Open source hardwares

https://player.vimeo.com/video/1035182953?h=1d18acf893

Week 11: Open Source Hardware & Material Explorations

Inspiration

Tyla,Sand Dress

Coperni Slip Dress Spray-Painted

Fiber Dress by Anastasia Pistofidou

Spray Gun for Spray-on Material and Open Source Felting Gun

Team Members

- Aleksandra Piotrowska
- Holly Adams
- Germarilis Ruiz
- Dhrishya Ramadass

Project Overview

Our group explored **open-source tools** and materials to develop:

1. A **spray gun** for creating a spray-on biomaterial.

2. An **open-source felting gun**, redesigned from scratch with improvements to existing files.

Objectives

- Develop functional open-source tools.
- Improve existing designs to make them more efficient and accessible. •

Experiment with biomaterials and processes for textile applications.

1. Spray Gun for Biomaterial

Concept

We aimed to create a simple and low-cost **spray gun** capable of applying **biomaterials** onto surfaces. Inspired by **sprayable garments** like the Coperni dress for Bella Hadid, we explored materials that solidify on contact.

Materials and Tools

- Compressor
- Biomaterial Mixture (custom mix; recipe below)
- Pen, Container
- Tubing and Pump

Design and Development

Research and Ideation

We researched spray systems, focusing on the pressure and consistency needed for applying viscous materials.

Material Testing

Ingredients

8g Sodium Alginate

1500ml Water

Calcium Chloride solution

equipment

Spray bottle

Measuring cylinder

Cast mould

Fabric

Hand Blender

Digital weighing scale

Recipe

Measure the sodium alginate and water, blend them together until combined. Try and not make too many air bubbles - ideally leave the mixture over night.

Pour the mixture into a spray bottle and test that the mixture is thin enough to be able to be sprayed. If it is not then water it down.

Prepare the calcium chloride solution

Place the mould onto a flat surface with the fabric laying over

it. Spray the first layer of sodium alginate.

Spray the calcium chloride solution straight away onto the sodium alginate.

Repeat these layers at least 3 times.

Leave to dry for a couple of days.

Step 5: Spray Trials

• Adjusted compressor pressure and nozzle design to achieve a fine, even spray.

Outcome

The spray gun successfully applied the biomaterial onto fabric and rigid surfaces.

2. Open Source Felting Gun

Concept

The goal was to create a **felting gun** that could **mechanize the felting process**, making it accessible and efficient. Building on Barbara's existing open-source files, we made improvements to the design and electronics.

Improvements Made

• **Enhanced 3D Files**:

• Modified the handle for ergonomics and stability.

• Strengthened internal components to improve durability.

- Redesigned the Crank Mechanism fitted for the gun

Electronics Testing:

We followed the same electrical circuit steps and created the following circuit:

Components:

1N22AB MOSFET

10K Ohm Rotary Potentiometer

4.5 - 15V D.C. Motor

https://class.textile-academy.org/2024/barbara rakovska/assignments/week10/

- Holly did a great job and we were able to test and integrate the electronic components (motor, switch, and power source).
- Ensured smooth operation of the felting mechanism.

Tools and Materials

- **3D Printer** (PLA filament)

PolyLite PETG

Printing Speed: 30 - 50mm/s

Printing Temp: 230-240°C

Bed Temp: 70-80°C

Fan: OFF

- **Electronics**:
- Motor
- Switch
- Wires and soldering tools
- **Felting Needles**
- 3D printer - Bambu X1

Testing Process

1. Assembled the 3D-printed parts and electronic components.

2. Tested motor speed and needle alignment to ensure efficient felting.
3. Conducted trials on various textiles to evaluate the performance.

Challenges and Solutions

• **Needle Stability**: Added support structures to prevent misalignment during felting.

• **Motor Power**: Tested multiple motors to find the appropriate power-to speed ratio.

Results

• **Felting Gun**: Improved usability and efficiency, making felting faster and more accessible.

Documentation and Files

• **3D Models**: [Insert links to STL files here]

• **Electronics Diagram**: [Include wiring diagram images here] •

Videos and Images: [Embed or link to project videos and photos]

Steps to build:

1. Attach the crank mechanism to the gun body. Use an M3 screw, two washers, and a hex nut to firmly secure the mechanism to the base of the gun body Ensure the screw is tightened securely, but avoid over-tightening.
2. Insert the remaining part of the crank into the motor. This will provide the power needed to drive the firing mechanism.
3. Use three short M3 screws to attach the motor to the gun body.
4. Insert a longer M3 screw into the front part of the crank. This will help stabilize the crank and ensure smooth operation.
5. Install the Needle Base. Slide the needle base into the hole located at the front of the gun base.

6. Connect the needle base to the crank mechanism.
7. Carefully insert the needles and attach them to the base. Double check that the needles are aligned correctly and securely fastened.

8. Place the rubber band onto the cranks.

9. Insert the potentiometer and connect it to the motor. The potentiometer will allow you to adjust the power output of your gun.

