AutoBrailler

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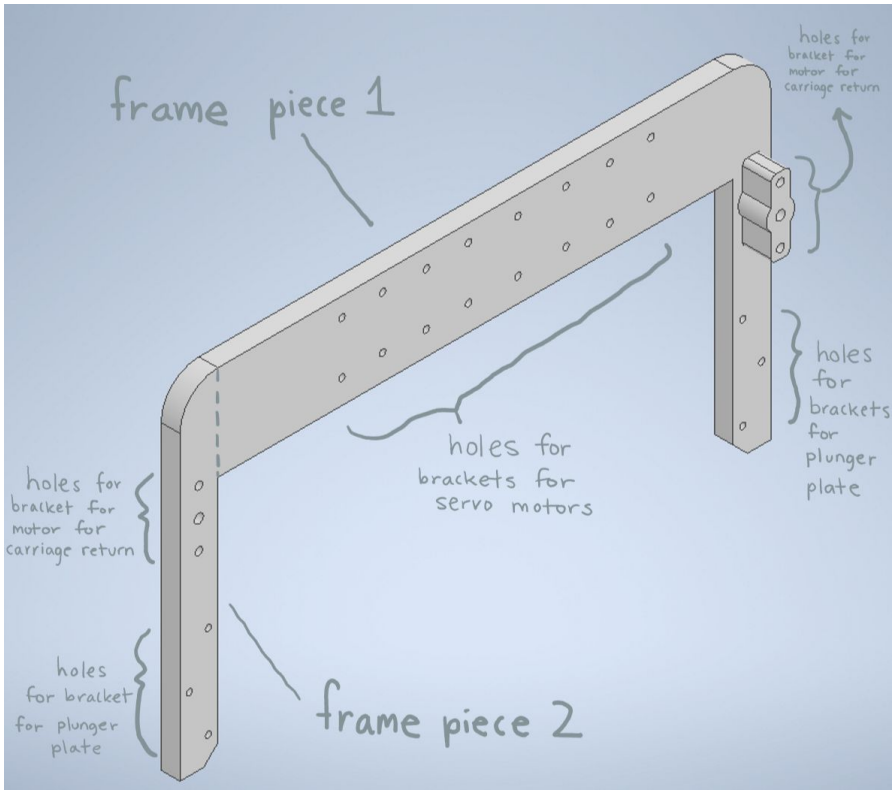
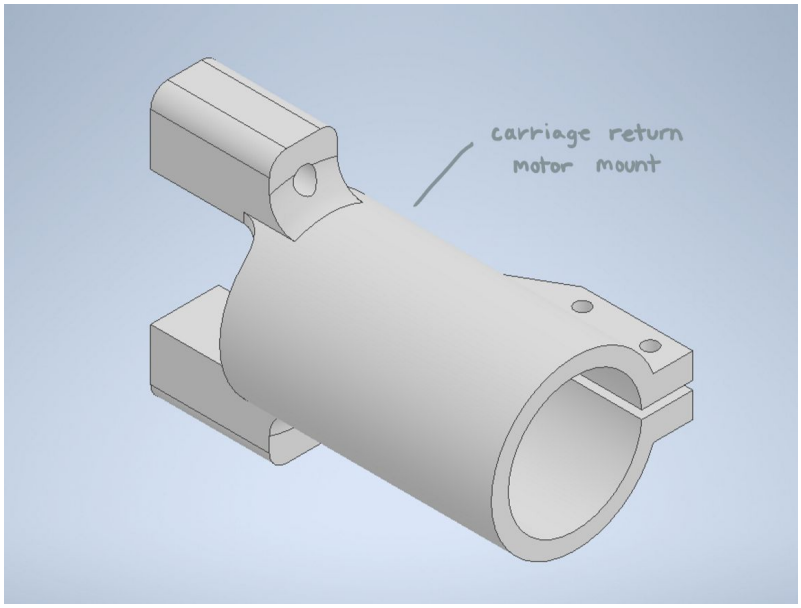
The Problem:
Braille printers are extremely expensive and bulky, and consequently most people cannot afford to buy one. However, many blind people already own a brailler for typing braille, so it would be very convenient if they could use the device they already own as a printer as well.

