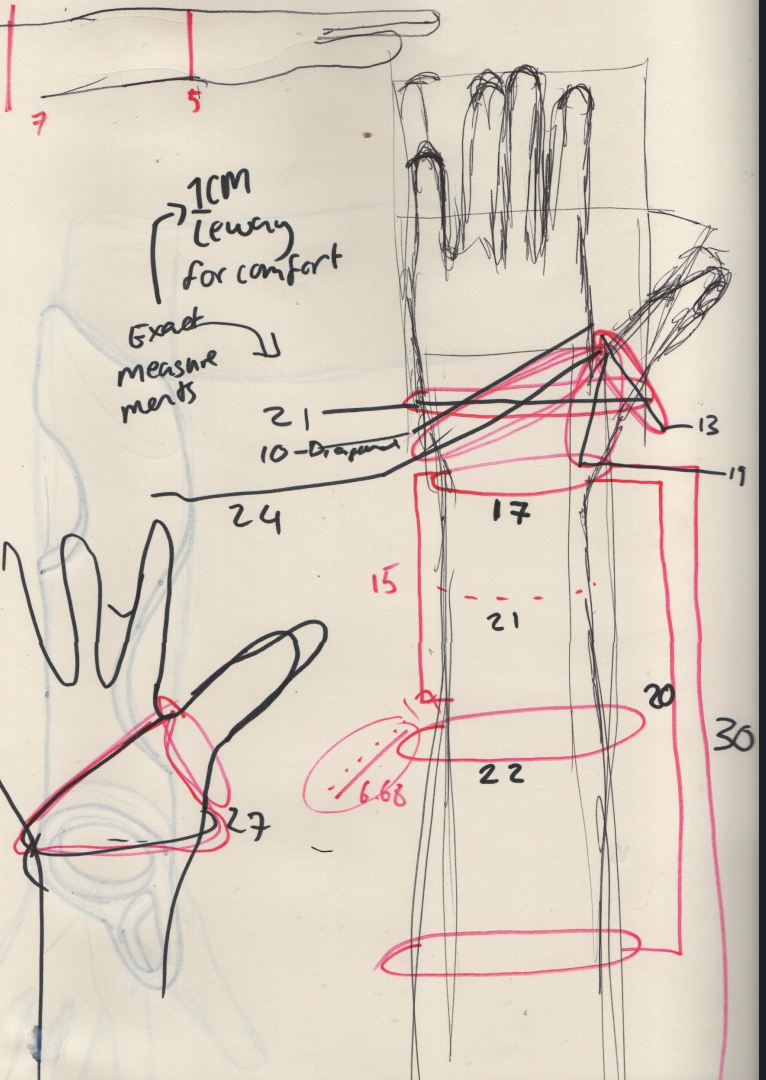
SPECIFICATION POINT	HOW IT'LL BE MEASURED/TESTED
Safety	- The products **adjustment mechanism should be fully locked.** - Should promote good posture and **follow size, material and environmental specs** - **Weight shouldn't make user uncomfortable** or put any stress on a person's arms	- Taking trial walks will help test the comfortability of the product and if it is durable in certain terrains. - Using stress simulations to measure the tensile strength of the product and how weights affect a person's muscles.
Function	**Obstacle detection**- Must utilise a range of sensors to detect obstacles in the users path **Navigation Assistance**- Must integrate a GPS Module for accurate location tracking **Intuitive UI**- Should include raised buttons to provide intuitive buttons for essential functions **Customisable Settings**- Must have adjustable features to make the product suitable for all individuals of all ages etc.. **Emergency features**- should allow users to notify emergency services/preset contacts in urgent situations	- Controlled testing environment with obstacles of varying sizes and shapes. Use objects or other obstacles commonly encountered in daily life. - Also test the time in which the alarm sounds and ensures users safety. - Have wayfair scenario testing and destination recognition tests.
Material	**Lightweight**-material to allow for little discomfort to the user. **Strong and durable**- In order for the product to last long and be a practical as well as excelling the reliability. **Environment Resistance**- waterproofing and corrosion resistant for protection over electronic components. **Price Effective-** using cheap and commonly used materials to keep costs low.	-The cane can be tested through weighing it and analysis though human opinions/ judgment. -Tested through various stress tests and wear tests while applying it in different environments and conditions. -It should be tested thoroughly through general use by a non blind member and a blind person to test the quality of material and life usage/ wear.



Electronics

Sensors	Function	Uses In the Product
Ultrasonic Sensor 	An ultrasonic sensor measures distance by sending out ultrasonic waves and calculating the time it takes for the waves to bounce back after hitting an object. This information helps in determining the proximity or presence of the object, making ultrasonic sensors commonly used in applications like obstacle detection, distance measurement, and even in some medical devices.	In a smart cane, an ultrasonic sensor can be incorporated to detect obstacles in the user's path. By measuring the distance to objects, the cane can provide haptic or auditory feedback, alerting the user to potential obstacles and enhancing navigation for individuals with visual impairments.
Infrared Sensor 	An infrared (IR) sensor is a device that detects infrared radiation in its vicinity. It works by receiving and interpreting the infrared signals emitted or reflected by objects. Commonly used in applications such as motion detection, temperature measurement, and communication (like in TV remotes), IR sensors play a key role in various electronic devices by converting IR radiation into electrical signals for analysis and control purposes.	In a smart cane, an infrared sensor can be employed to detect obstacles based on their heat signatures. By sensing the infrared radiation from nearby objects, the cane can alert the user to potential obstacles, improving navigation, especially in low-light conditions where visual cues may be limited.
Camera 	A camera is a device that captures and records visual images or videos. It typically consists of a lens, an image sensor, and mechanisms to control exposure and focus. Cameras are used in various devices, including smartphones, digital cameras, surveillance systems, and more, to capture still images or moving pictures for personal, professional, or security purposes.	In a smart cane, a camera can be integrated to provide visual assistance to users with visual impairments. The camera captures the surrounding environment, and the images or video feed can be processed to identify obstacles, recognize objects, or even offer navigation guidance. This visual information can then be conveyed to the user through auditory cues or haptic feedback, enhancing their awareness and improving mobility.
GPS Module	A GPS (Global Positioning System) module is a device that receives signals from satellites to determine its precise location on the Earth's surface. It typically includes a receiver that communicates with GPS satellites, allowing it to calculate latitude, longitude, altitude, and sometimes speed. GPS modules are commonly used in navigation systems, tracking devices, and various applications where accurate location information is essential.	
Force Pressure sensor	A force pressure sensor, also known simply as a force sensor or a pressure sensor, is a device designed to measure the force applied to it per unit area. These sensors are used to convert the mechanical force or pressure into an electrical signal that can be measured and interpreted.	

Design



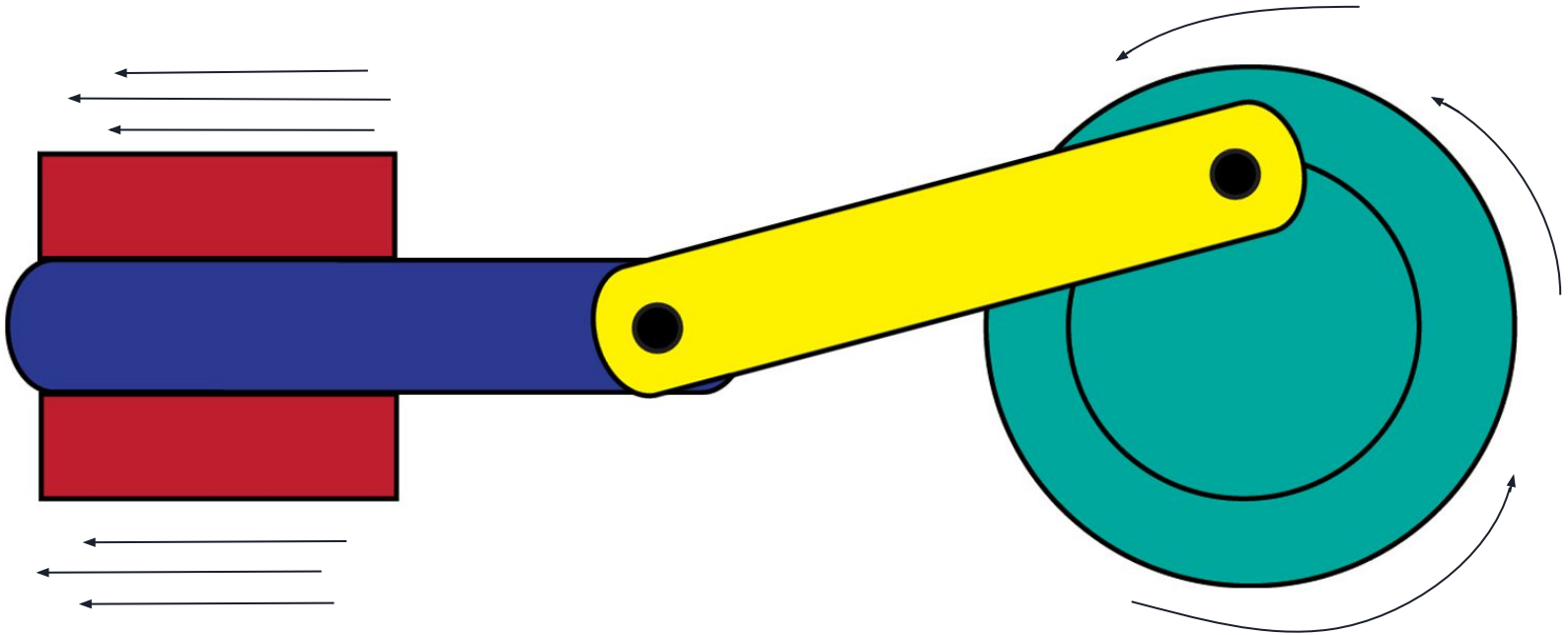
What are anthropometrics and why are they important?