Reflections

This project allowed me to apply my skills in **3D modeling**, **printing**, and **electronics testing** while collaborating with my teammates. I learned the importance of iterative design and testing, particularly when combining hardware with materials.

In the future, I would like to further refine the spray gun to support more complex materials and improve the motor integration for the felting gun.

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https://drive.google.com/drive/u/1/folders/11t8gTaTG-P5GaRtXHPDSDNrMaAHb1i1

https://grabcad.com/library/hvlp-spray-gun-1

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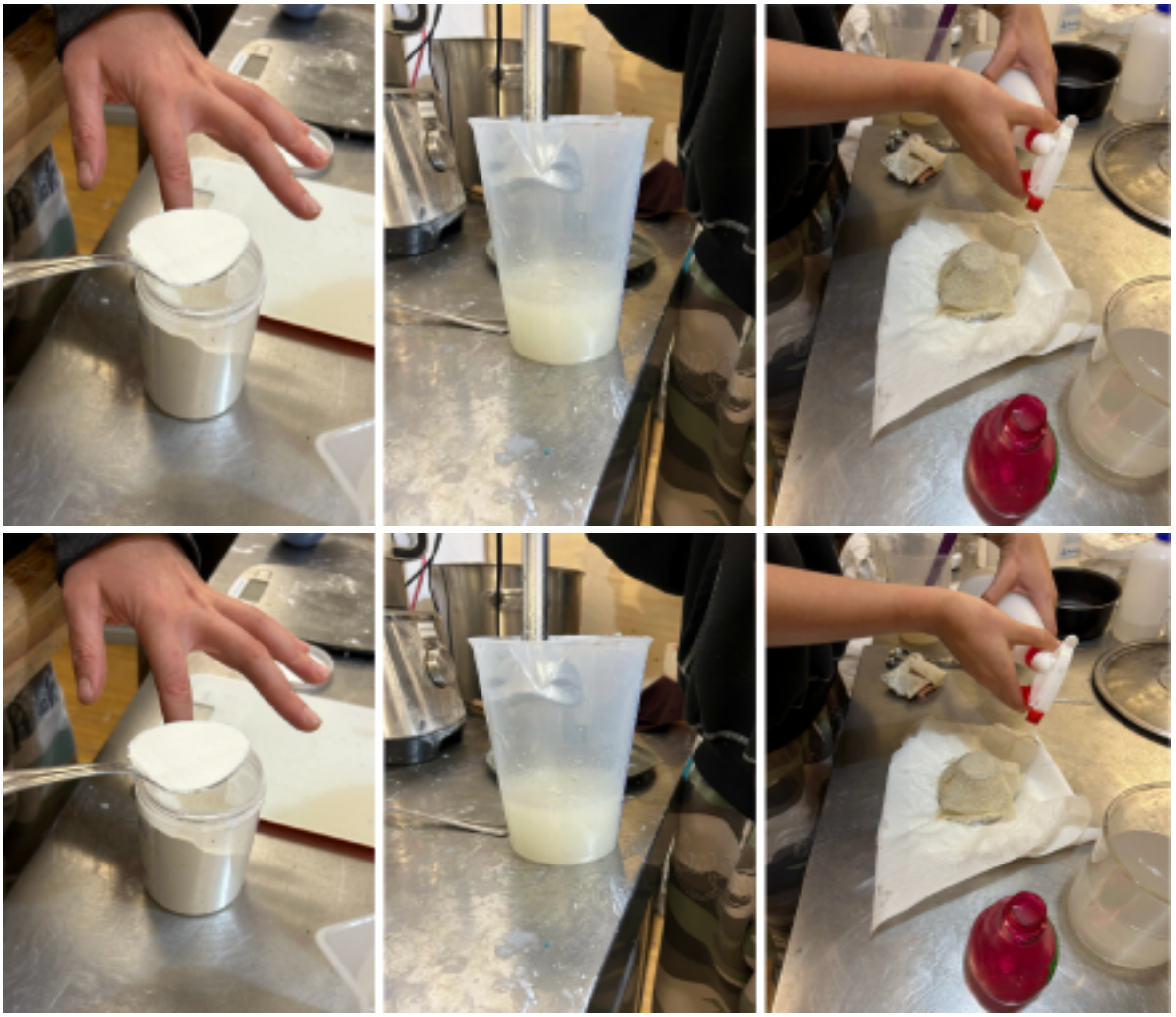

