ADAPTIVE FEEDER

Our adaptive feeder: a tool for independence, dignity, and empowerment.
Let's redefine possibility, one invention at a time.

Grand Canyon
University Capstone

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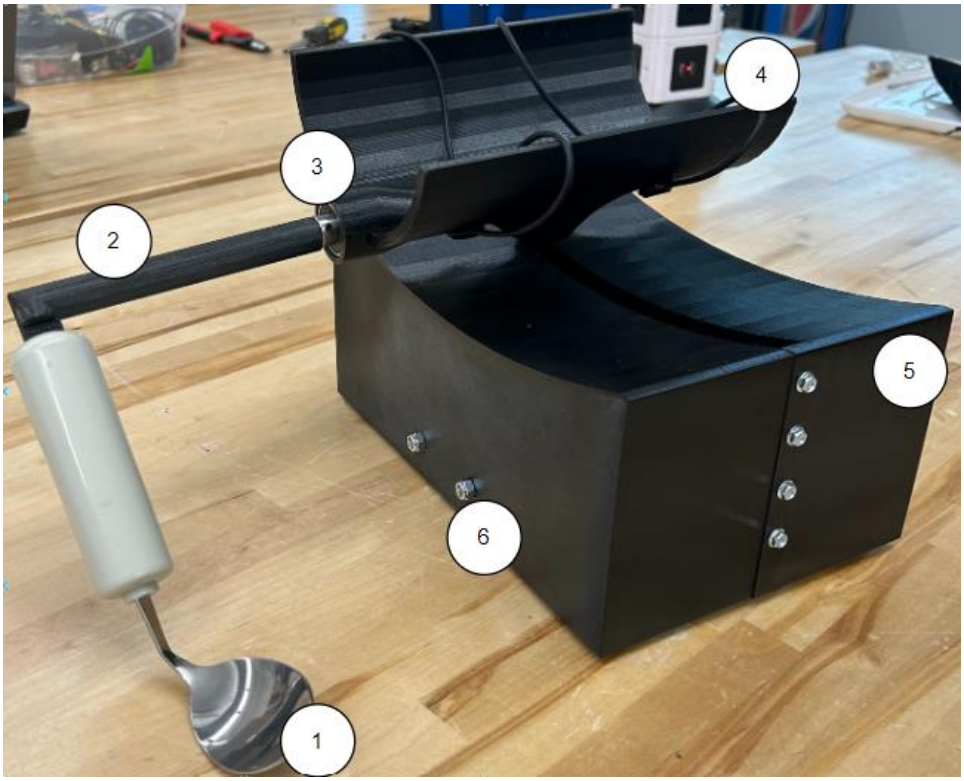
Introduction

The Adaptive Feeder is a device used to empower individuals with disabilities to gain independence in feeding themselves. With its intuitive design and helpful features, it serves as a reliable guide to support users in mastering the art of self-feeding.

Overview



1. Spoon
2. Handlebar
5. Base
3. Bearing
4. Arm Holder
6. Panavise (Inside Base)

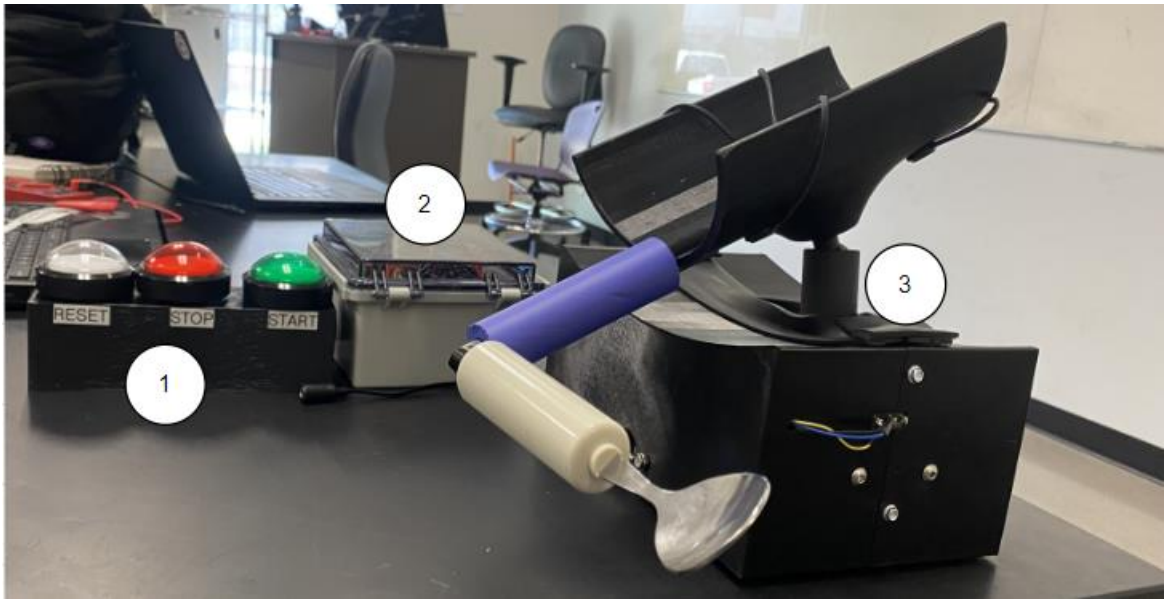
Materials list

Materials Needed	Quantity	Cost Total ($)	Vendor & Link
Lead Screw and Brass Nut	1	$26.97	Amazon
Pololu High-Power Stepper Motor Driver 36v4	1	$24.00	Pololu
Stepper Motor: Bipolar, 200 Steps/Rev, 57×76mm, 3.2V, 2.8 A/Phase	1	$73.37	Pololu
Motor Shaft Coupler	2	$12.99	Amazon
KBT 12V 2400mAh Rechargeable Li-ion Battery	2	$22.99	Amazon
9V Battery	1	$7.10	Amazon
Certified Food Grade PETG 3D Printer Filament Roll	2	$41.61	Amazon
ELEGOO UNO Project Super Starter	1	$38.80	Amazon
Self-Alignment Bearing	1	$9.69	Amazon
Adaptive Spoon	1	$6.95	Amazon
Vive Foam Tubing	1	$16.14	Amazon
PANAVISE 380 Vacuum Base	1	$61.42	Amazon
12 Pack 8/32 Inch M4 Threaded Rod with Hex Nuts 12 Pcs M4 Stainless Steel Threads Studs Rods 12 Pcs M4 Stainless Steel Fully Threaded Hex Nuts for Beaded Garden Stake Rods (8 Inch)	1	$10.76	Amazon
Push Buttons	3	$18.88	Amazon
Limit Switches	2	$5.99	Amazon
Rubber Stripping Roll	1	$13.99	Amazon
Electrical Waterproof Box	1	$20.99	Amazon
Self-Tapping Hex Screws Pack	1	$9.99	Amazon
Wire Nuts Pack	1	$8.97	Amazon
Magnet Straps	4	$14.99	Amazon
Speaker Wire Spool	1	$8.99	Amazon
Electrical Tape	1	$4.98	Amazon
Total (Electric)		$460.56	
Total (Mechanical-Underlined)		$155.86	

Health and Safety

- Make sure to read all the instructions before building the device and make sure to use the CAD/code files attached in the links section. If done incorrectly the device may not work properly and could cause harm.
- The adaptive feeder should not be used without someone supervising in case of choking or something going wrong.
- People with uncontrolled movements should not use metal spoons on the device, instead use plastic ones.
- Make sure to not run device if a wire is exposed.
- Make sure to have a fully or half charged battery.
- Do not touch any exposed electrical components when the power is on.
- Before use make sure the base is fully secured to the table with the Pana-Vise
- Ensure the device was reassembled correctly and nothing is to lose.
- Do a routine check up on all components every two or three weeks.
- Make sure to wipe and clean all parts before every meal.