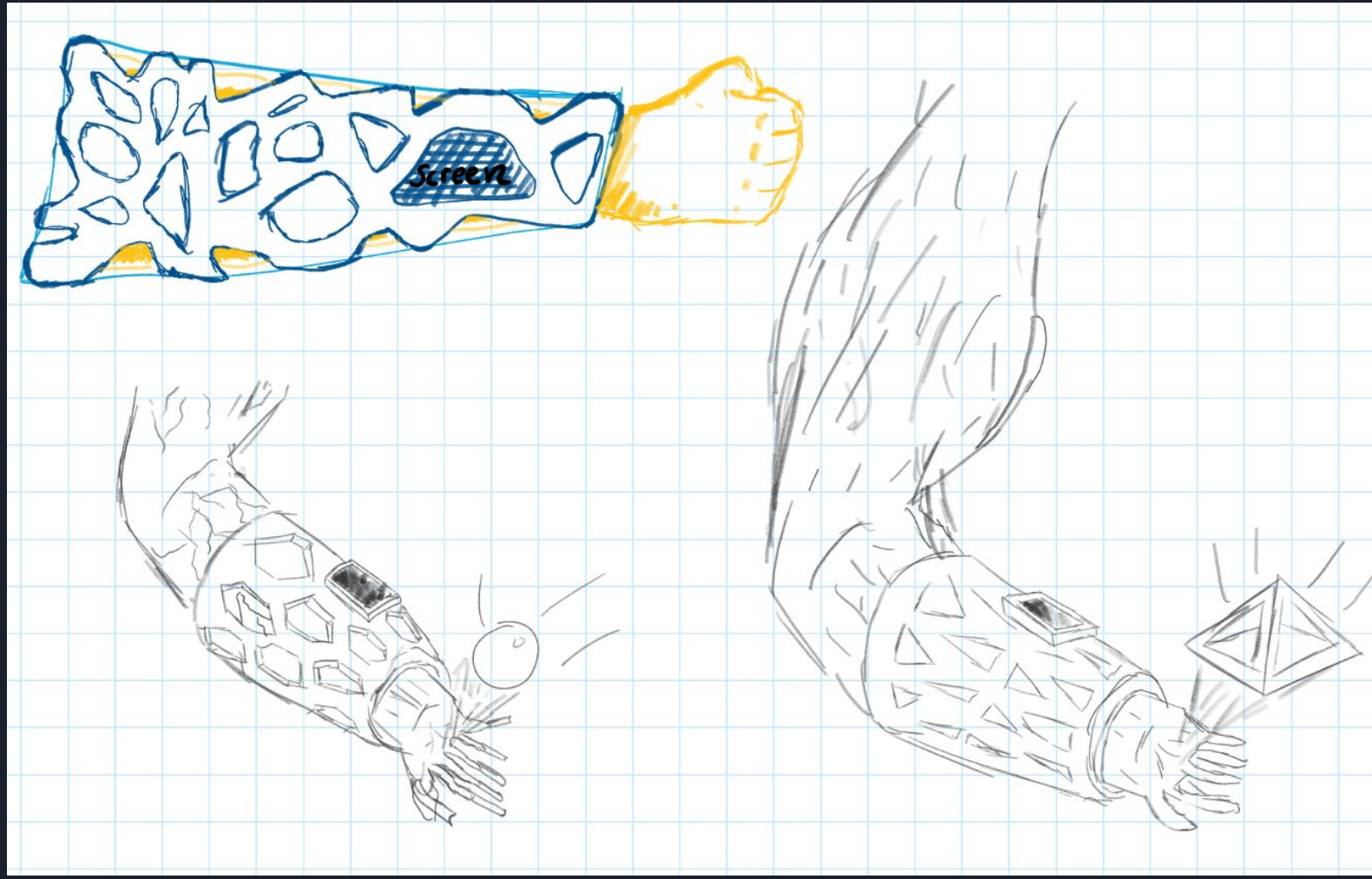
Anthropometrics are measurements of the human body, like height, weight, and limb length. They're important because they help designers create products and spaces that fit people comfortably and safely. By considering anthropometric data, designers can ensure inclusivity and accessibility for a diverse range of individuals, ultimately enhancing user experience and quality of life.

For comfort, we took measurements of my arm and constructed a fitted arm cast around it to ensure it fit comfortably and was not loose.