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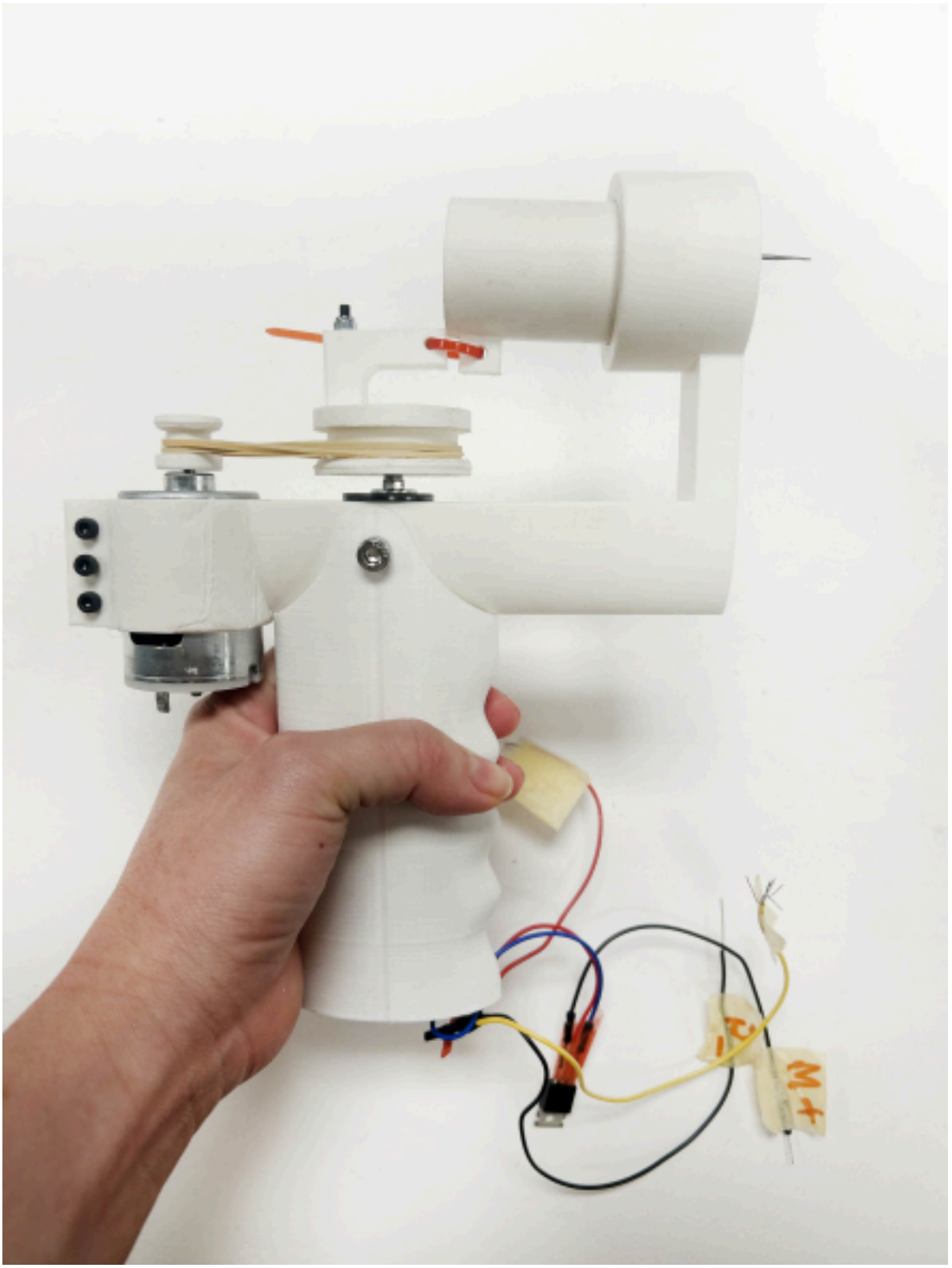