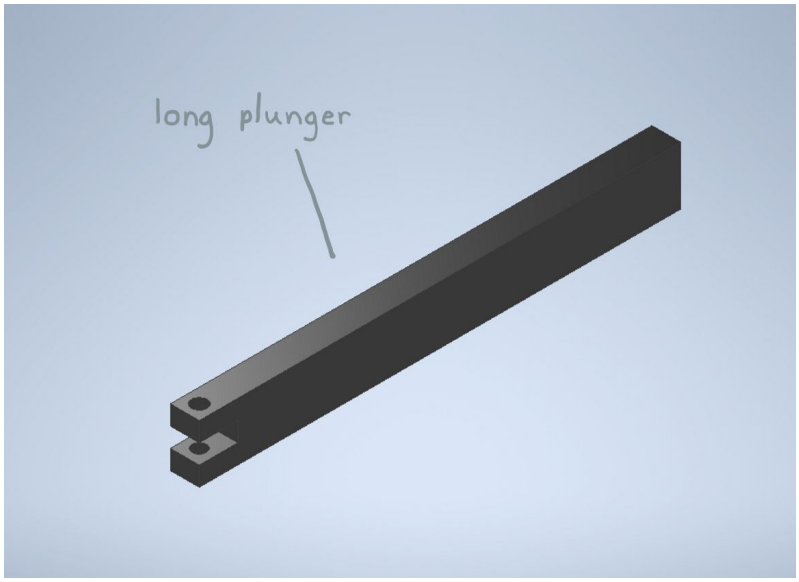
The Project:
Build a device that attaches to a Perkins brailler and connects to a computer. The user can then run the associated program, which takes in a text file and triggers the appropriate buttons on the brailler to type the contents of the file.

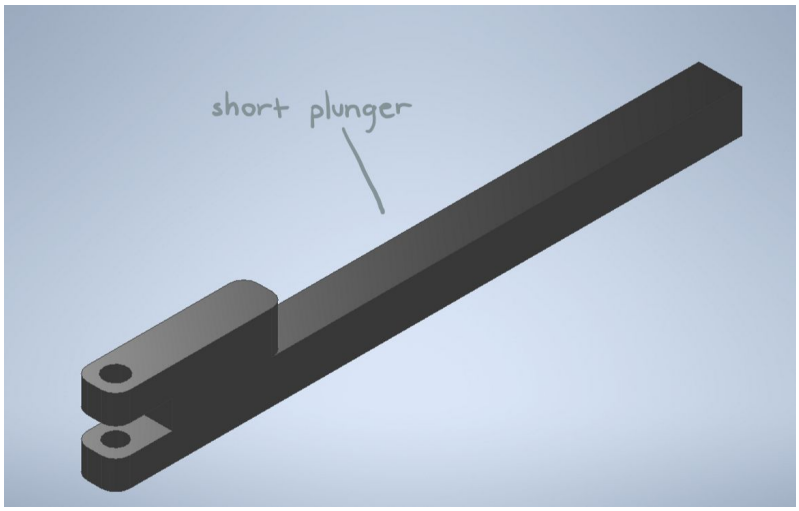
Design Summary:
Our device consists of a frame that is placed over the brailler and clamps in place. A series of servo motors can be controlled by an arduino to press the keys on the brailler. A motor will be used to automatically return the carriage at the end of a line. A python script is used to preprocess the text file being printed, removing any invalid characters and inserting line breaks as necessary. The script then writes the characters to be printed one at a time to the Serial port, where it is then read and translated into servo and motor action by Arduino code. The device can be easily removed from the original Perkins brailler so that the user can use the brailler without the add-on.