Crank & Slider

From Rotary Motion into Reciprocating Motion

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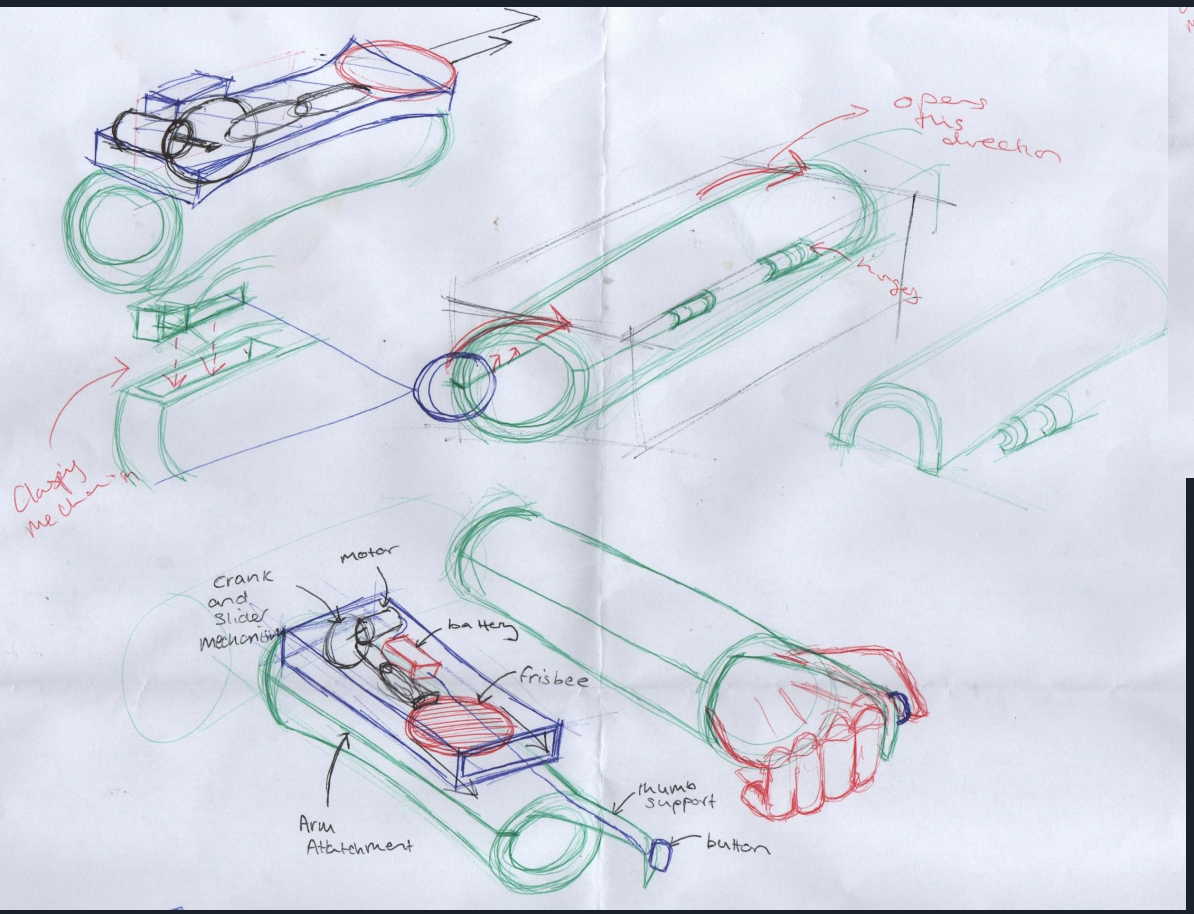
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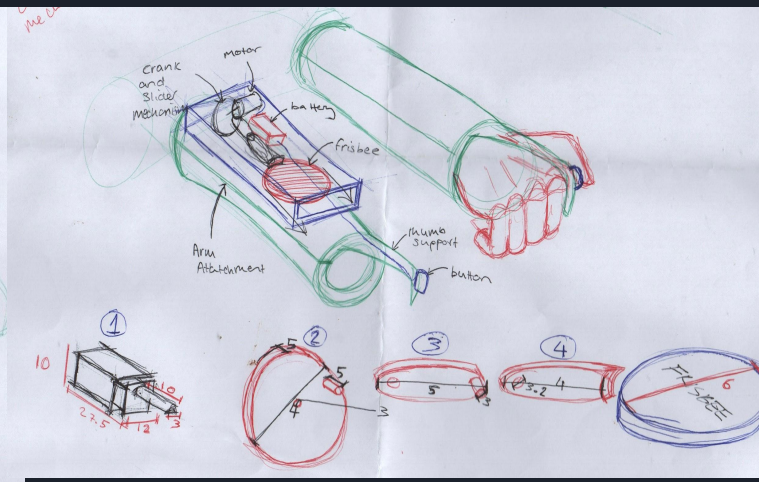
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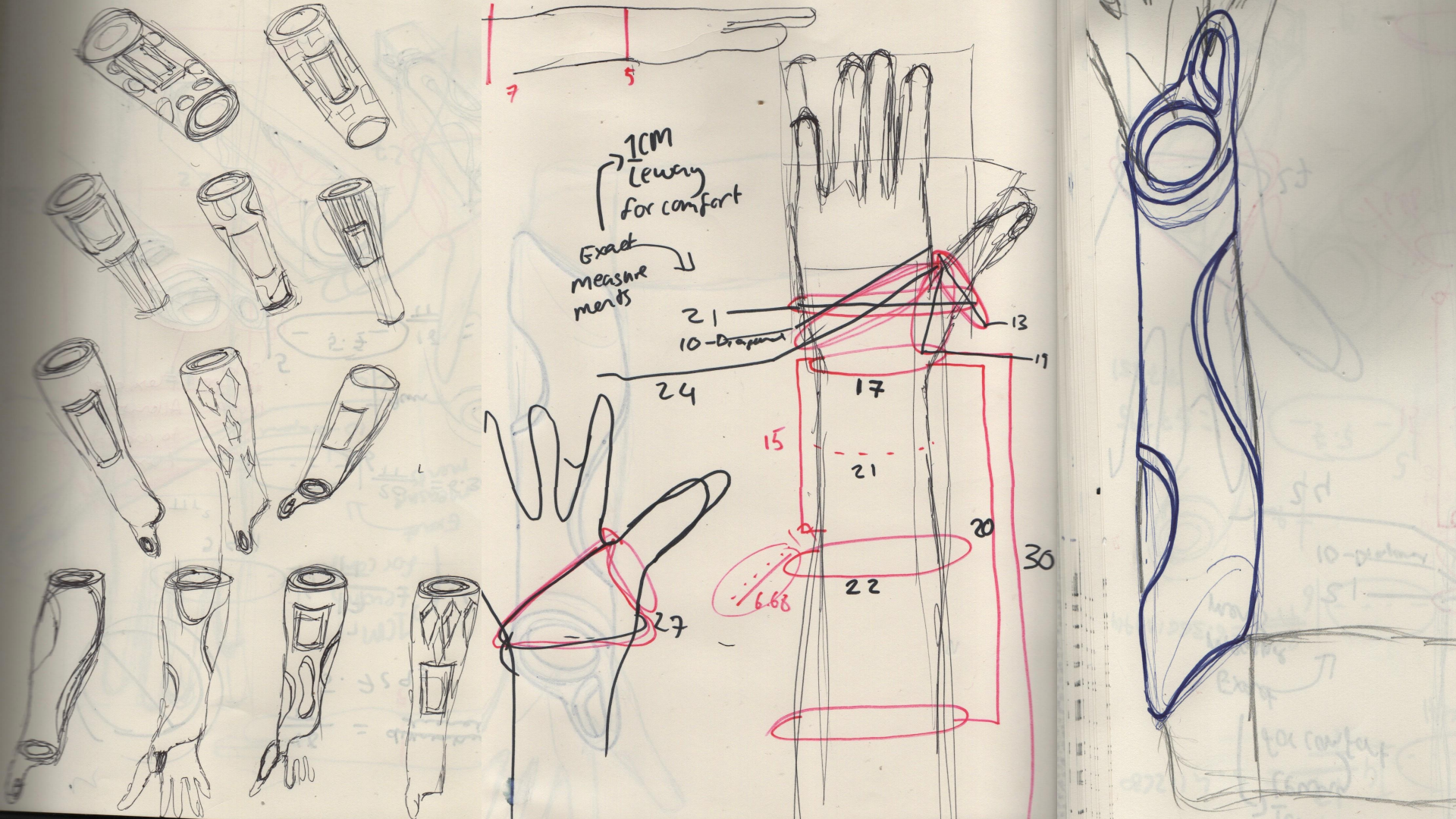
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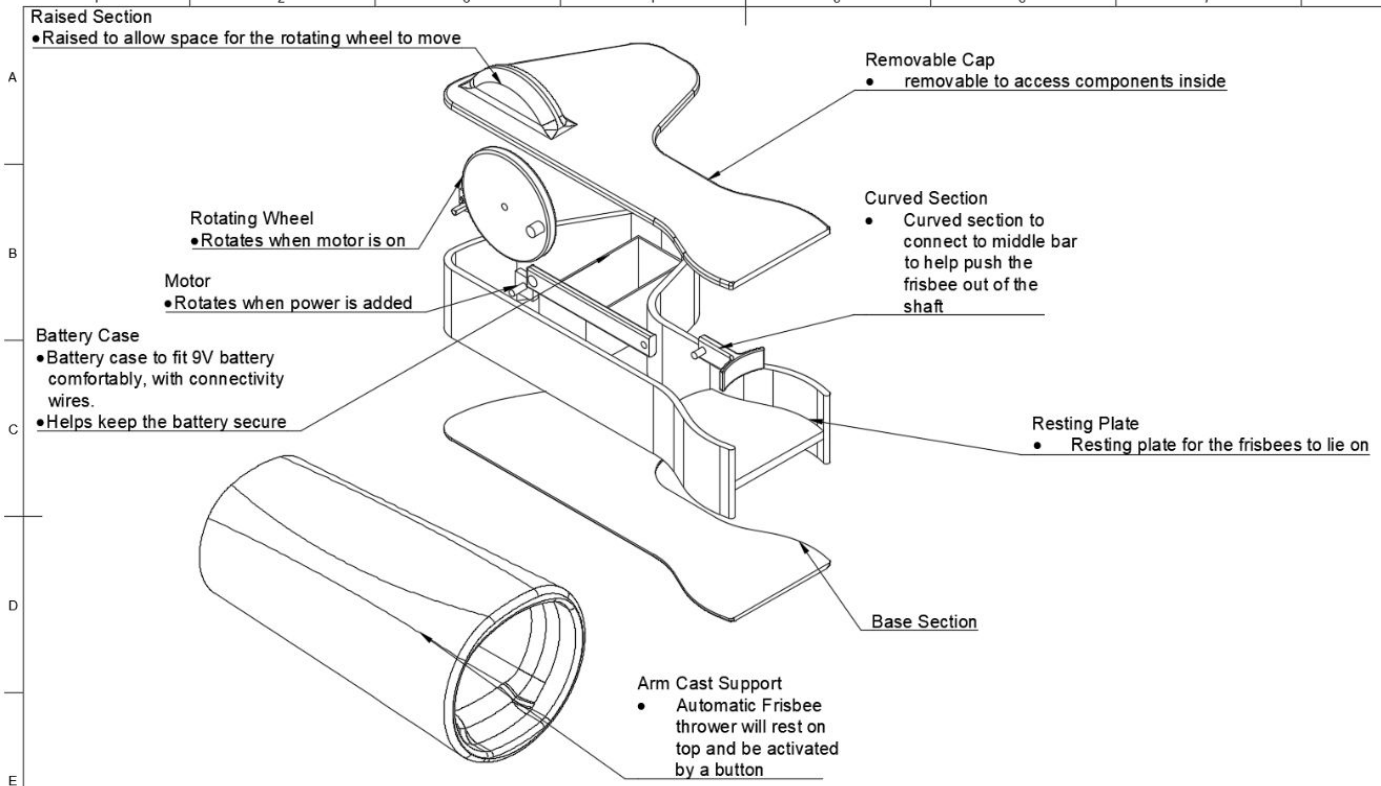