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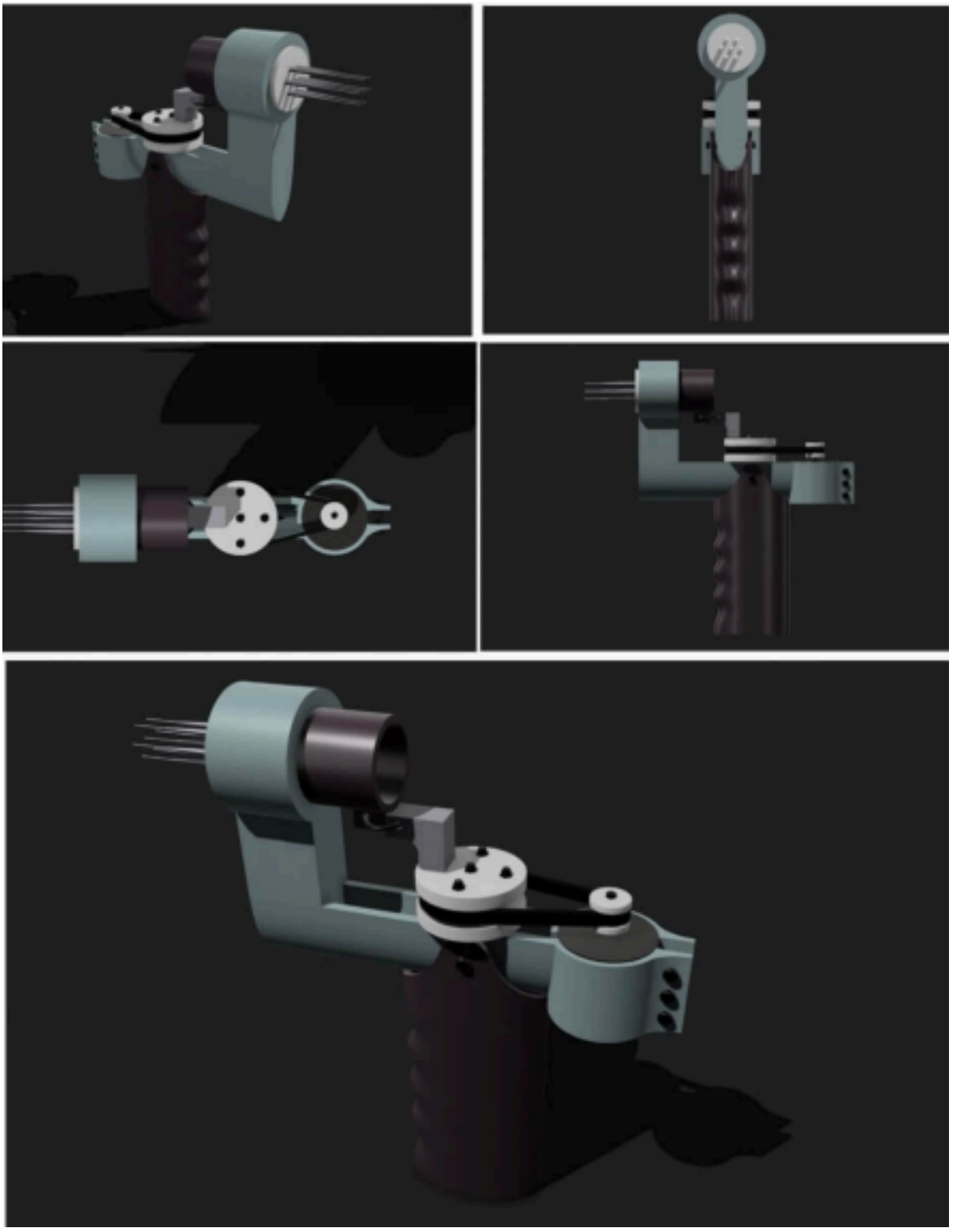