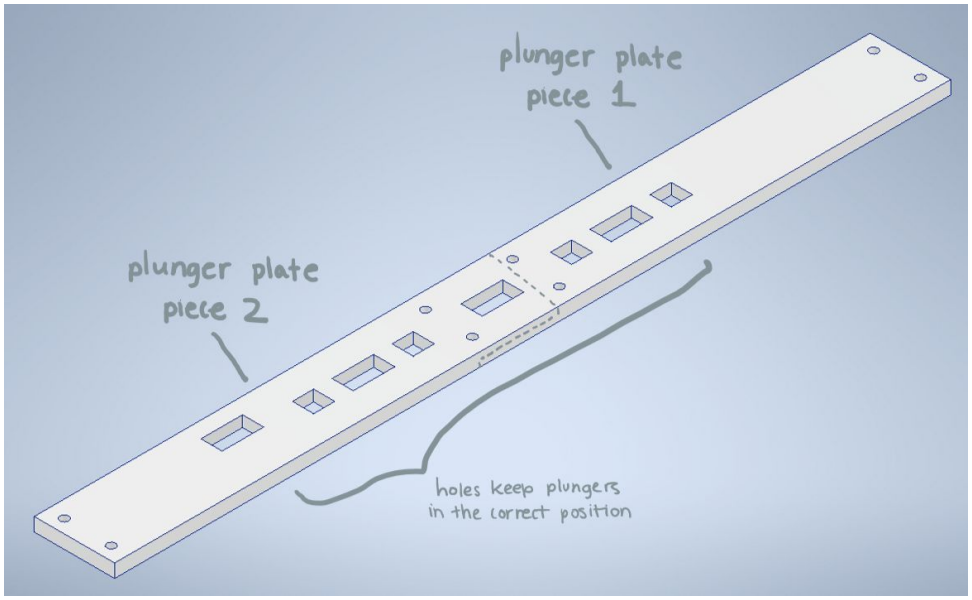
Physical Components and CAD Drawings:

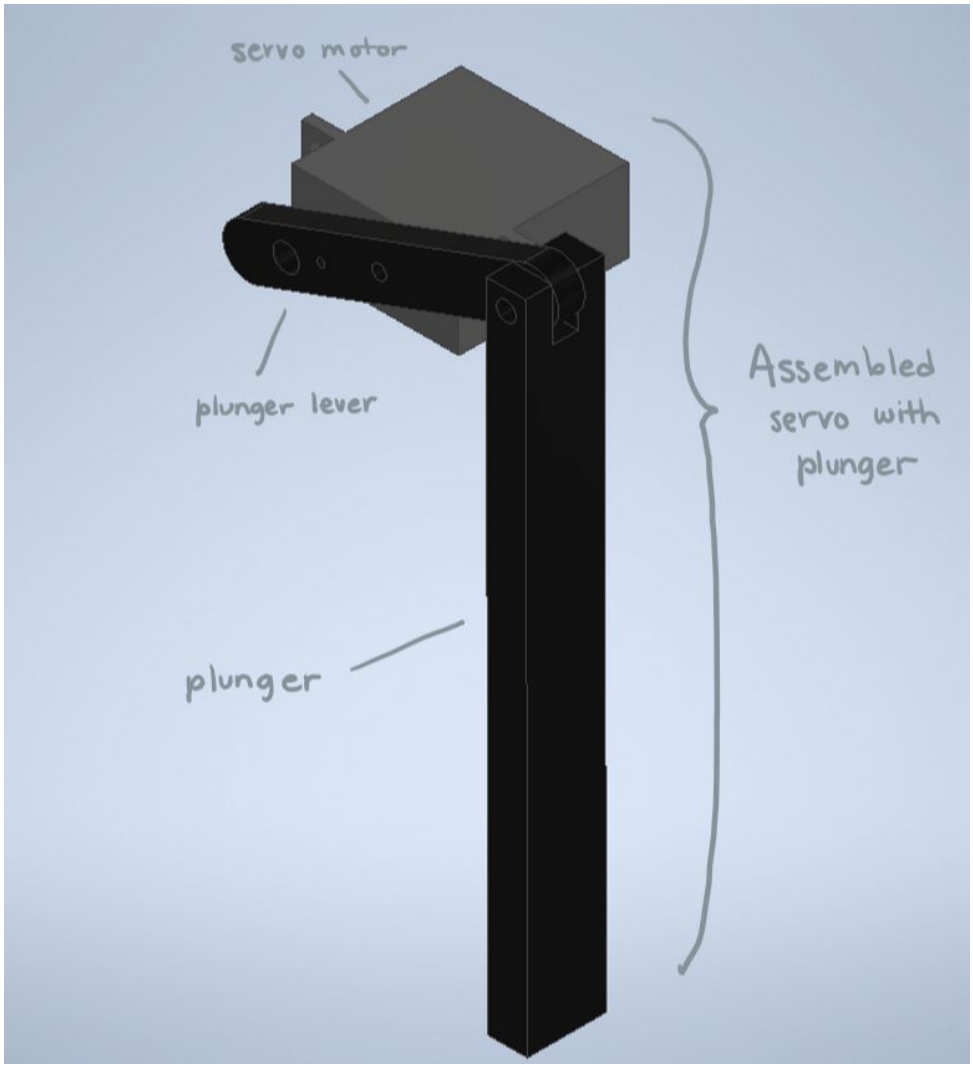


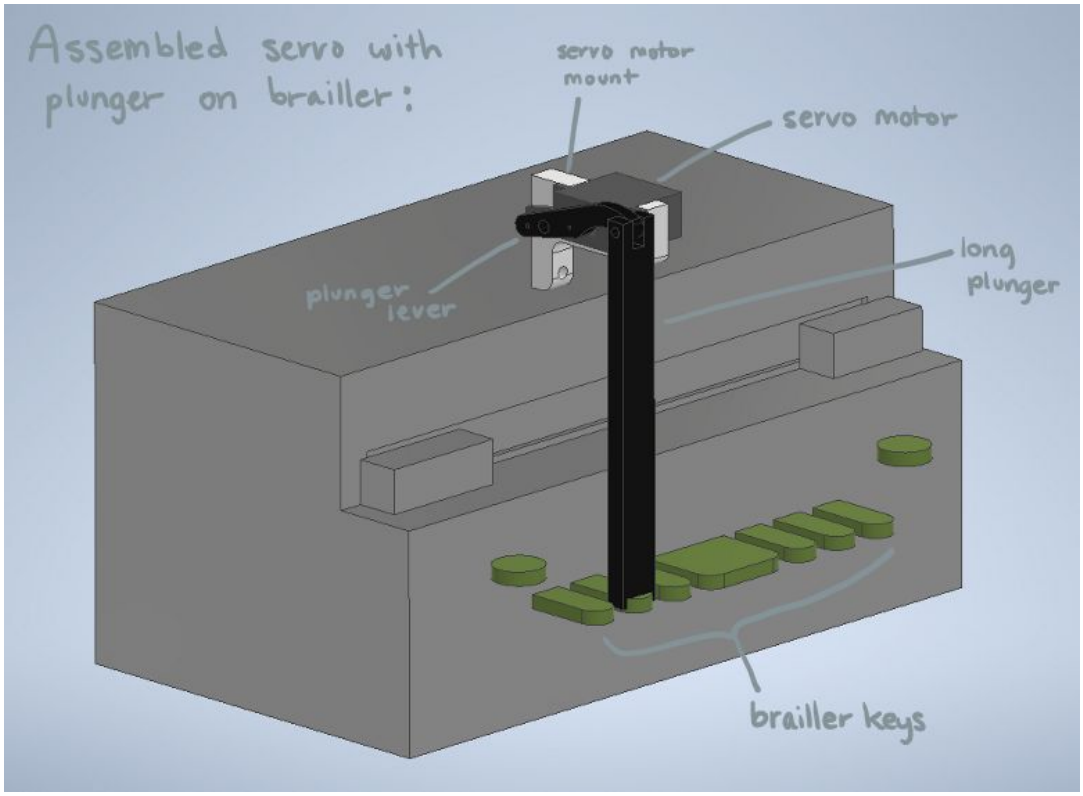


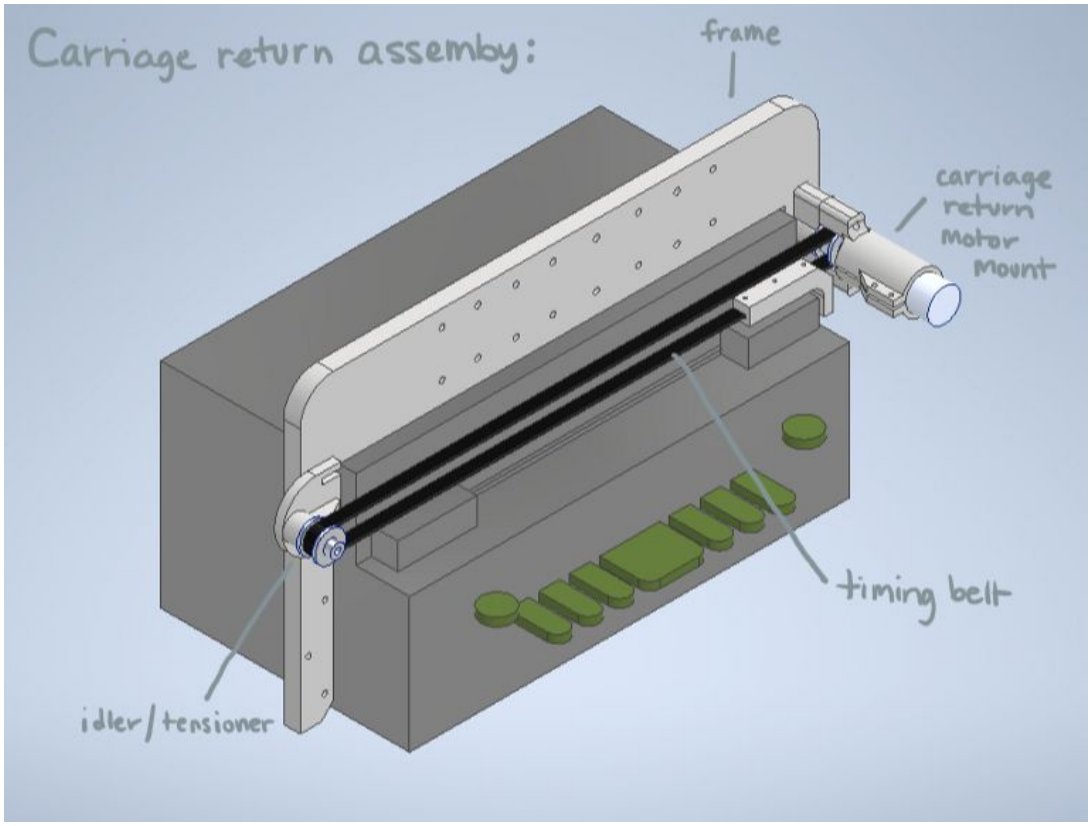

long plunger

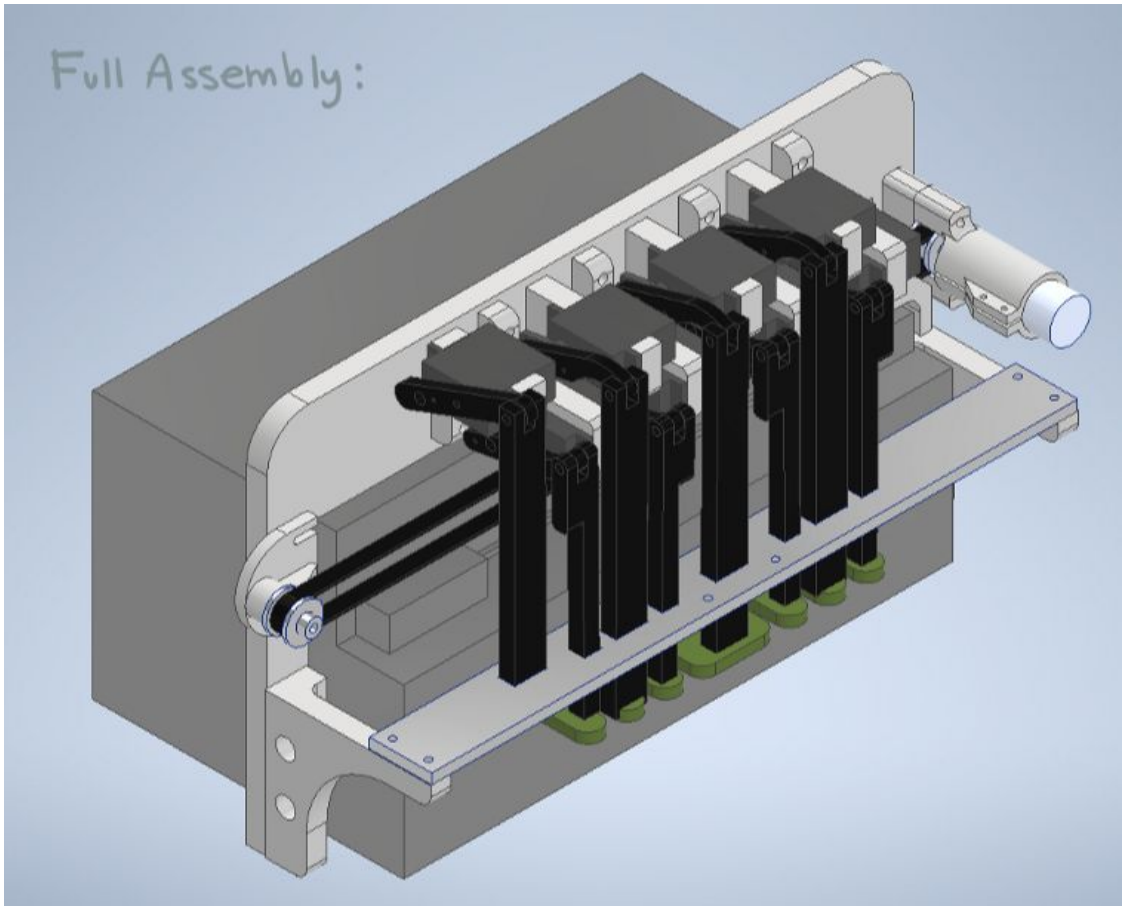

short plunger


plunger plate