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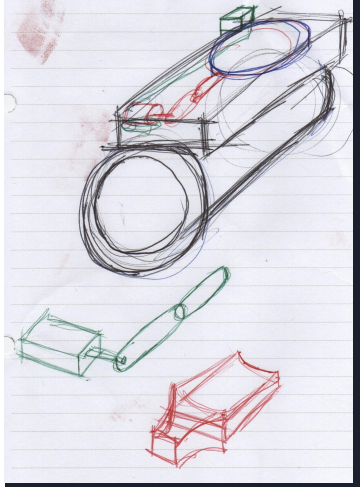
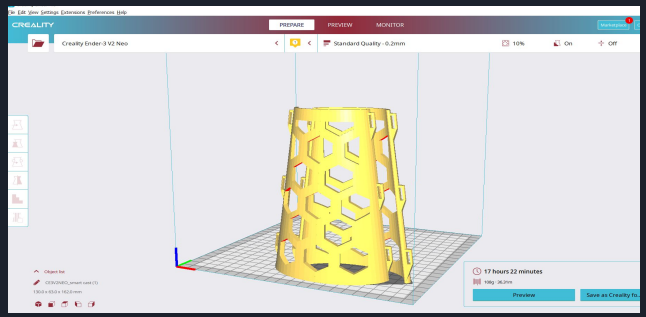
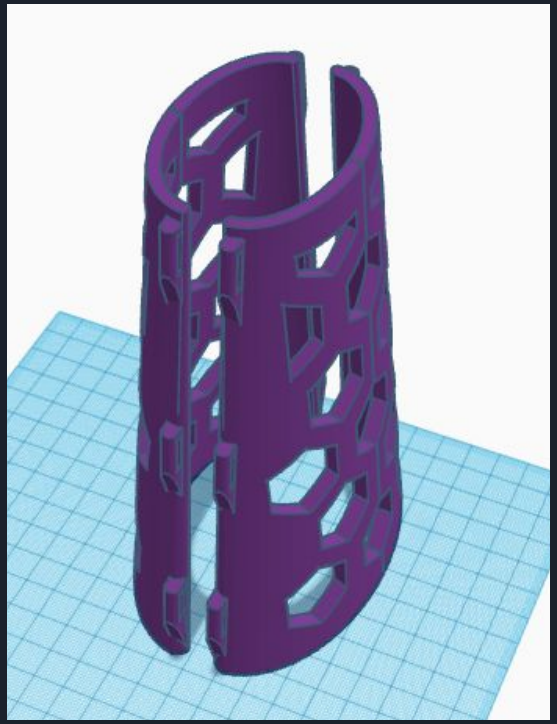
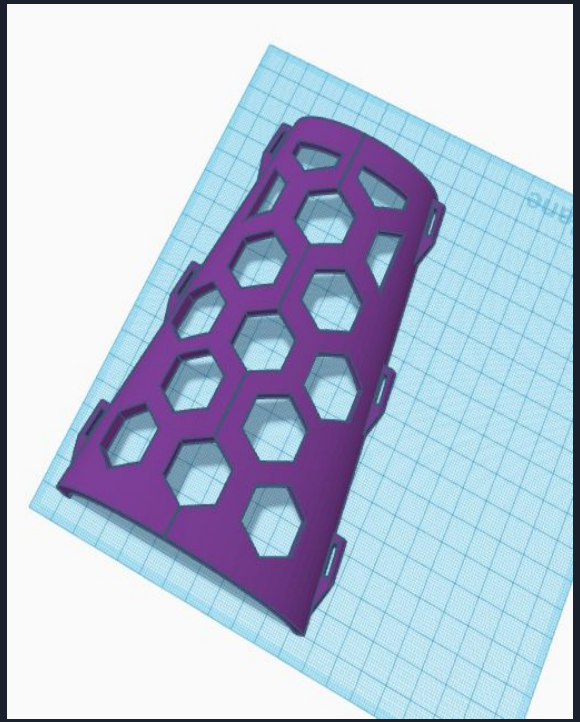
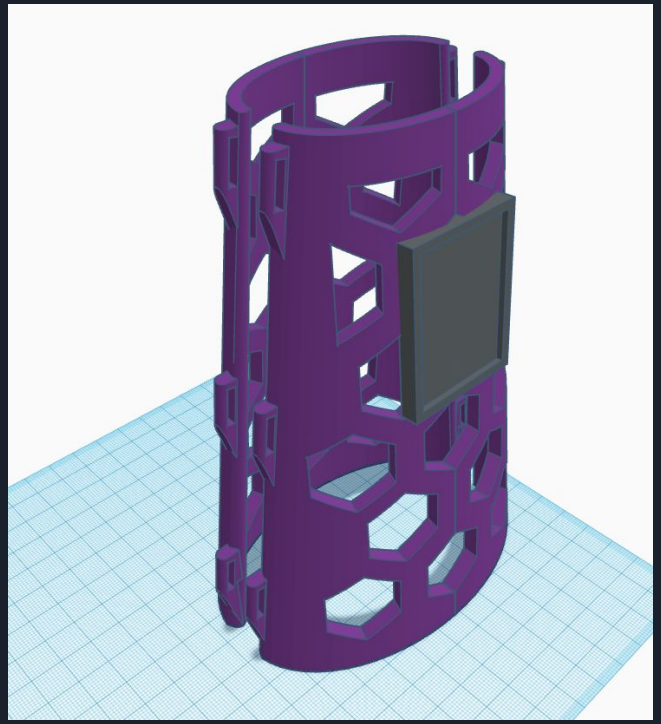


Initial TinkerCad Prototype

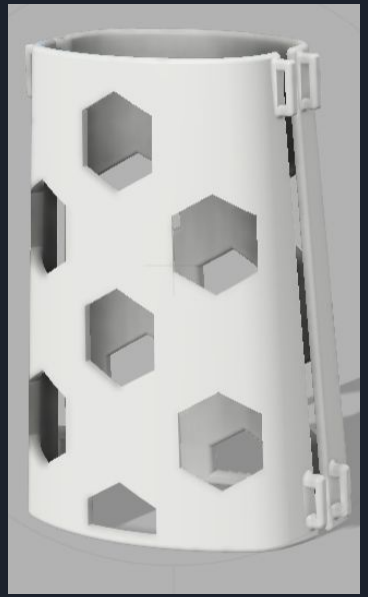
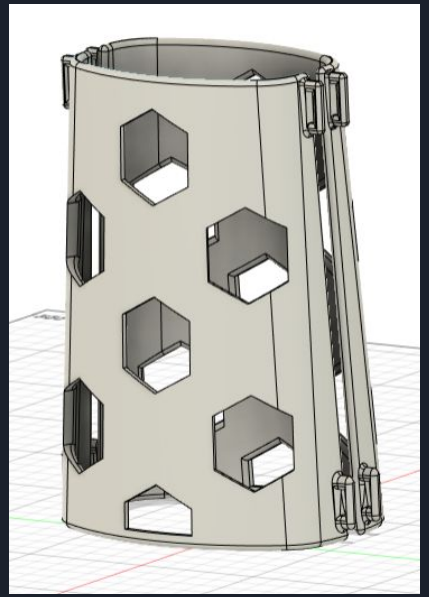