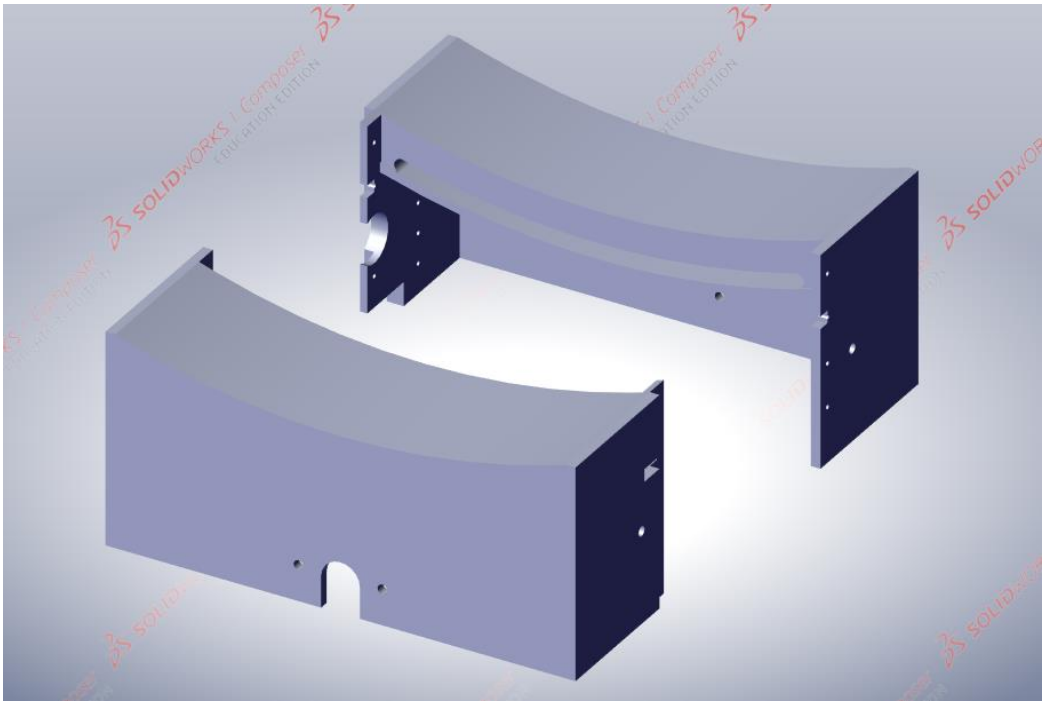
Adaptations



1. A button box with buttons can be added to make the motorized version of this device
2. An electrical box needs to be added to maintain all the wires safe for the motorized version.
3. The joint can at the spoon holder can be removed and a joint can be added on the base for the motorized version
4. The motor and screw rod can be removed and the adaptive could be used mechanically.
5. The motor and screw rod can be removed and the adaptive could be used mechanically.
6. The motor case needs to be added to keep the motor safe from any food and make it the motorized version.

Quick Set up with motor

1.



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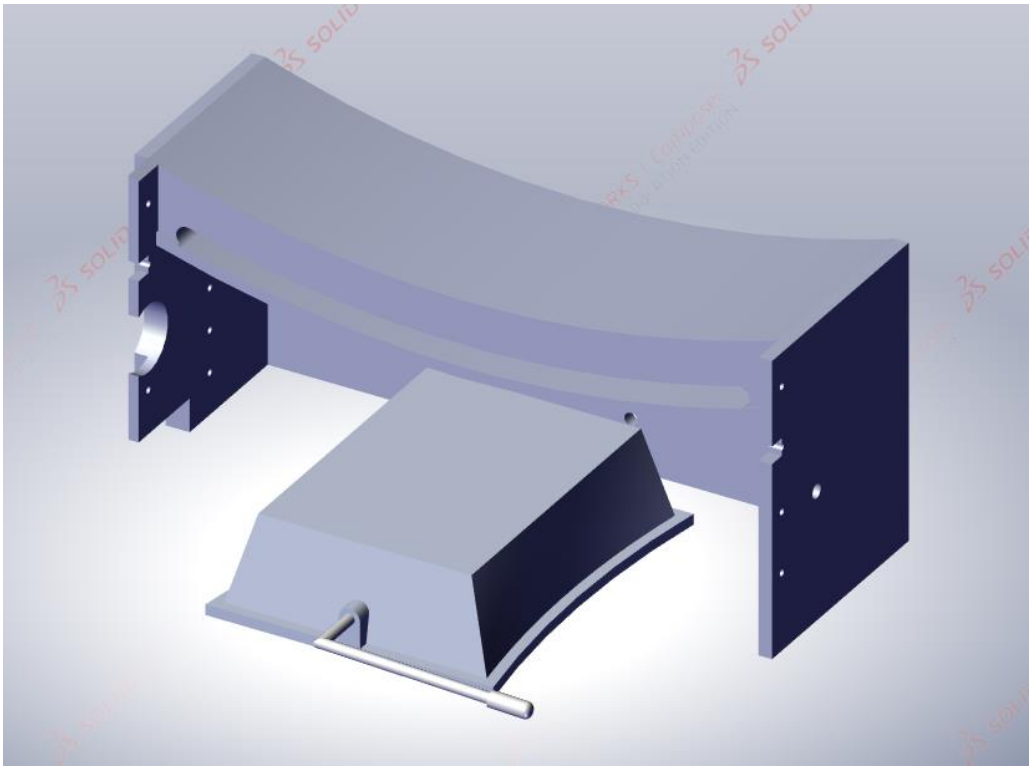