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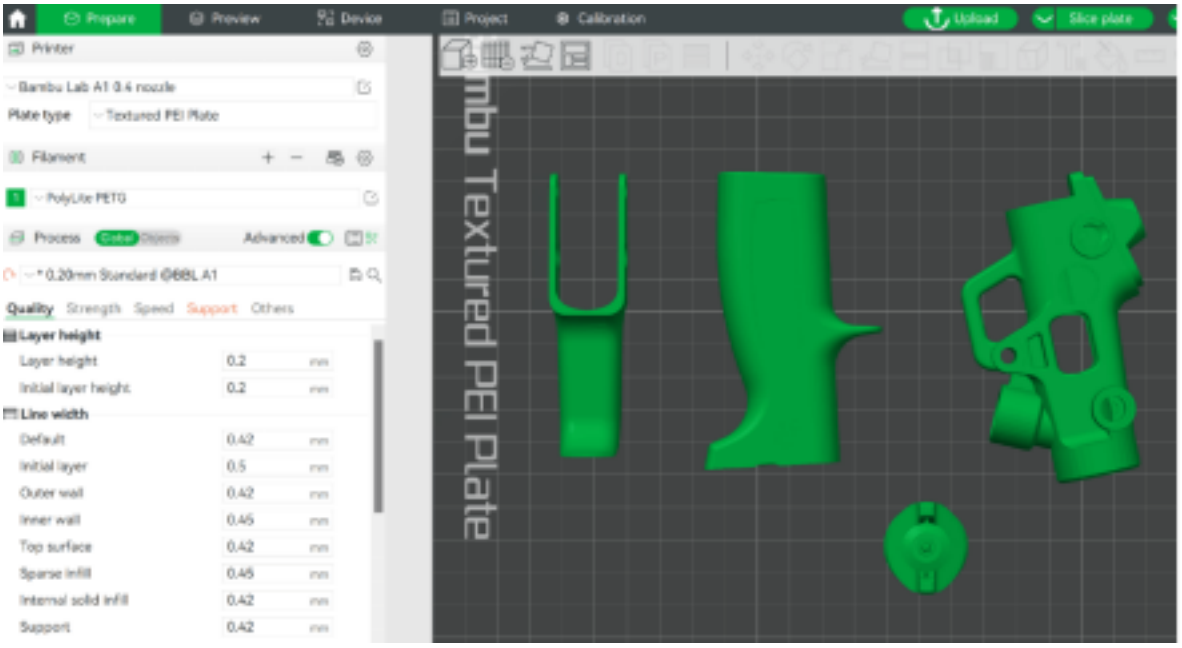
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Plate type
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Process
Advanced
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Quality
Strength
Speed
Support
Others
Layer height
Layer height
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Initial layer height
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Line width
Default
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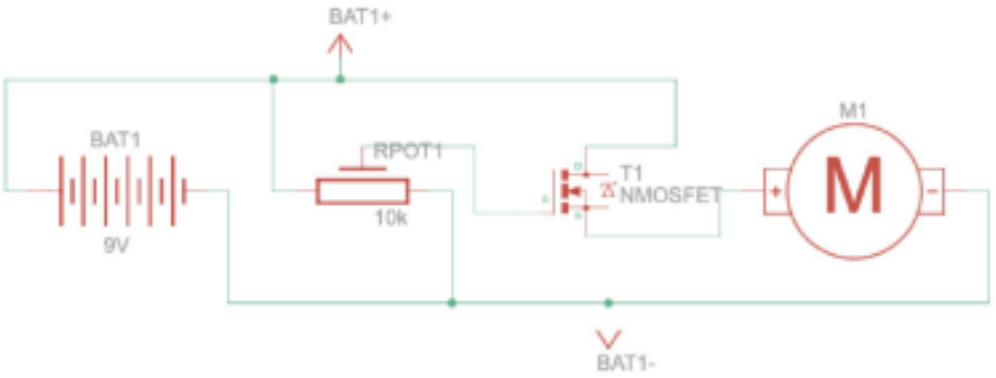
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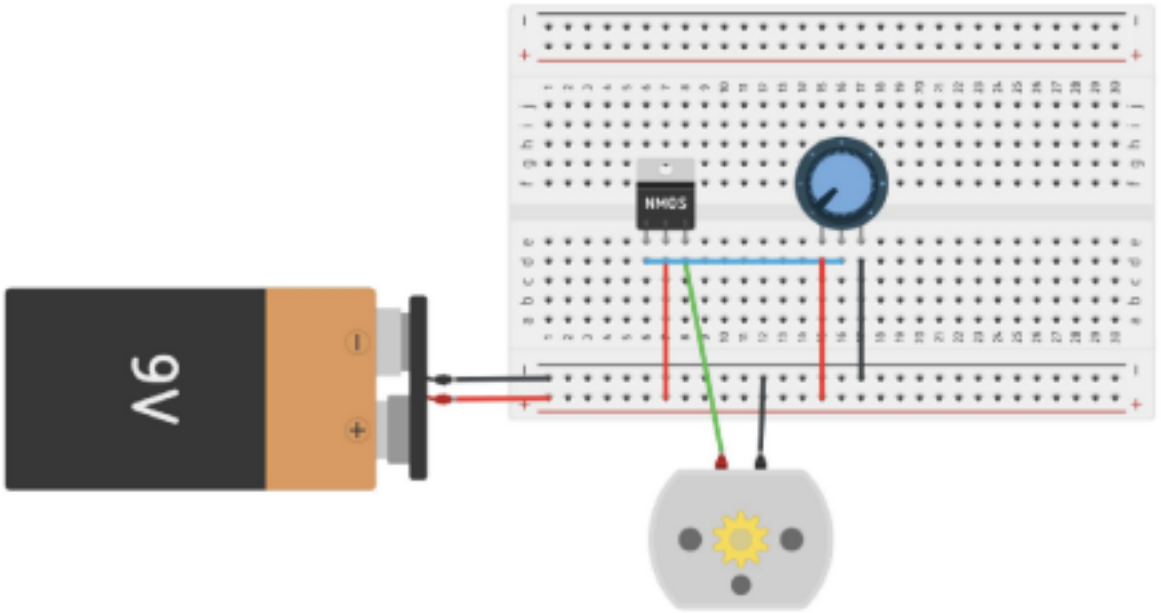
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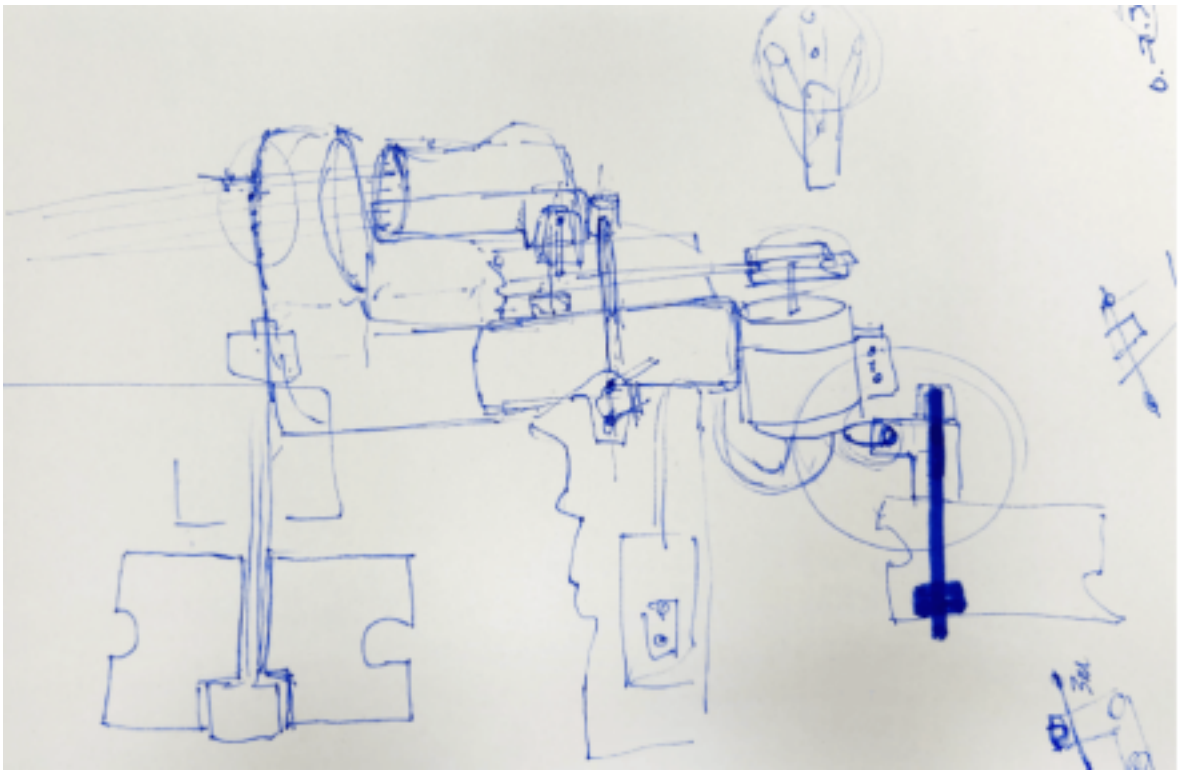