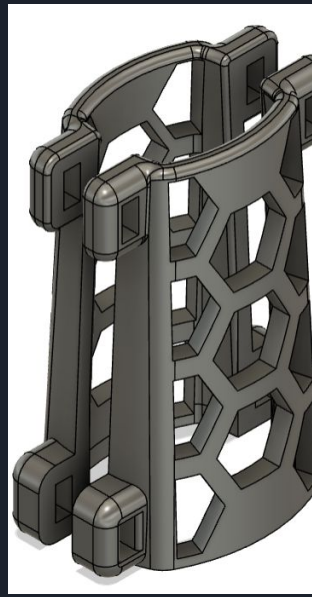






1st prototype

Design Development & Iteraions

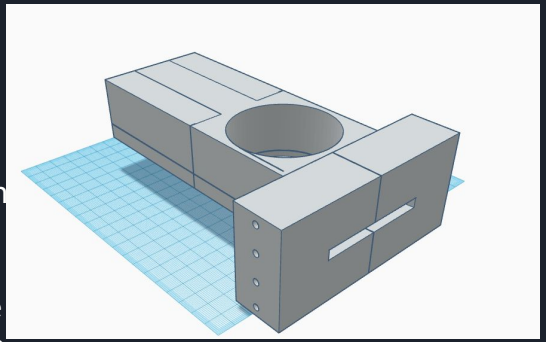
Initial Product Concept

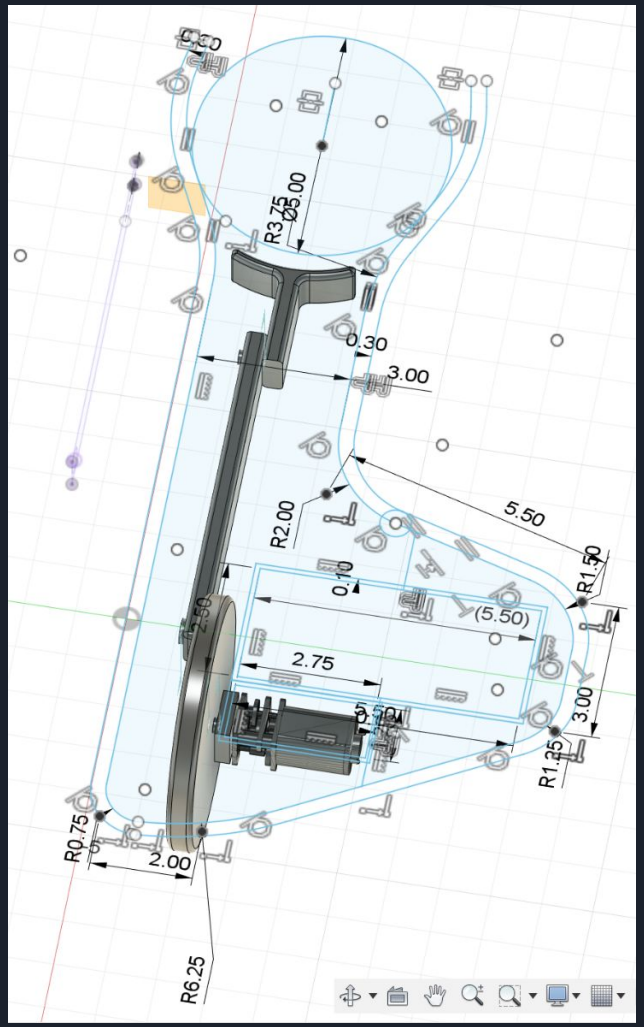
Initially, our idea was to design and build an adaptive arm cast for people with arm injuries, such as broken bones or fractured wrists. We wanted to incorporate sensors such as heartbeat and blood pressure sensors etc and enable the readings to be displayed on a small screen situated on the surface of the arm cast.
The design consisted of an ergonomic shape and parametric perforations to enable ventilation, regulating the arm temperature. However, upon further thought and consideration, we decided to iterate our idea further, as we believed that the design should have more empathetic thought considerations and could be more exciting and unique.

Second Product Concept

Our new product is an automated **frisbee thrower**, for individuals that may find it difficult to throw frisbees due to a lack of mobility in their arms. Examples of disabilities within this criteria are people with arthritis, broken arms or paralysis.

To really change the product, we added a frisbee thrower mechanism on top of the 'cast'. In order to launch the frisbee, there is a trigger mechanism. To activate the trigger mechanism, an easy access button, located on the side of the cast, must be pressed. This will cause an oscillating motor mechanism to activate, pushing the frisbee forward into a second mechanism. The second mechanism is the 'booster', consisting of 4 motors rotating in opposite directions at an extremely fast speed. In between the motors are foam cylinders that offer grip to the frisbee, allowing it to launch further.