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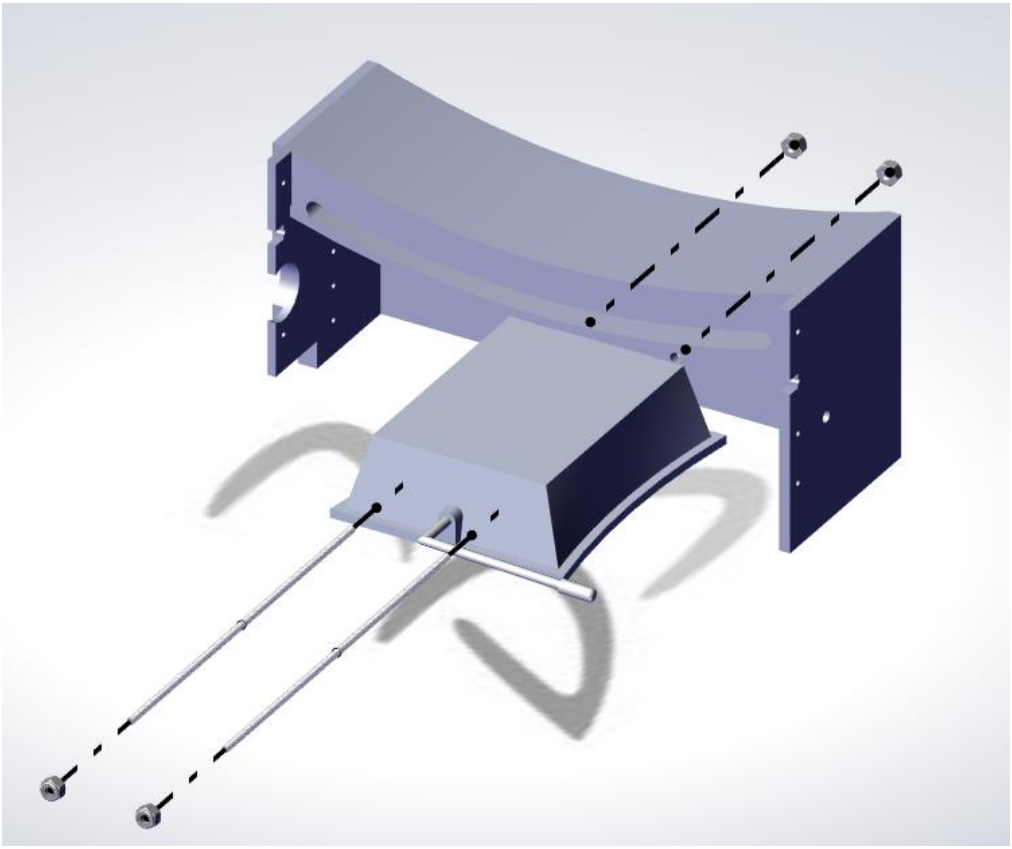

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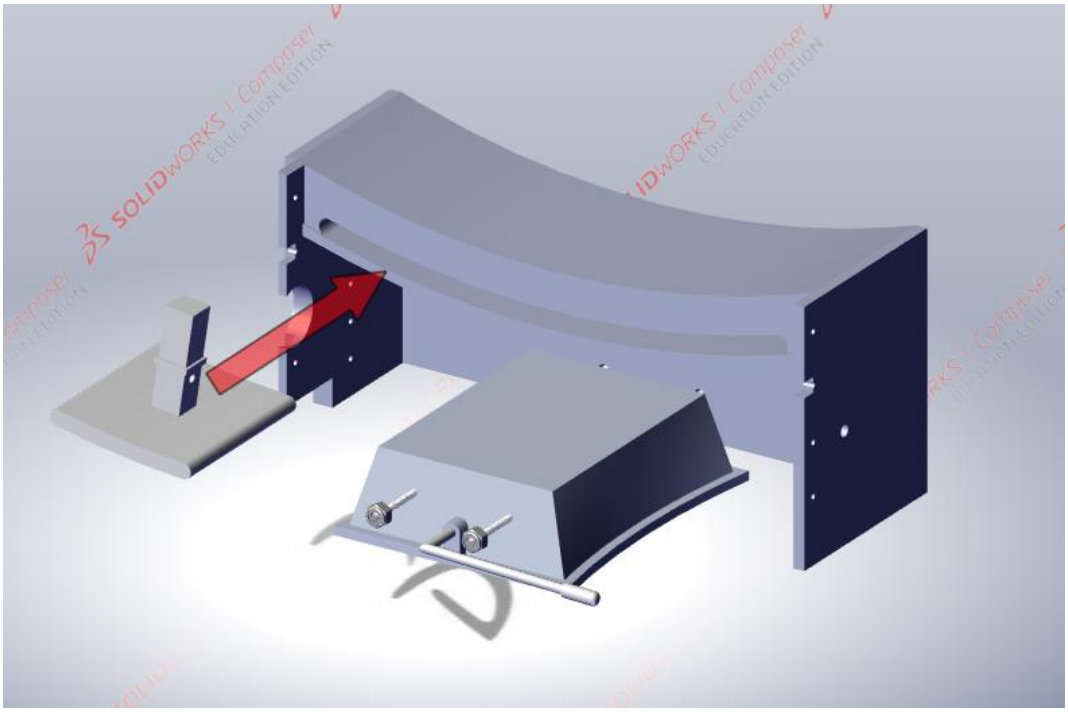

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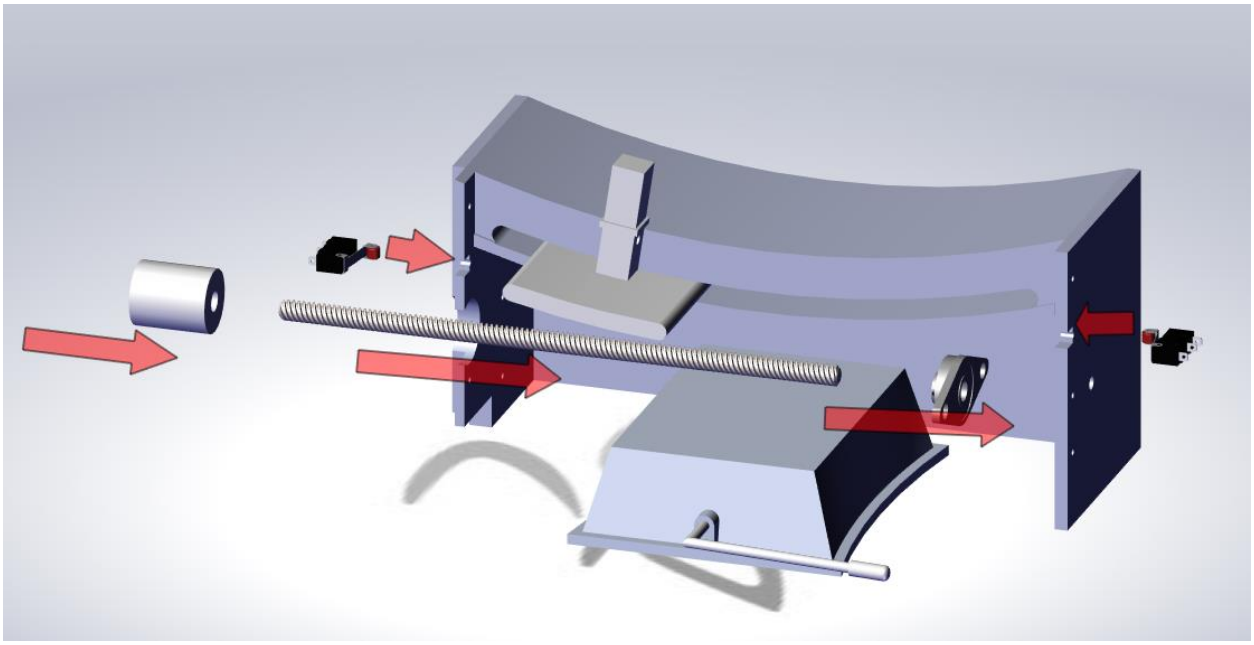