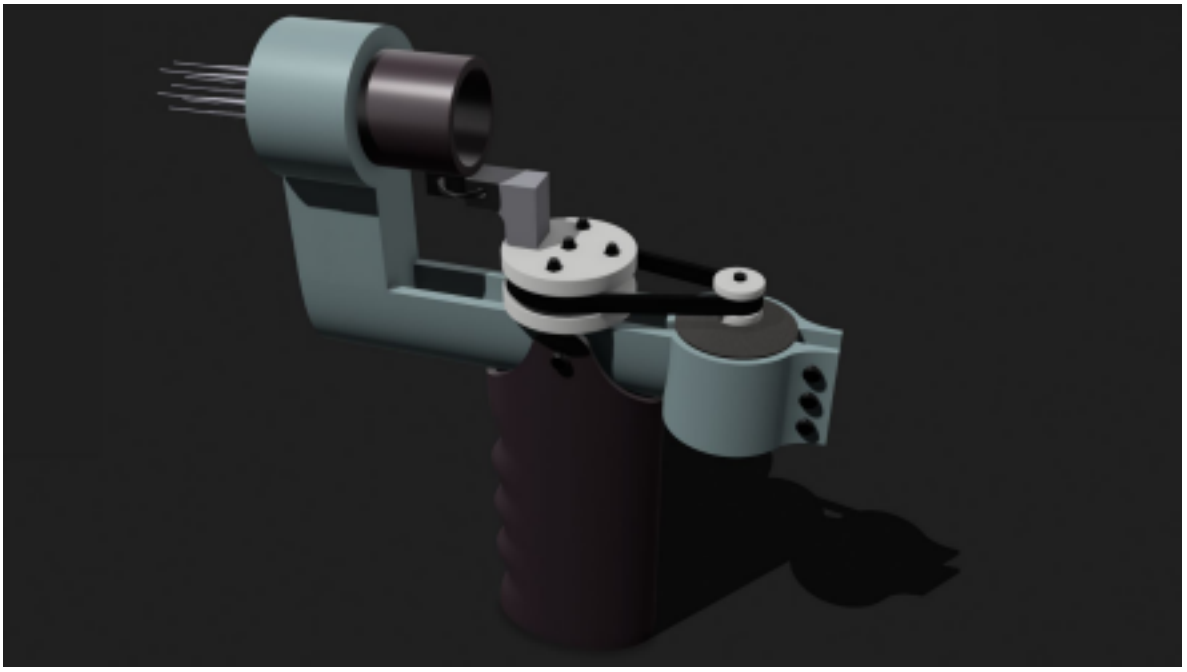

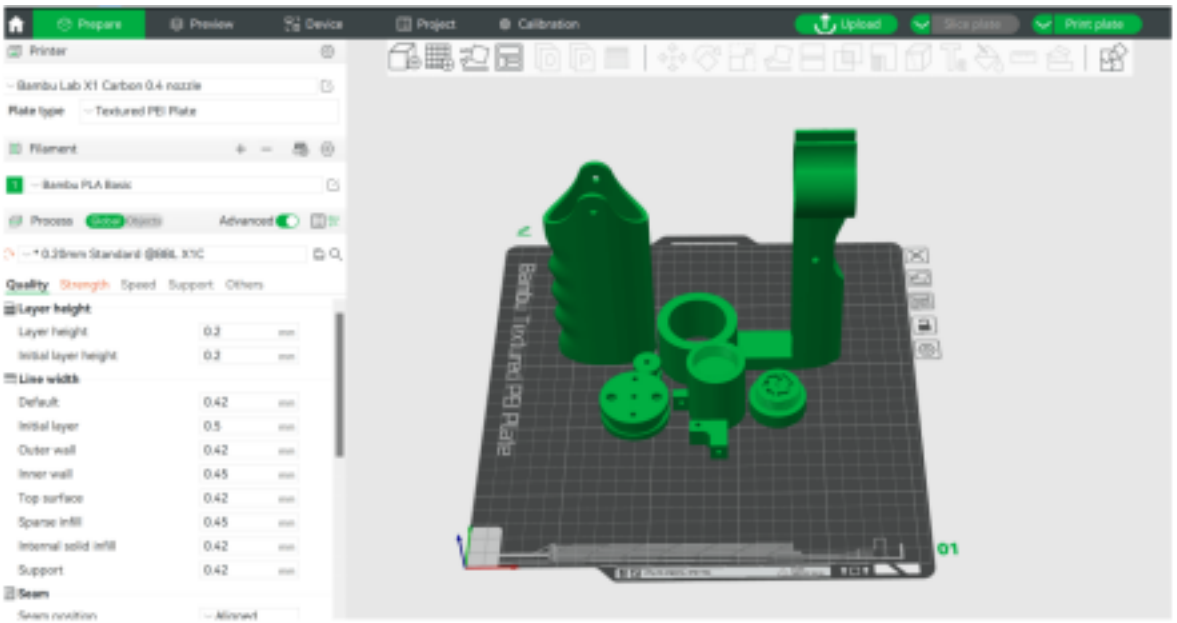
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Seam
Bambu Textured PEI Plate