piece 1
plunger plate
piece 2
holes keep plungers
in the correct position


servo motor
plunger lever
plunger
Assembled servo with plunger


Assembled servo with plunger on brailler:
servo motor mount
servo motor
long plunger
plunger lever
brailler keys


Carriage return assemby:
frame
carriage return motor mount
timing belt
idler/tensioner


Full Assembly:

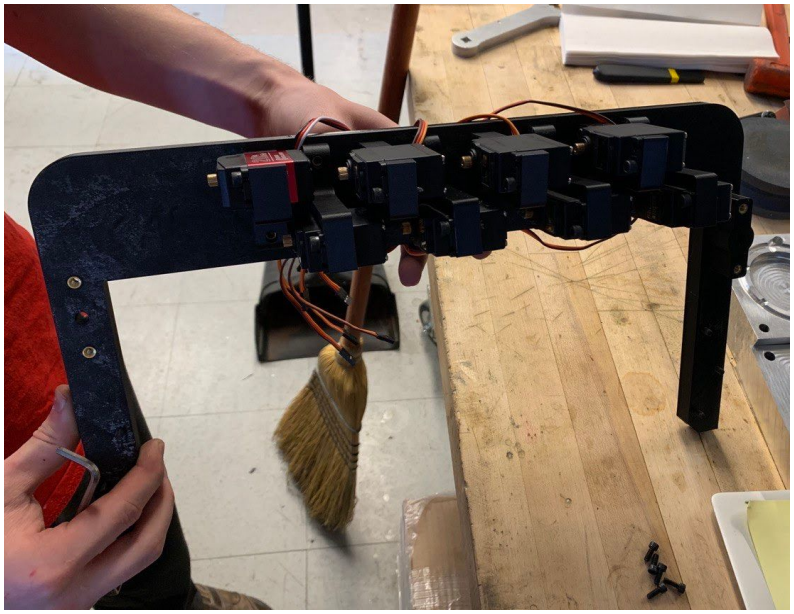
Assembly & Construction Pictures:

Perkins Brailler

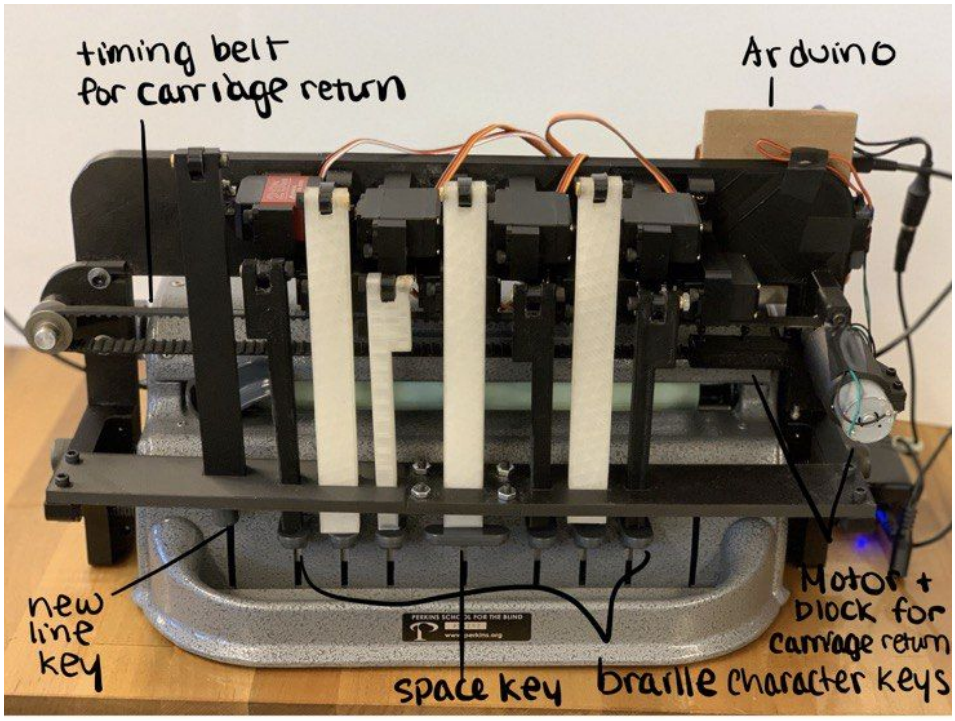
Plunger Lever and Large Plunger

Large and Small Plungers and Connected to Corresponding Levers

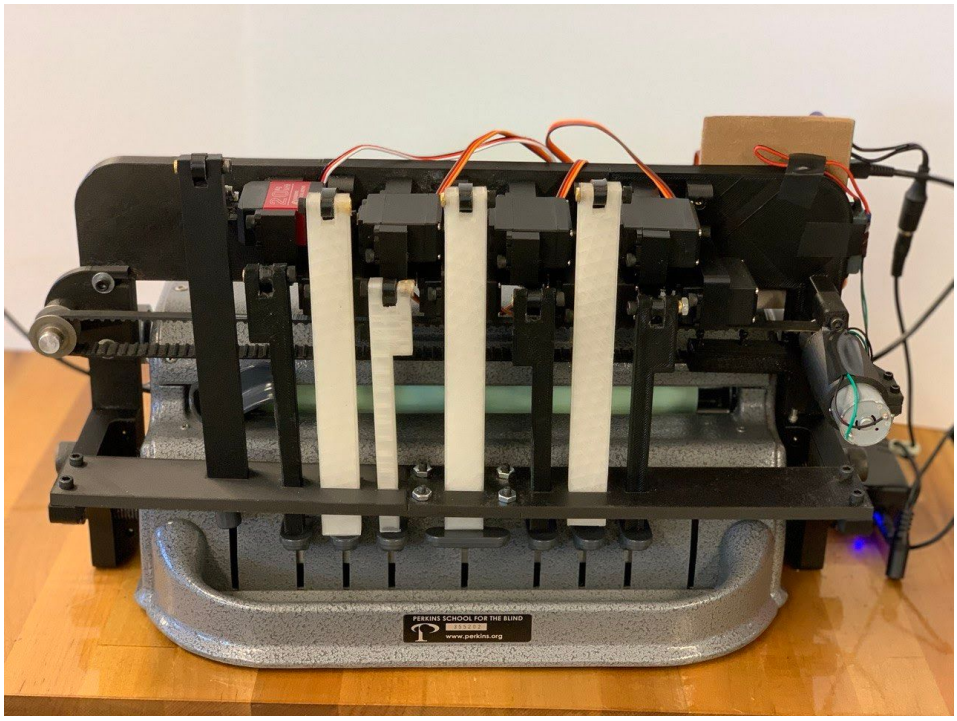
Frame and Servo Motors



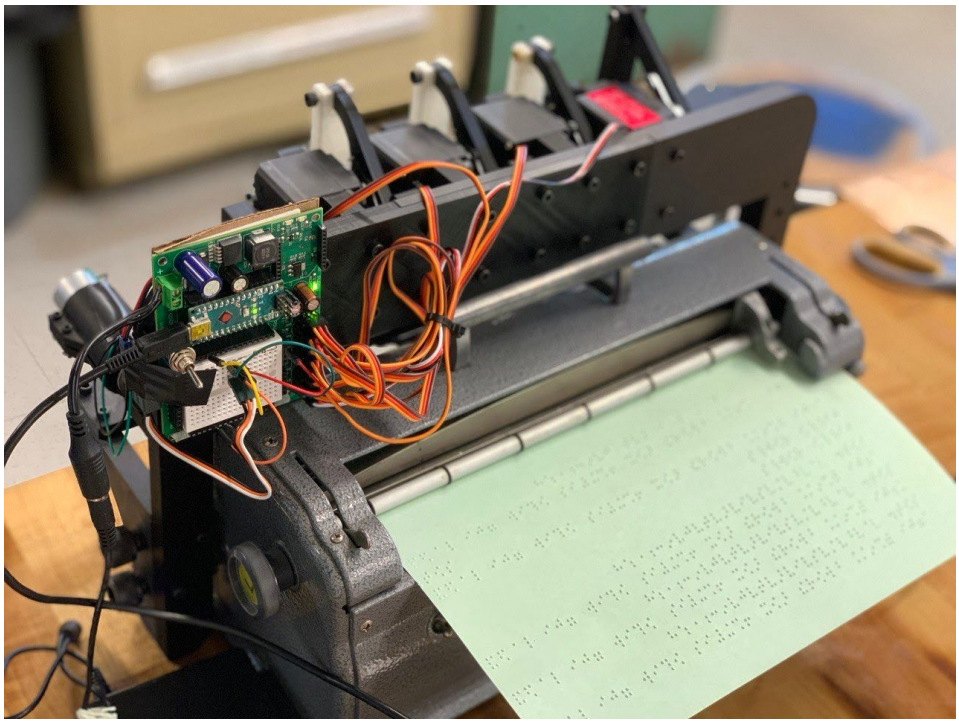
Final Automated Brailler



Final Automated Brailler (front)



Final Automated Brailler (back)



How to use the Auto-Brailler:

1. Place device onto original Perkins Brailler by aligning levers with their corresponding keys. Tighten 4 side screws to allow the device to be clamped onto Perkins Brailler.

2. Move any text file you want to print into the 'BraillePrinter' folder.

   If you have Windows:
   - Double-click on the '_braillePrinter_WINDOWS_' file
   - If it doesn't work, do the following:
     - Using 'dir' to see what files and folders exist and 'cd <folder name>' to go into a folder. Navigate your way into the 'BraillePrinter' folder
     - If this is your first time printing something, run the following command:
       pip install --user pySerial
     - Run the following command:
       python code/text_to_serial.py

   If you don't have Windows:
   - Open up Terminal
   - Using 'ls' to see what files and folders exist and 'cd <folder name>' to go into a folder. Navigate your way into the 'BraillePrinter' folder
   - If this is your first time printing something, run the following command:
     pip install --user pySerial
   - Run the following command:
     python code/text_to_serial.py

3. Get your braille writer ready to print:
   - Move the carriage all the way to the end
   - Insert a sheet of braille paper and rotate the knobs in the direction of insertion until it stops

4. Finally, follow the instructions that pop up!

Parts List (excluding 3D printed parts):

- 3D-printed parts
- 7 Low torque servos
- 1 High torque servo
- 2 Timing belt pulleys
- Timing belt
- Large shoulder bolts
- Large heat set inserts (8-32)
- Small heat set inserts
- Custom carrier board
- Wiring

https://docs.google.com/spreadsheets/d/1alL6Gv0JYYLOnGv4Snmt2FIedLQgV9nIvWQBe0xnOH8/edit?usp=sharing

Carrier Board Documentation:
https://sites.google.com/site/2007arduino/hardware-description/power-supplies-5v?fbclid=IwAR3cV08-XH_p-JH2CJN1DqoKnhchorkFSODgnaKqL8QkoxHhQip-D2mxyxs