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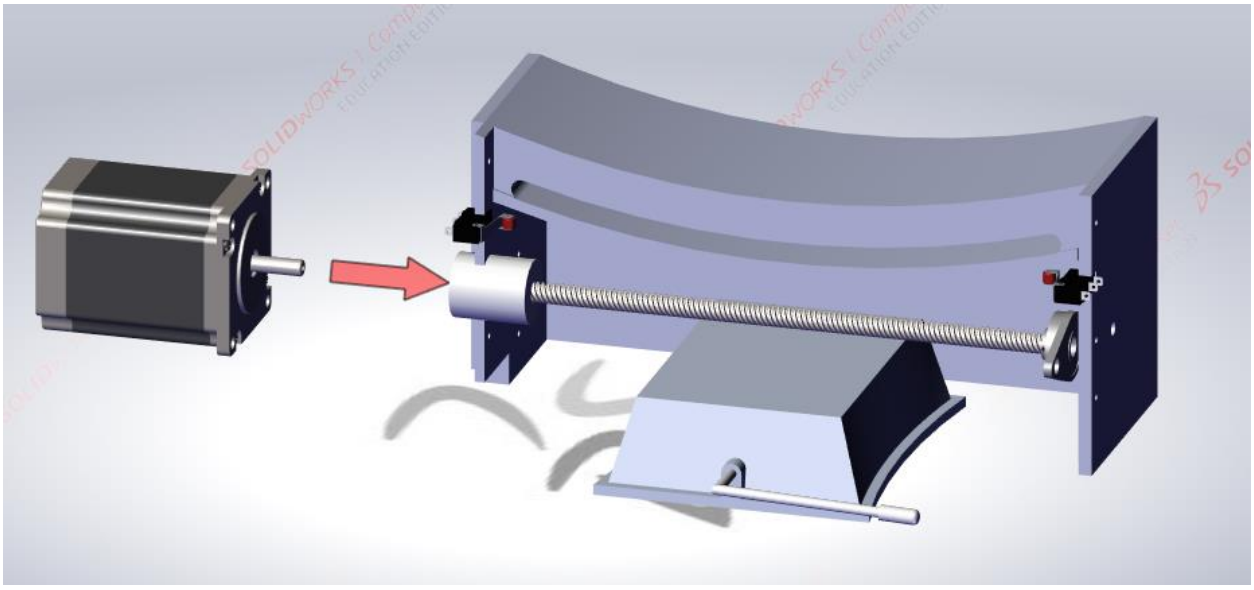

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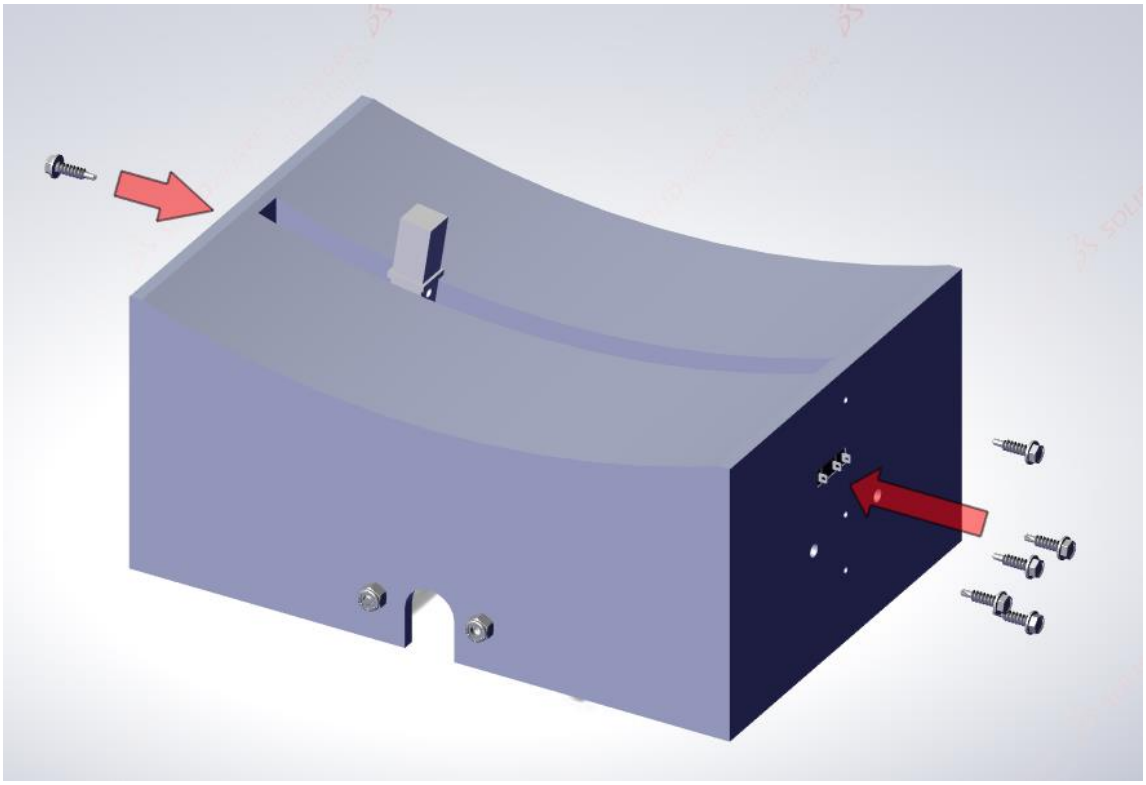

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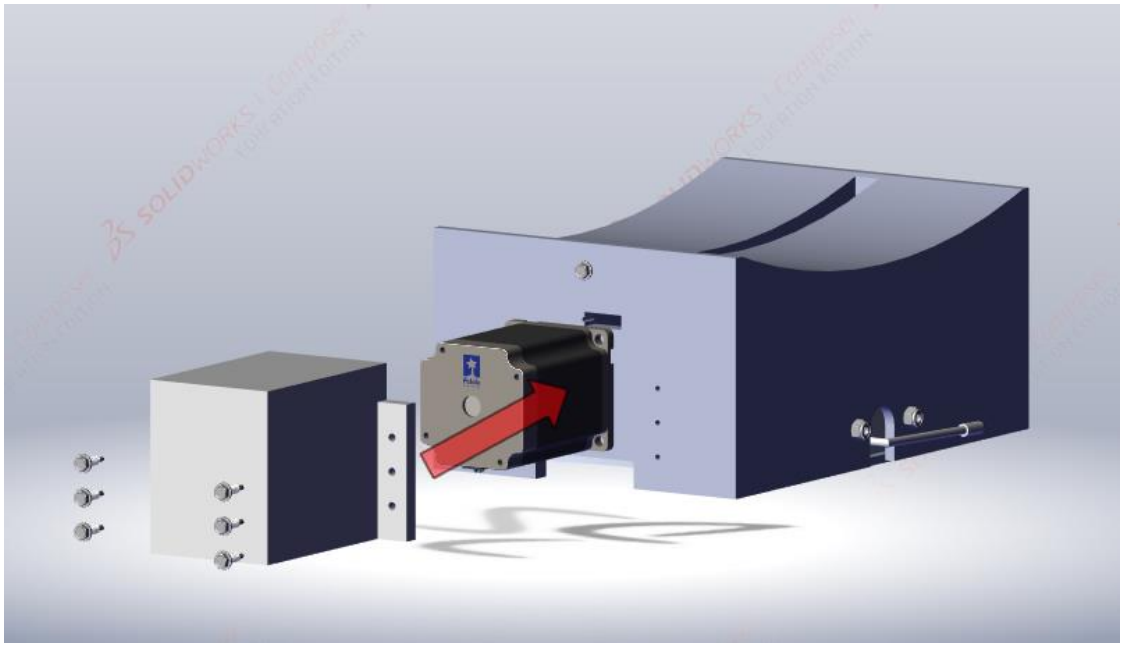