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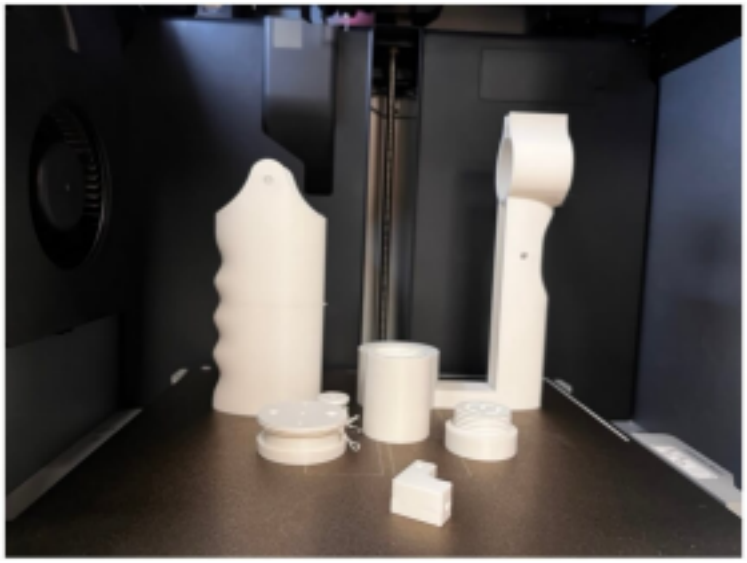
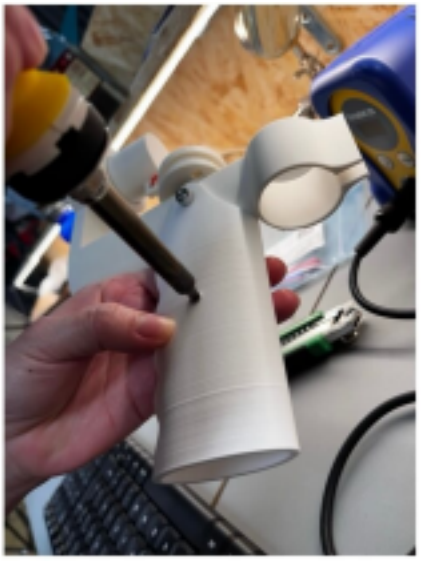
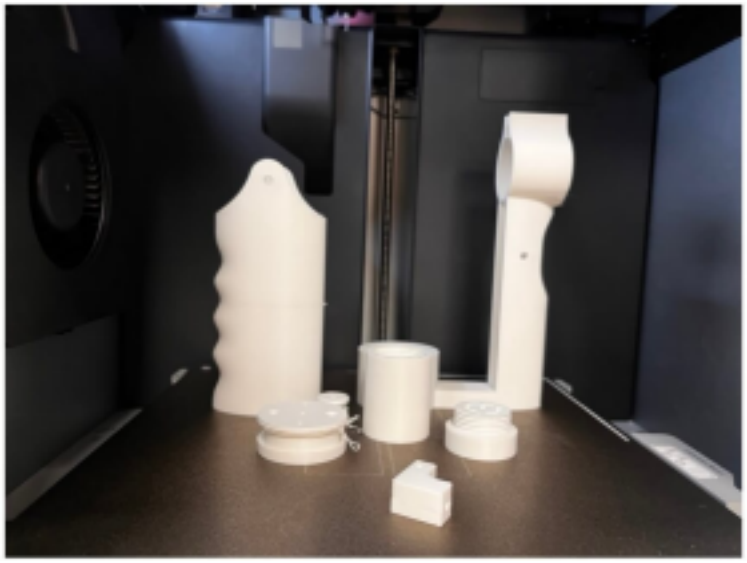
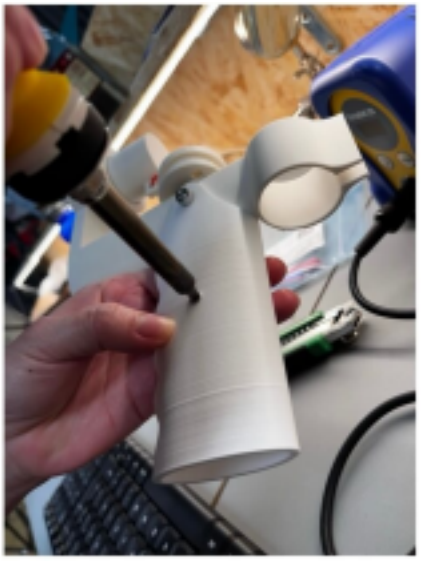