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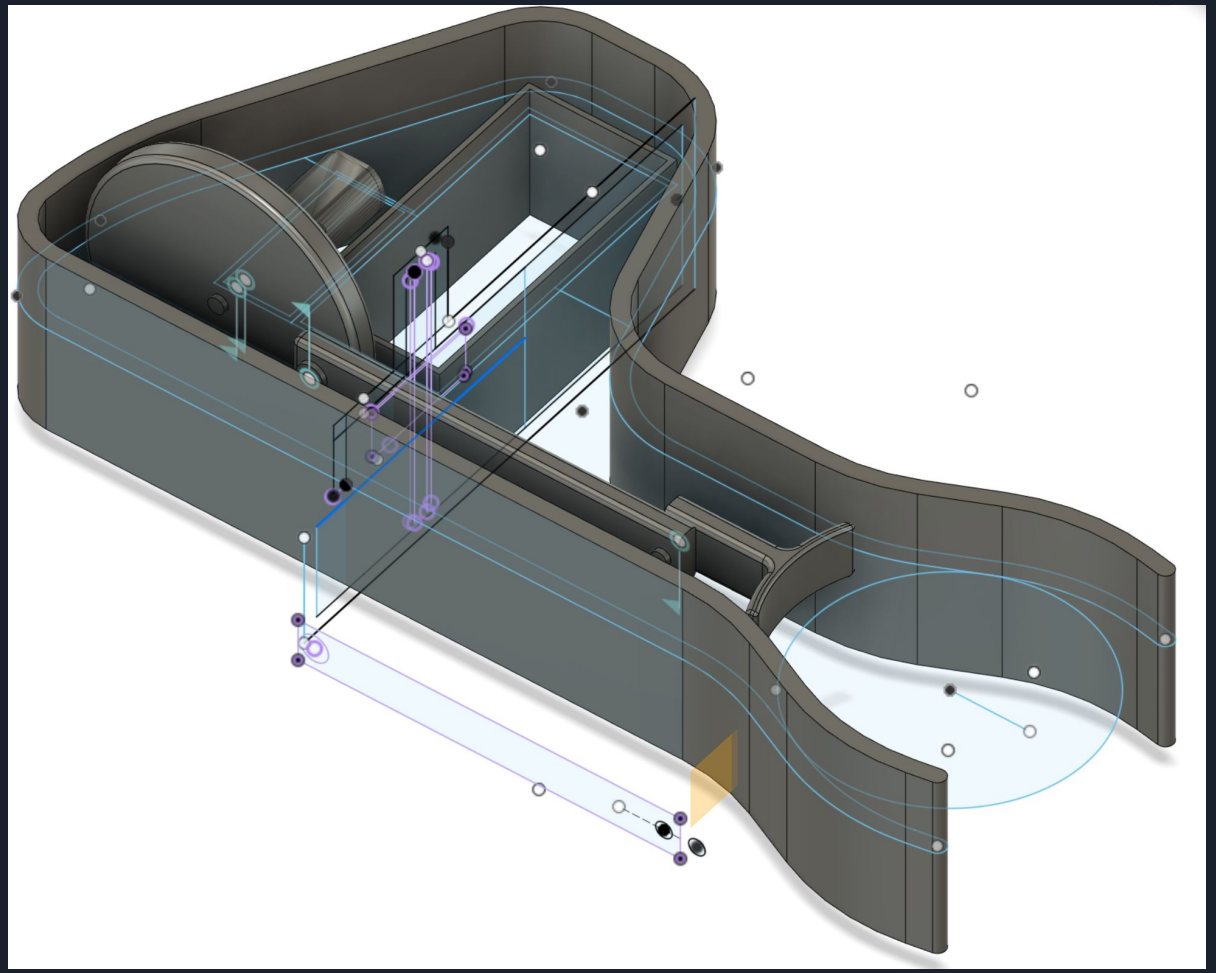
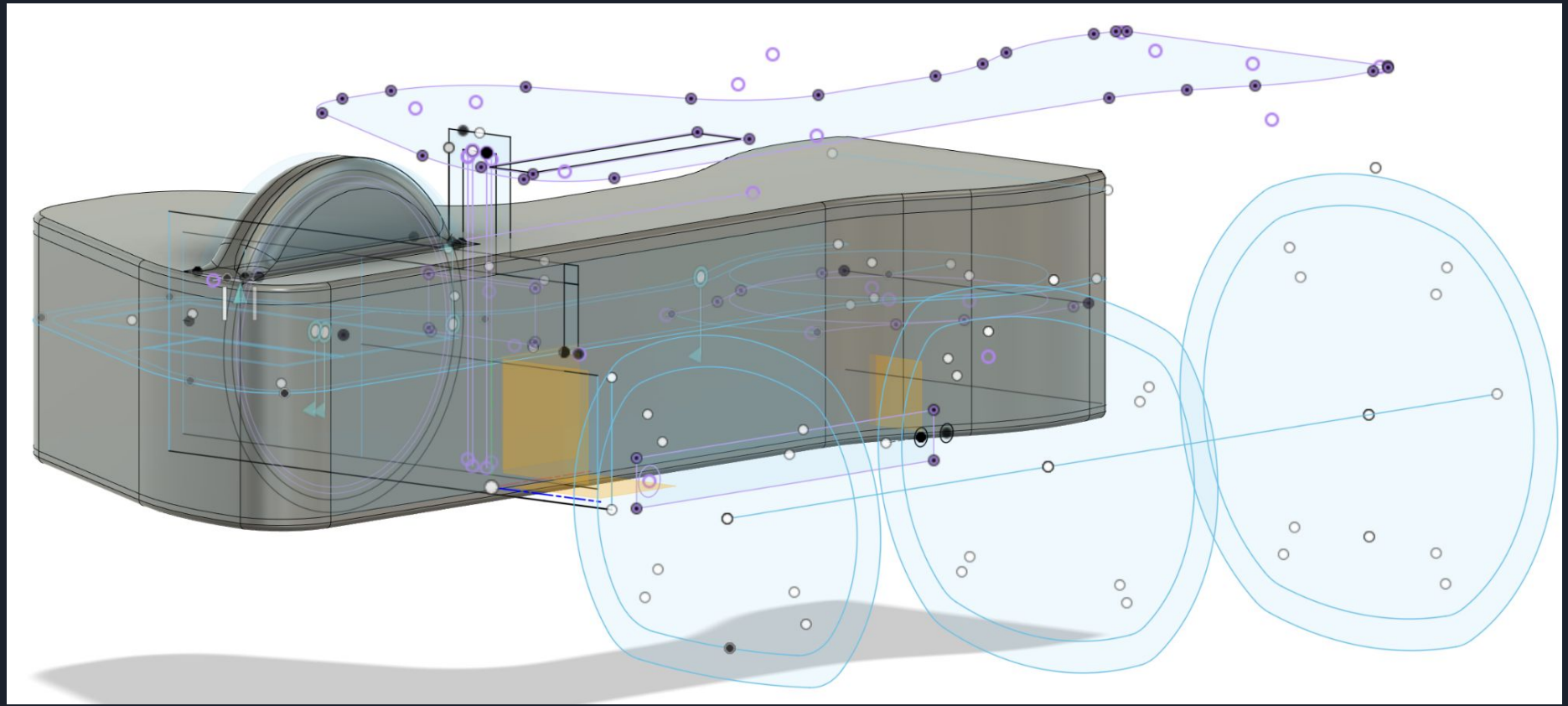
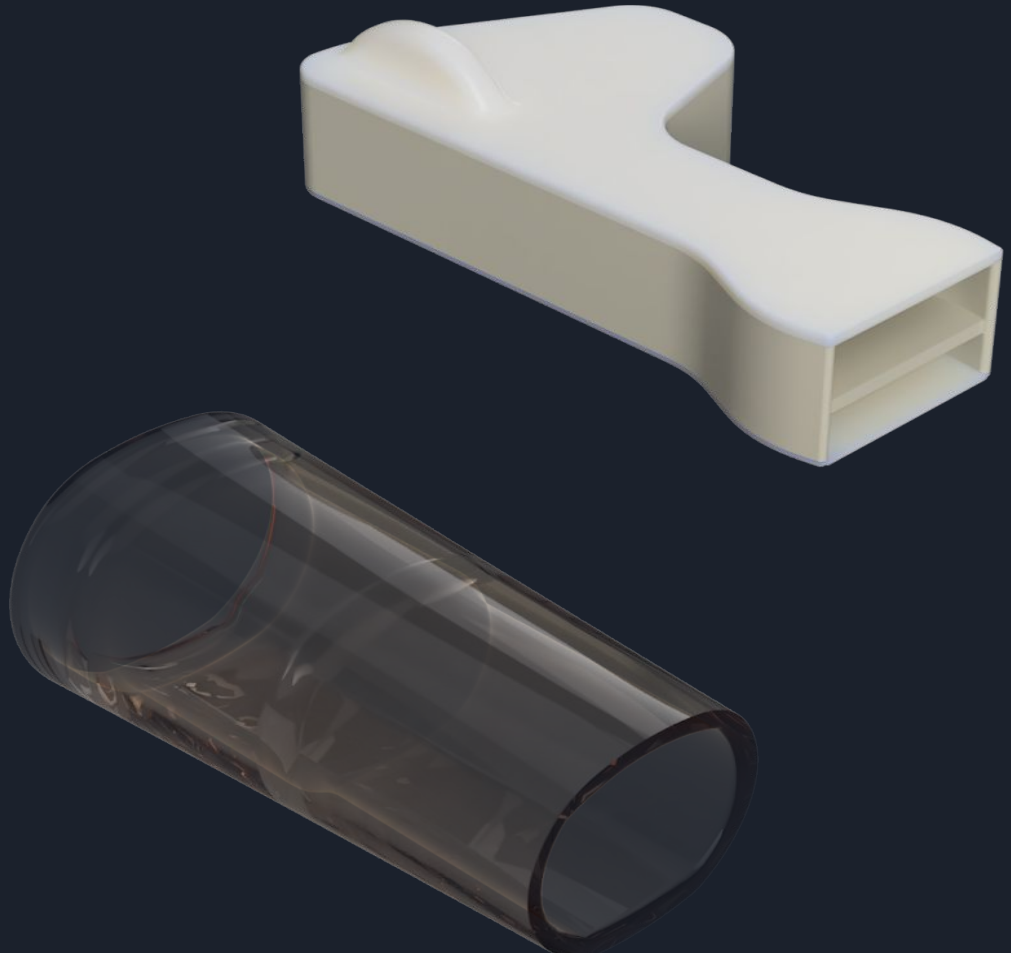
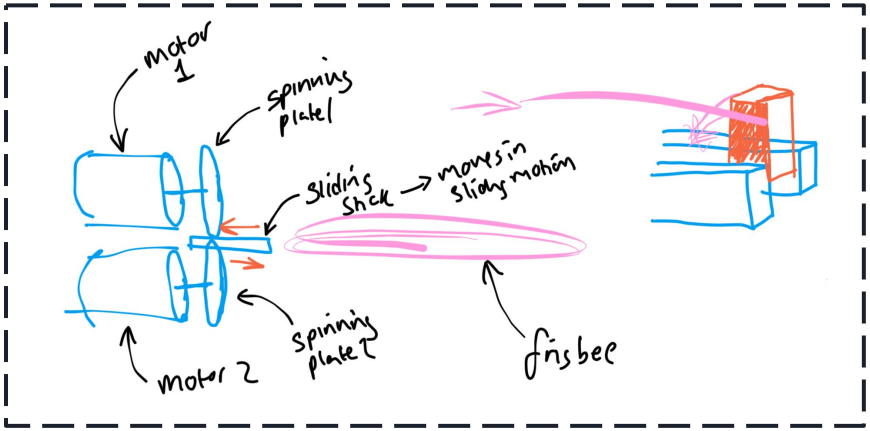