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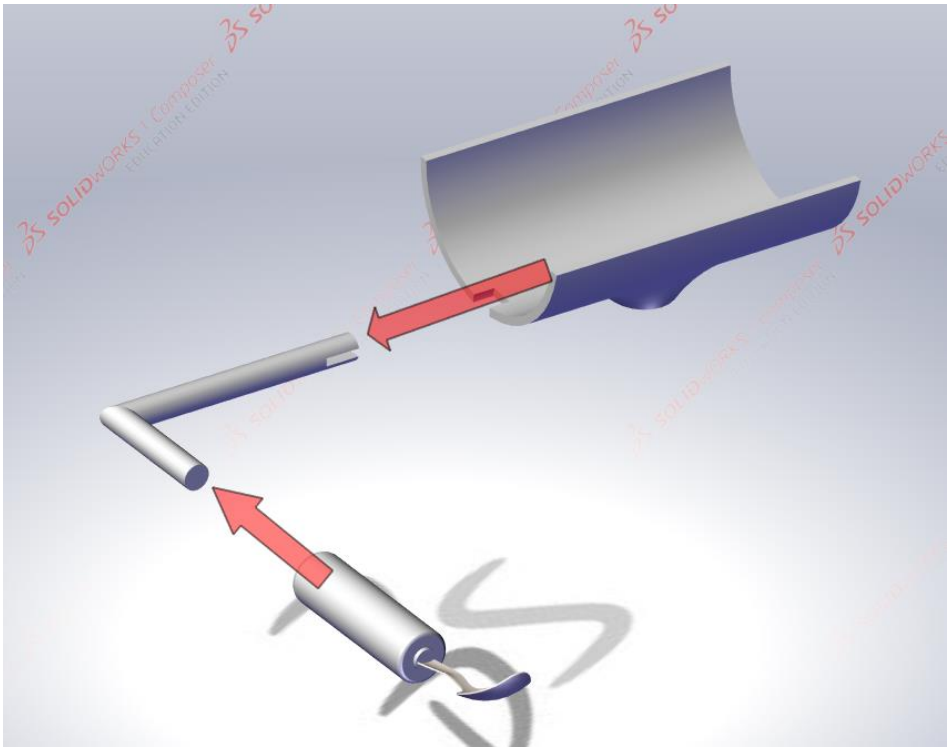

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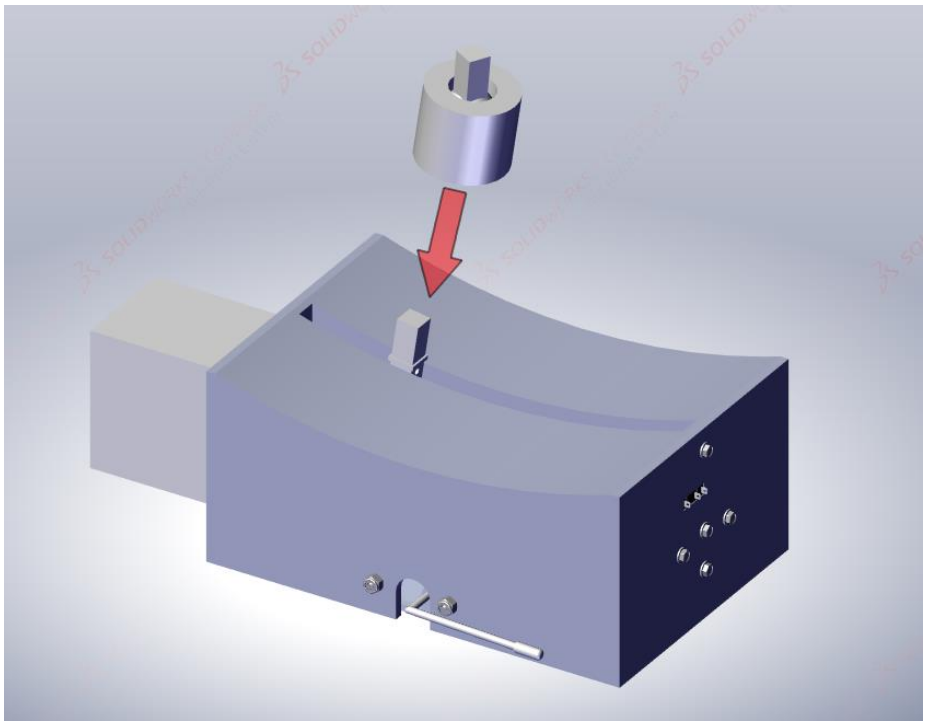

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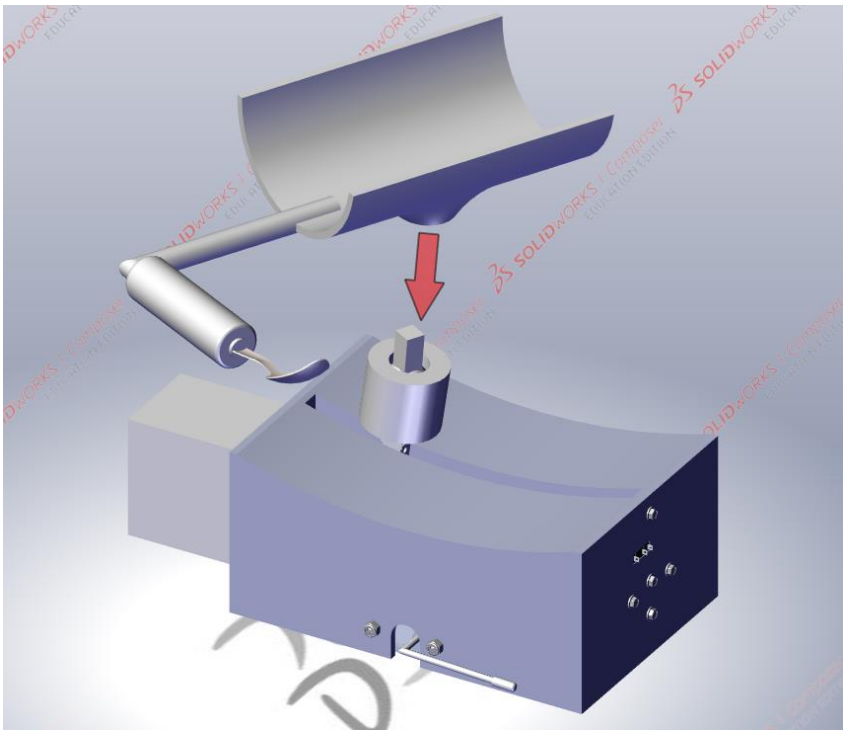