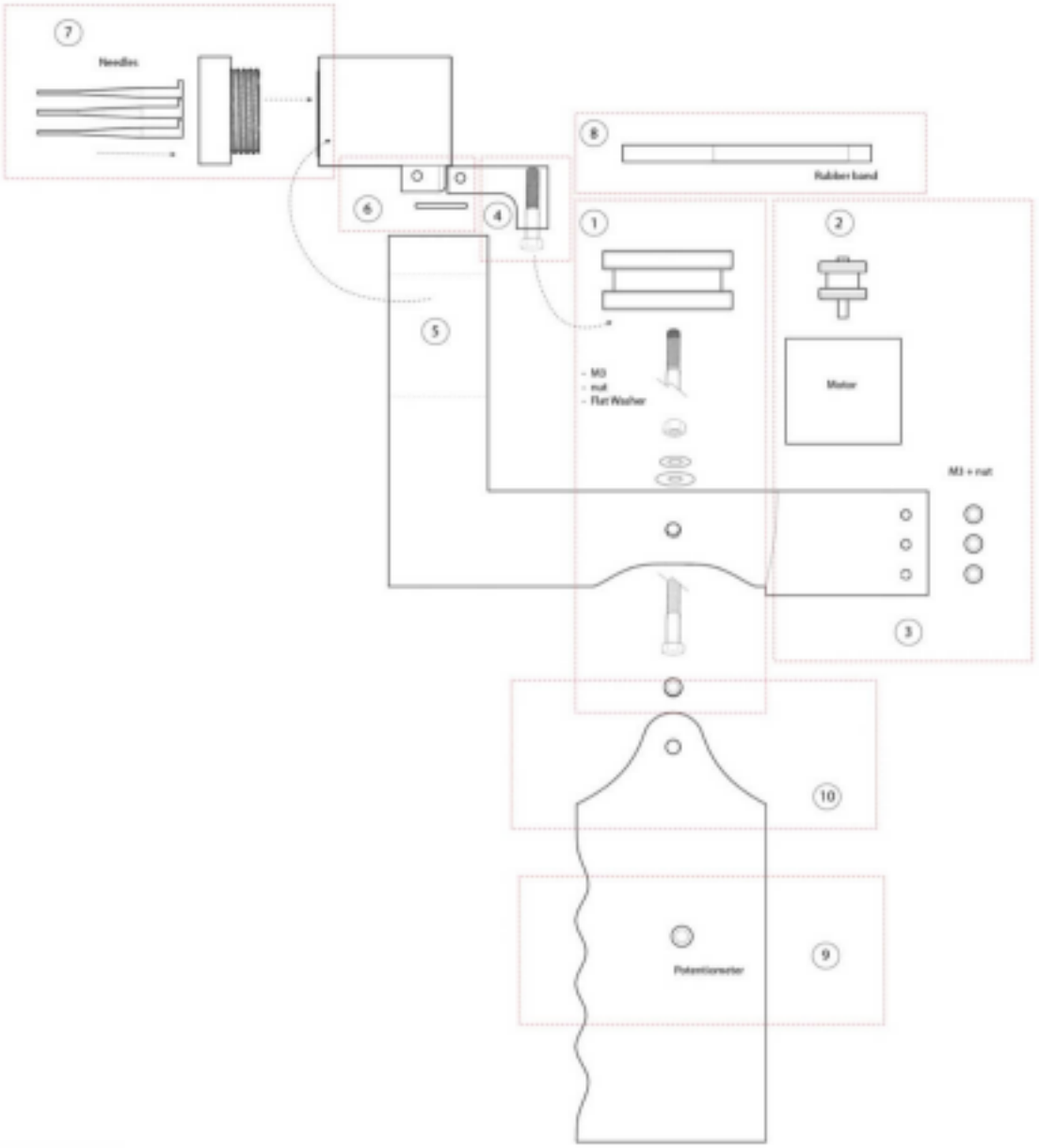
7
Needles
8
Rubber band
6
4
1
2
5
- M3
- nut
- Flat Washer
Motor
M3 + nut
3
10
9
Potentiometer