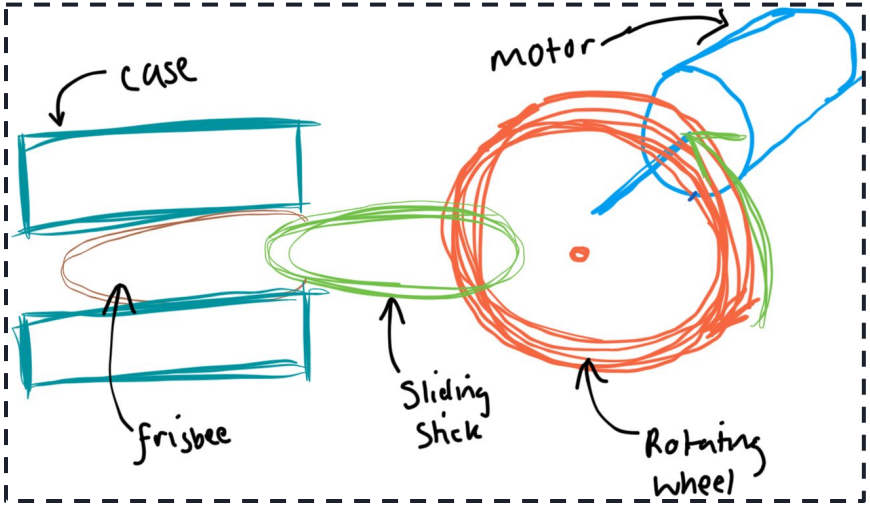


Further Iteration- Shell Booster



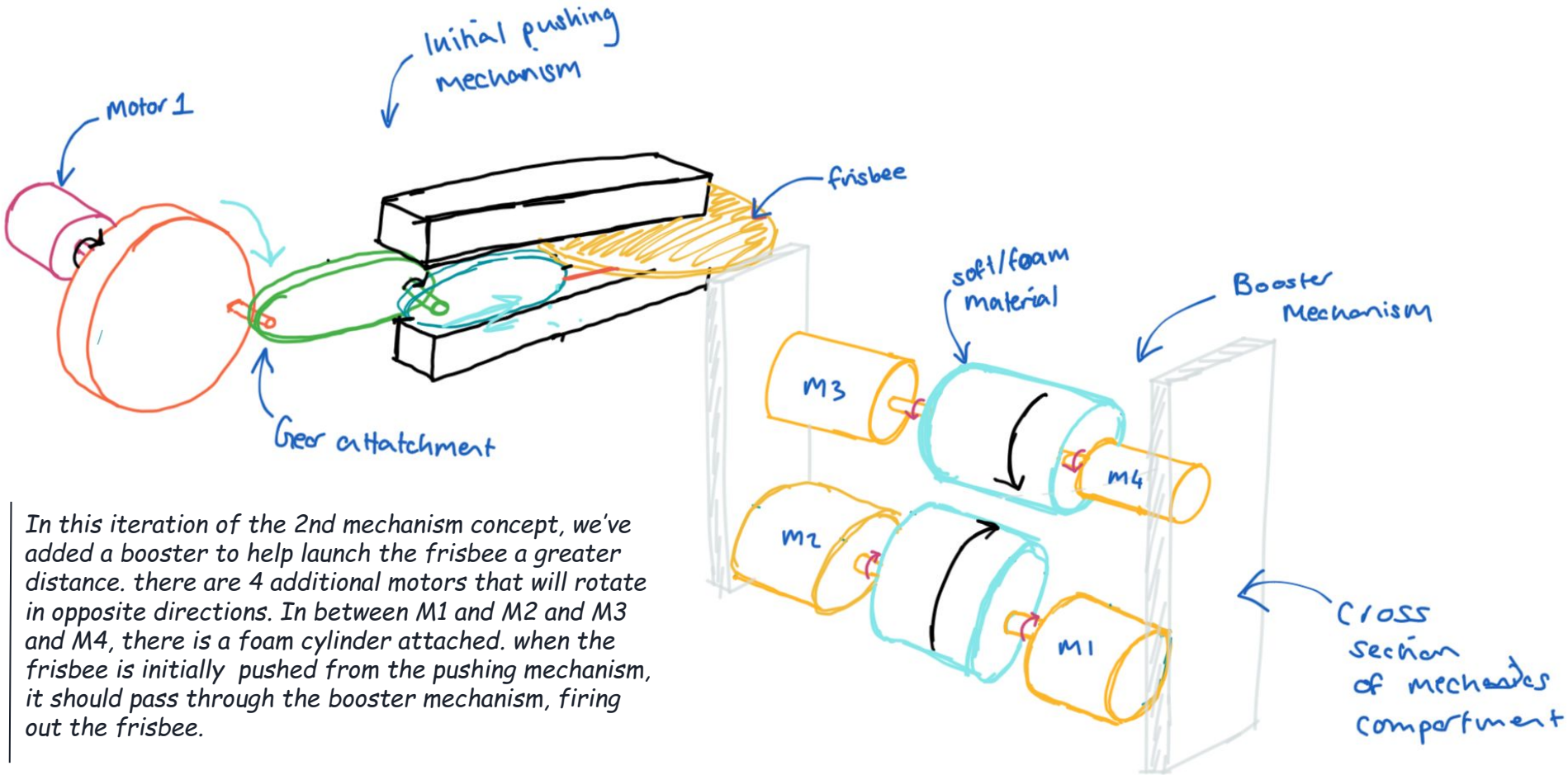
Initial Mechanism Concept.

The first mechanism that we conceptualised consisted of two motors, spinning in opposite directions, with two rubber plates situated on the end of them. Between them is a sliding stick that moves in a sliding motion, that in theory should launch the frisbee.
Upon further inspection, we noticed that the 'sliding stick' would move revolve instead of moving in a sliding motion. This is ineffective as it will be unable to eject the frisbee whilst moving in a circular motion.



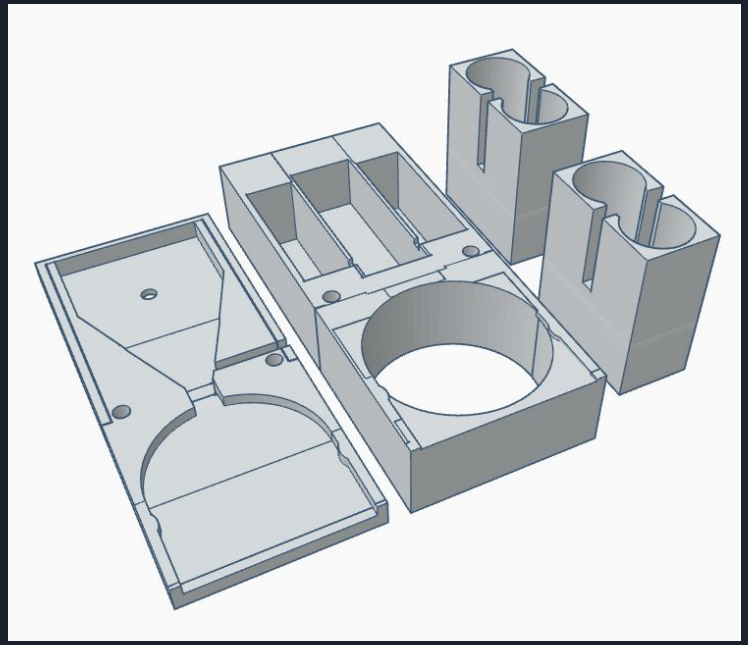
2nd Mechanism Concept.

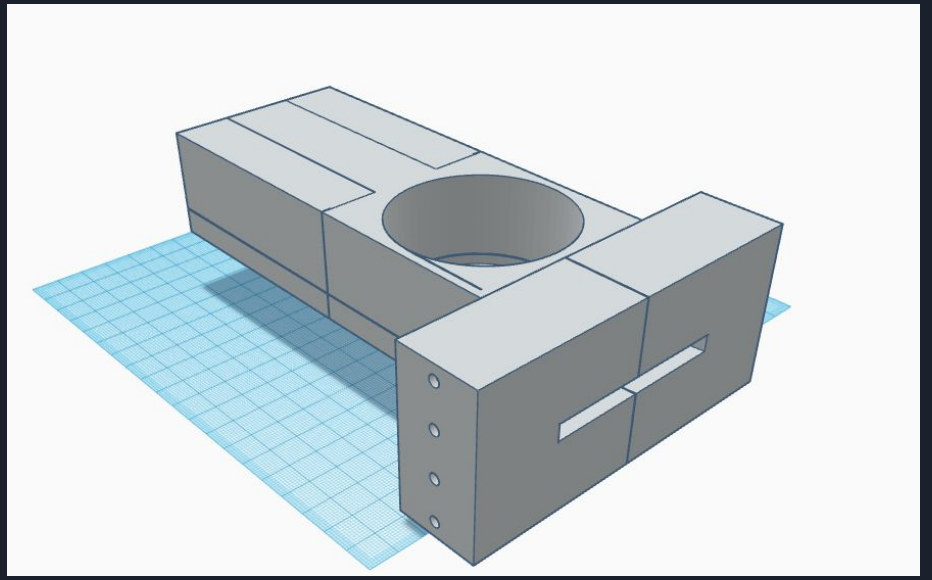
This mechanism is much more effective as it has a rotating wheel attached to the motor, that is attached to a sliding stick that would push the frisbee out of the case. The rotating wheel can provide extra torque that would enable the frisbee to be launched with more force, making it possible to fly a further distance.

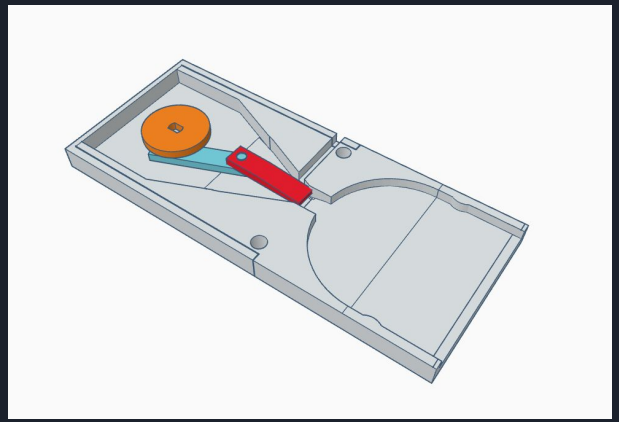


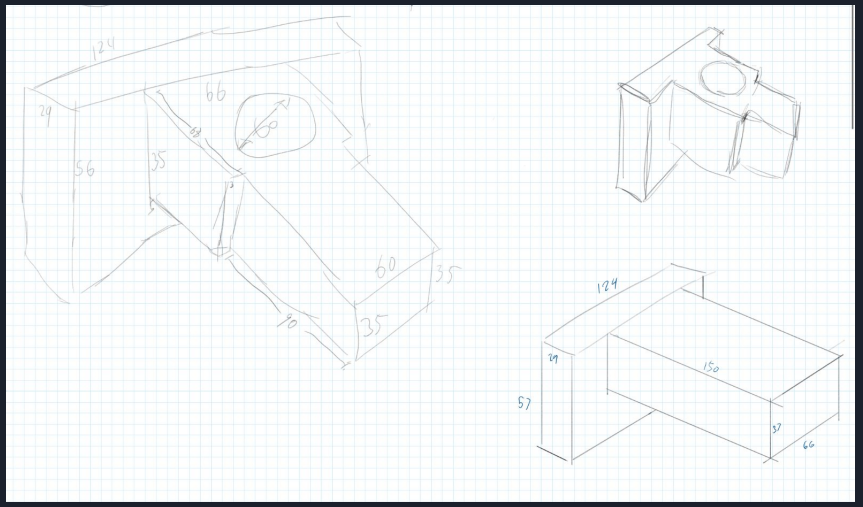
In this iteration of the 2nd mechanism concept, we've added a booster to help launch the frisbee a greater distance. there are 4 additional motors that will rotate in opposite directions. In between M1 and M2 and M3 and M4, there is a foam cylinder attached. when the frisbee is initially pushed from the pushing mechanism, it should pass through the booster mechanism, firing out the frisbee.