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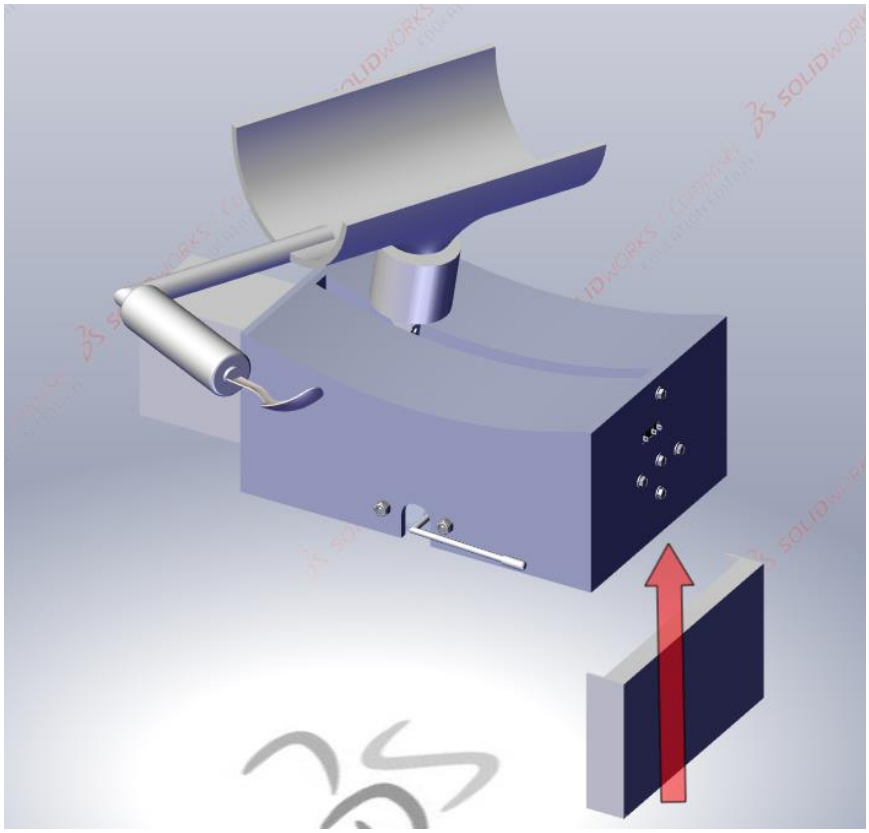

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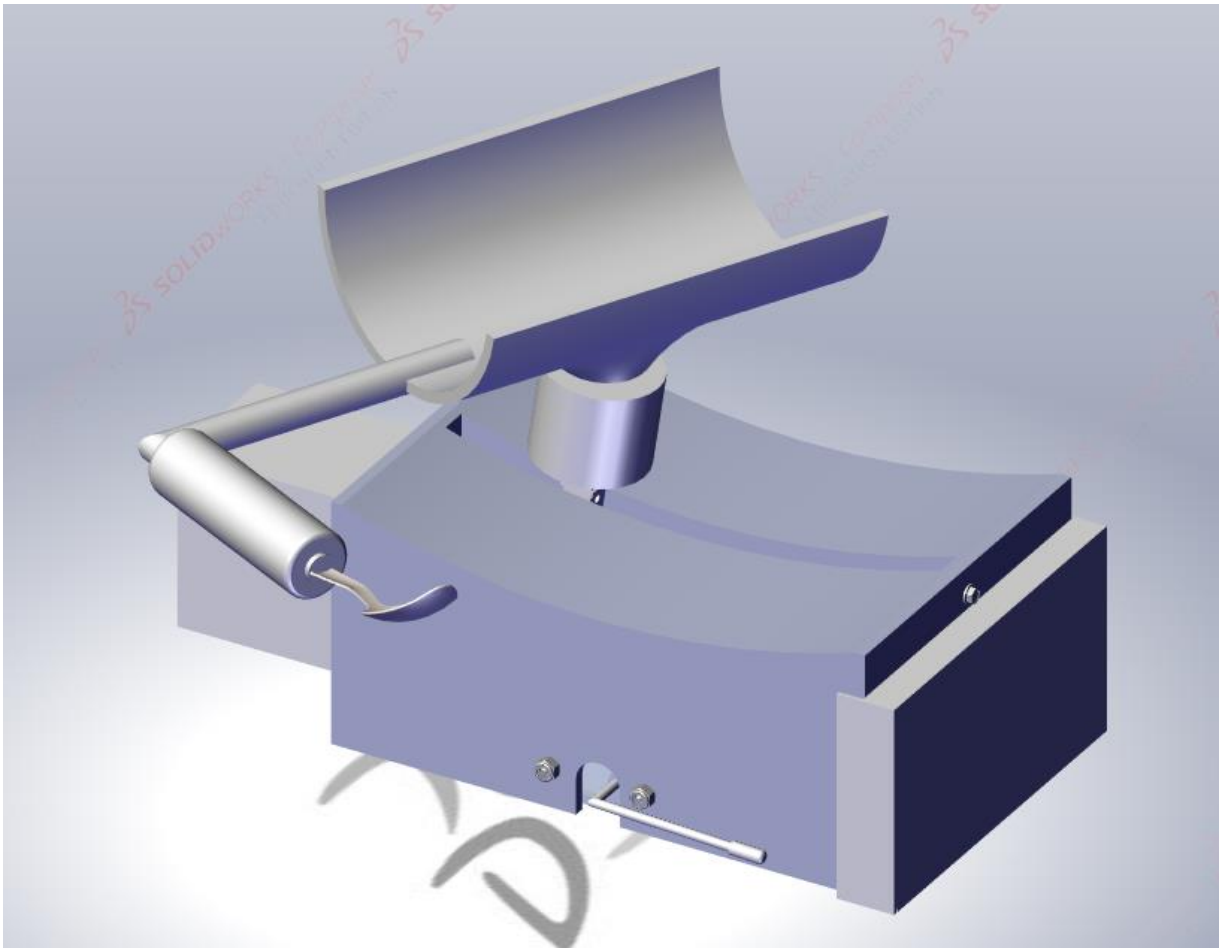
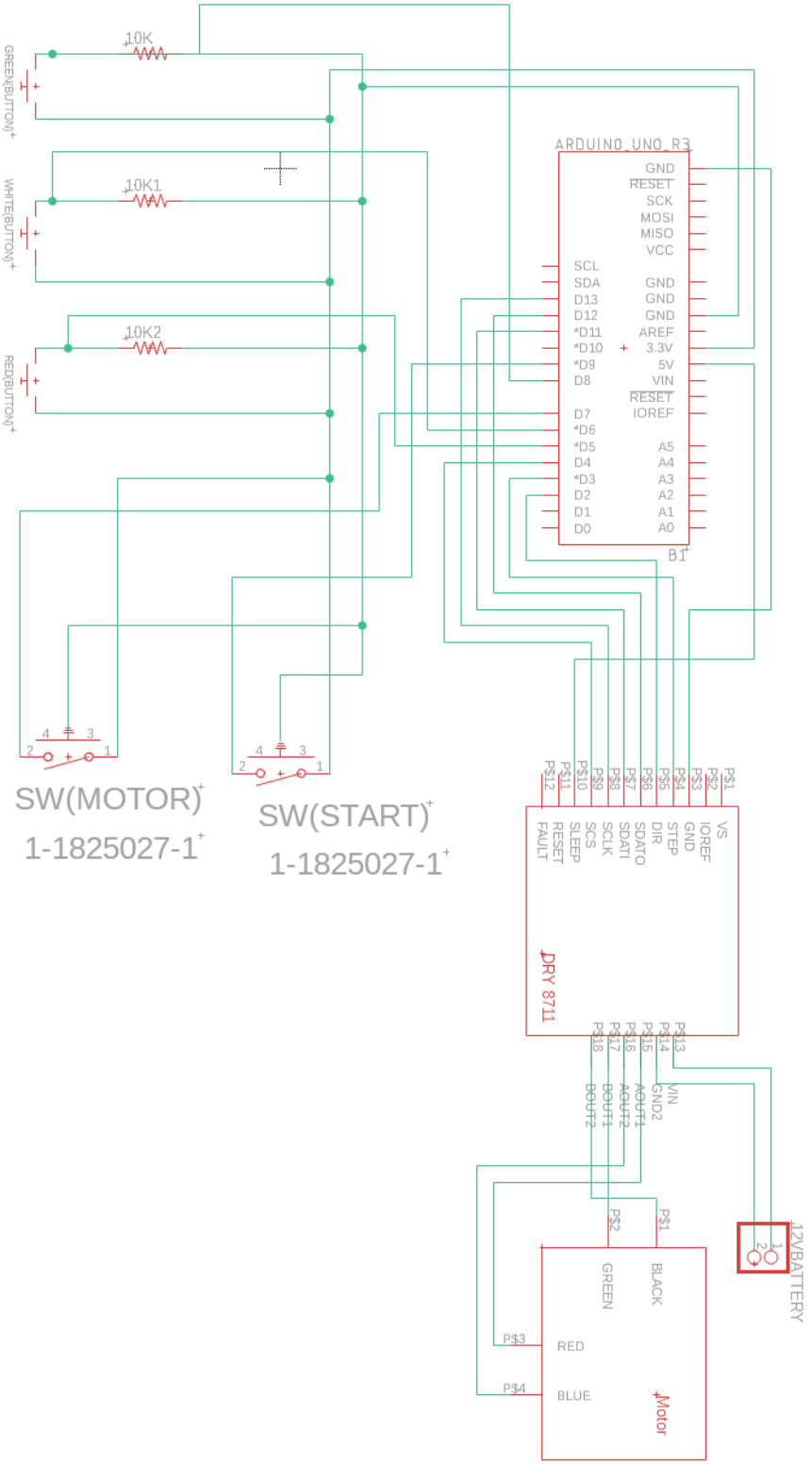


Quick Set Up Without Motor

Reference these steps 1, 2, 3, 4, 7, 9, 10 and 11 from Quick Motor Set Up.

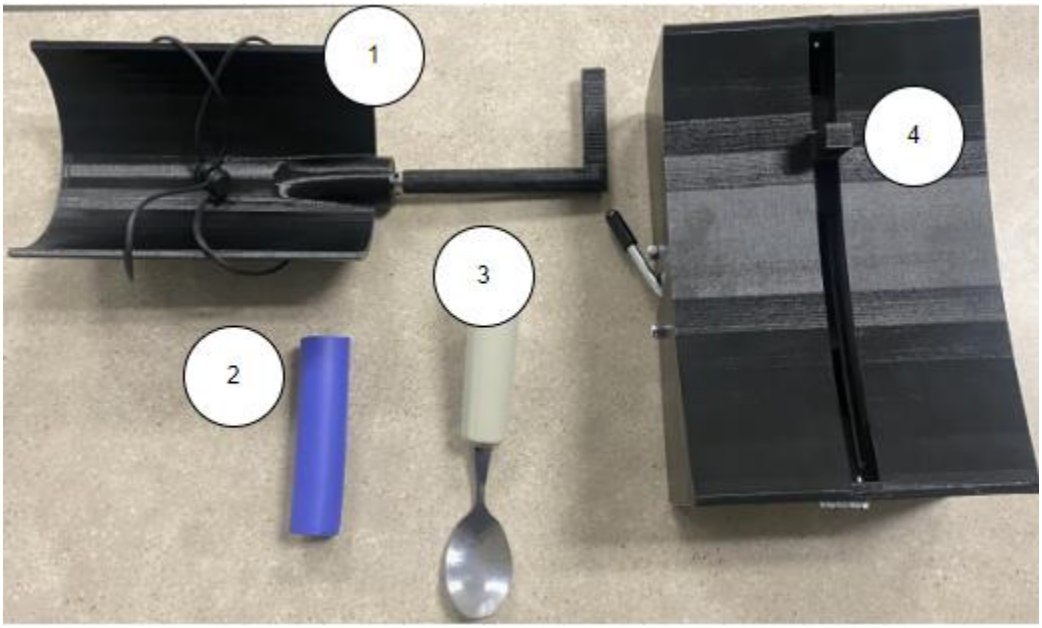
Electrical Diagram how to build



How to assemble

Mechanical Design: Assemble into 3 pieces

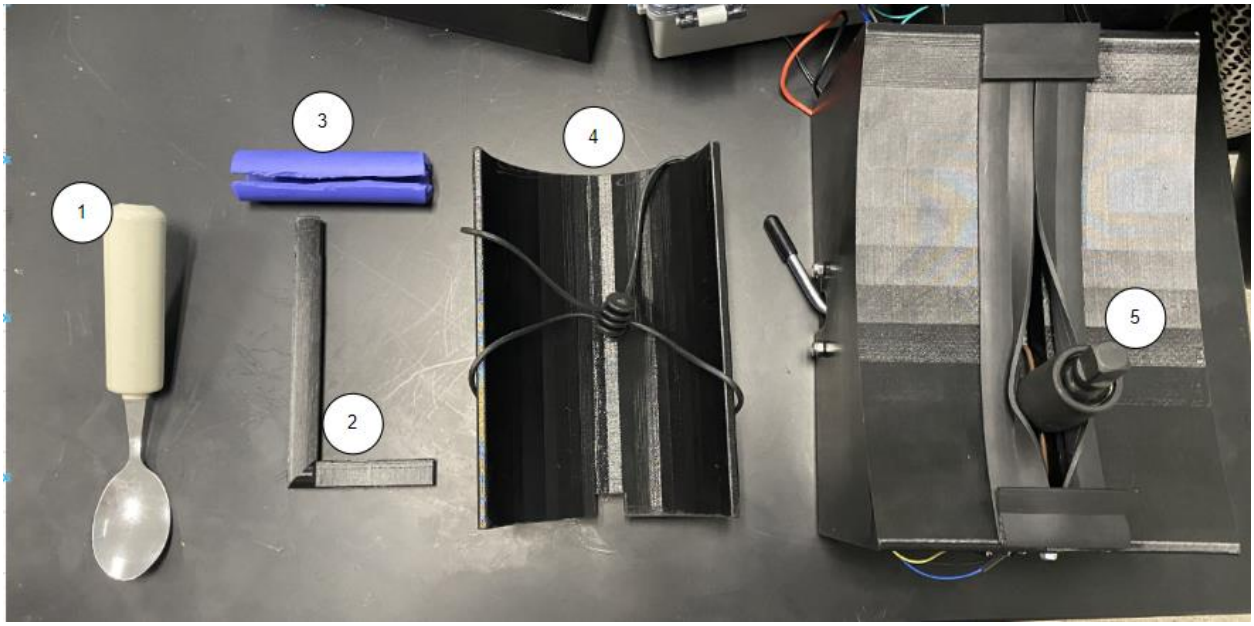
Place part 3 on part 1 at the flat surface. Then place part 1 on part 4 the slider. To add more support to the handle on part 1 add part 2 to the area with the round surface.