CAD models: Tinkercad base





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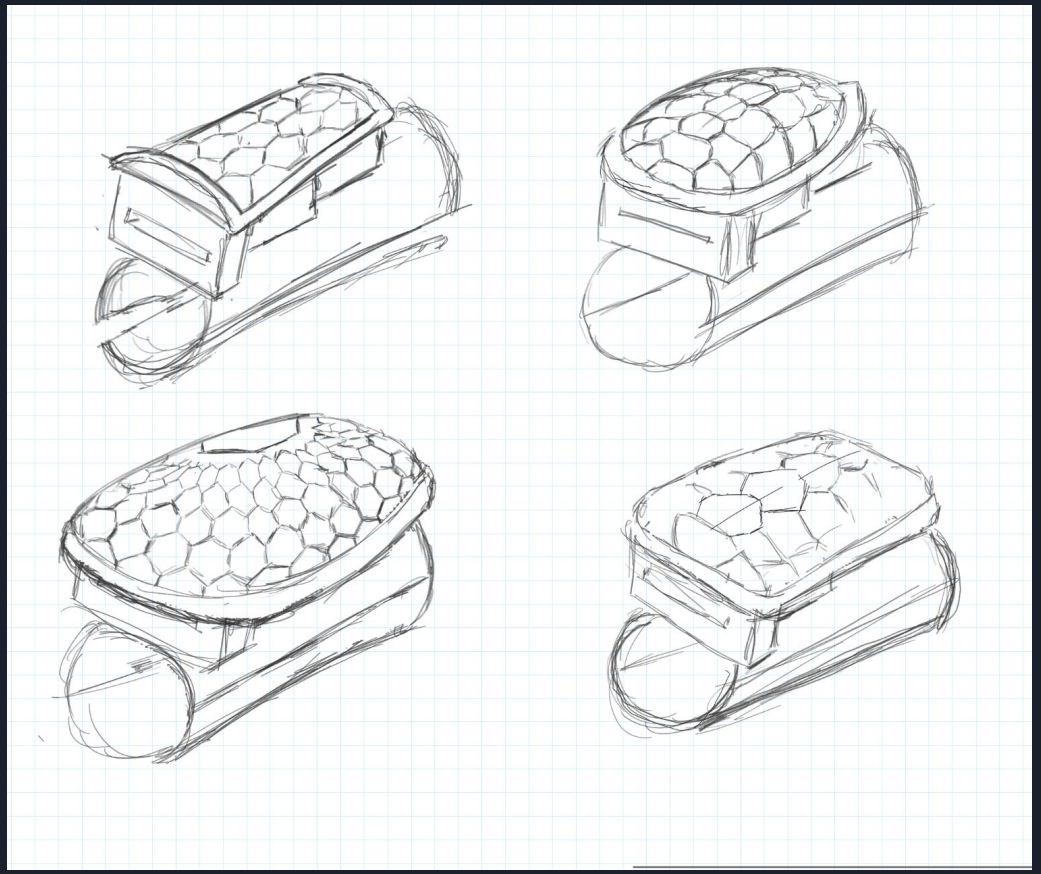
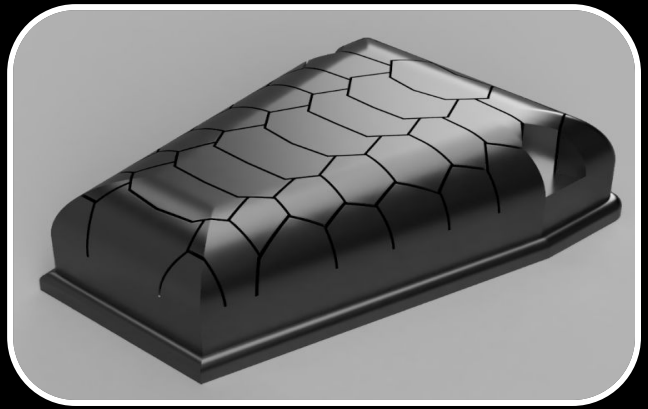
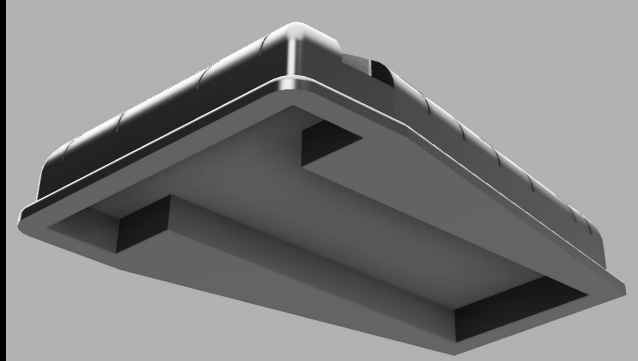
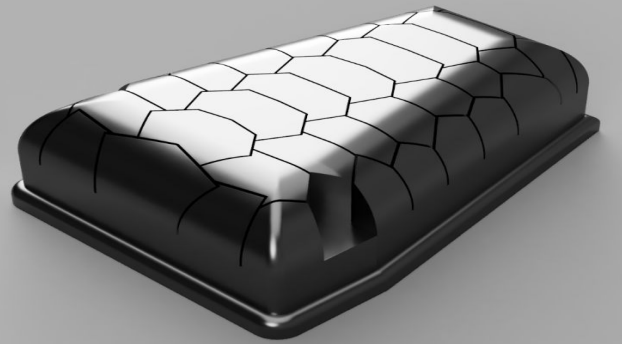
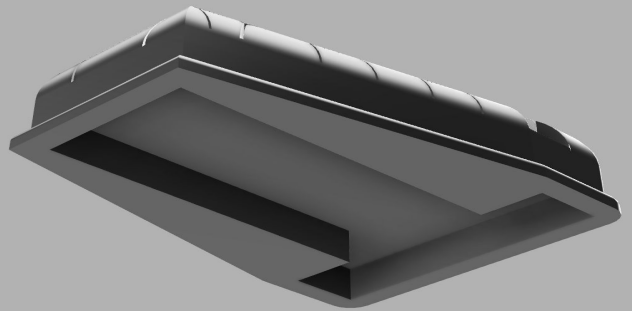


AESTHETICS: TURTLE SHELL COVER









Evaluation

Initially, our idea was to design and build an adaptive arm cast for people with arm injuries, such as broken bones or fractured wrists. We wanted to incorporate sensors such as heartbeat and blood pressure sensors etc and enable the readings to be displayed on a small screen situated on the surface of the arm cast.
The design consisted of an ergonomic shape and parametric perforations to allow ventilation to help regulate the arm temperature. However, upon further thought and consideration, we decided to iterate our idea further, as we believed that the design should have more empathetic thought considerations and could be more exciting and unique. Our new product is an automated frisbee thrower, for individuals that may find it difficult to throw frisbees due to a lack of mobility in their arms. Examples of disabilities fitting this criteria are people with arthritis, broken arms or paralysis.
We kept the generic design of the arm cast, however removed the sensors and screen, as they were no longer necessary.

To really change the product, we added a frisbee thrower mechanism on top of the ‘cast’. In order to launch the frisbee, there is a trigger mechanism. To activate the trigger mechanism, an easy access button, located on the side of the cast, must be pressed. This will cause an oscillating motor mechanism to activate, pushing the frisbee forward into a second mechanism. The second mechanism is the ‘booster’, consisting of 4 motors rotating in opposite directions at an extremely fast speed. In between the motors are foam cylinders that offer grip to the frisbee, allowing it to launch further.