For further detail watch the YouTube video called “Mechanical Assemble”

Motorized Design: Assemble into 3 pieces

Place part 2 on part 4 where the square indent is. Place part 1 on part two where there is a flat surface. Then place all parts onto part 1 the base on part 5. To add a better grip place part three on part 2 around the round part.

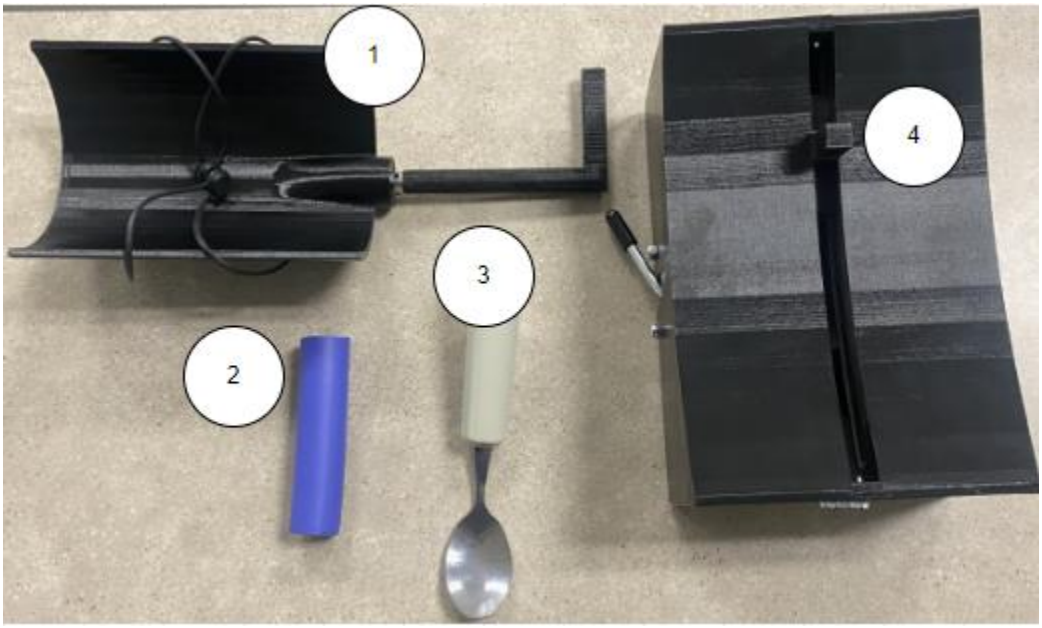


For further detail watch the YouTube video called “Motorized Assembled”

How to dissemble for easy storage

Mechanical Desing: Disassemble into 3 pieces

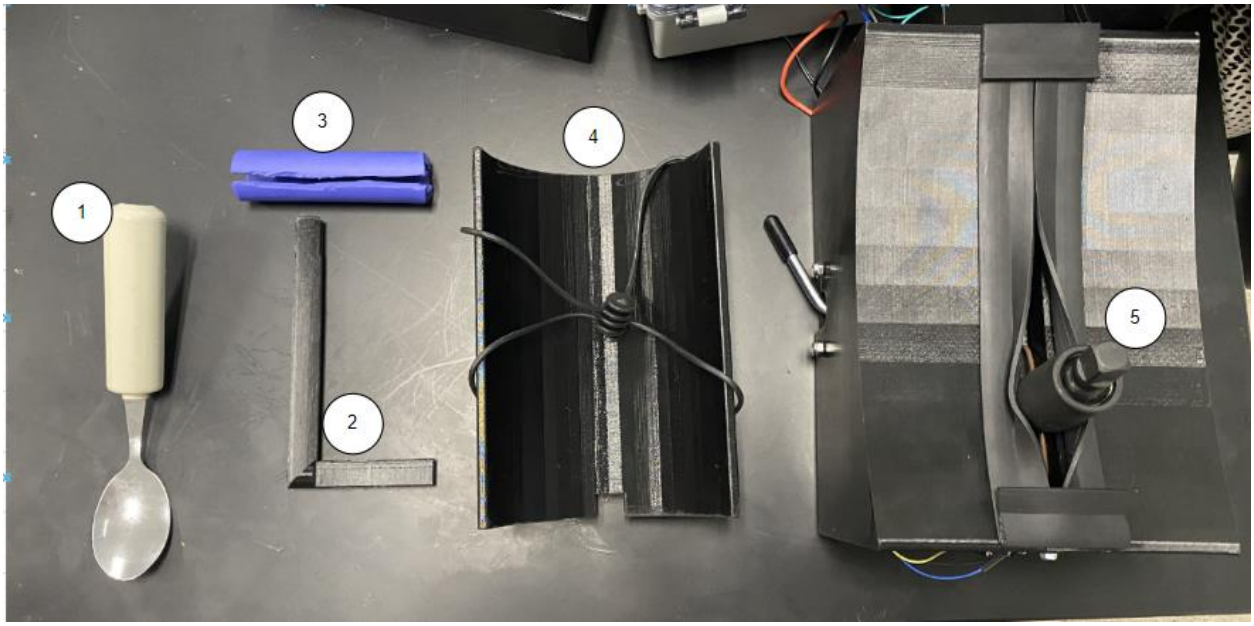
Remove part 1 from part 4 the slider. Then remove part 3 and 2 for easier storage and cleaning.



For further detail watch the YouTube video called “Mechanical Disassemble”

Motorized Design: Disassemble into 5 pieces

Remove part 1 by pulling it off part two. Next pull part 2 from part 4 and remove part 3. Once the smaller compartments are off, remove the arm holder part 4 from part 5. Removing all parts creates easier access to clean and store. Everything now can be stored in a cabinet.



For further detail watch the YouTube video called “Motorized Disassemble”

Maintenance and Cleaning

How to clean spoon

Remove the spoon from the adaptive feeder by pulling it off. Put spoon on the dishwasher or clean by hand with soap and water.

How to clean the arm support

To clean the arm support remove it from the base by the ball joint and use soap and water to clean.

How to clean the base and other components

To clean the outside of the base, use a wet towel with disinfectant spray. If food falls inside the track, make sure to take apart the base by removing the screws and wiping the inside down. Make sure to also wipe down the lead screw.

How to prevent the lead screw from rusting

To help the lead screw last longer grease can be applied. Add a bit of grease on the lead screw and run the motor to ensure the entire lead screw is covered. Lightly remove extra grease if any. If the lead screw needs cleaning reapply grease.

How to clean electrical components

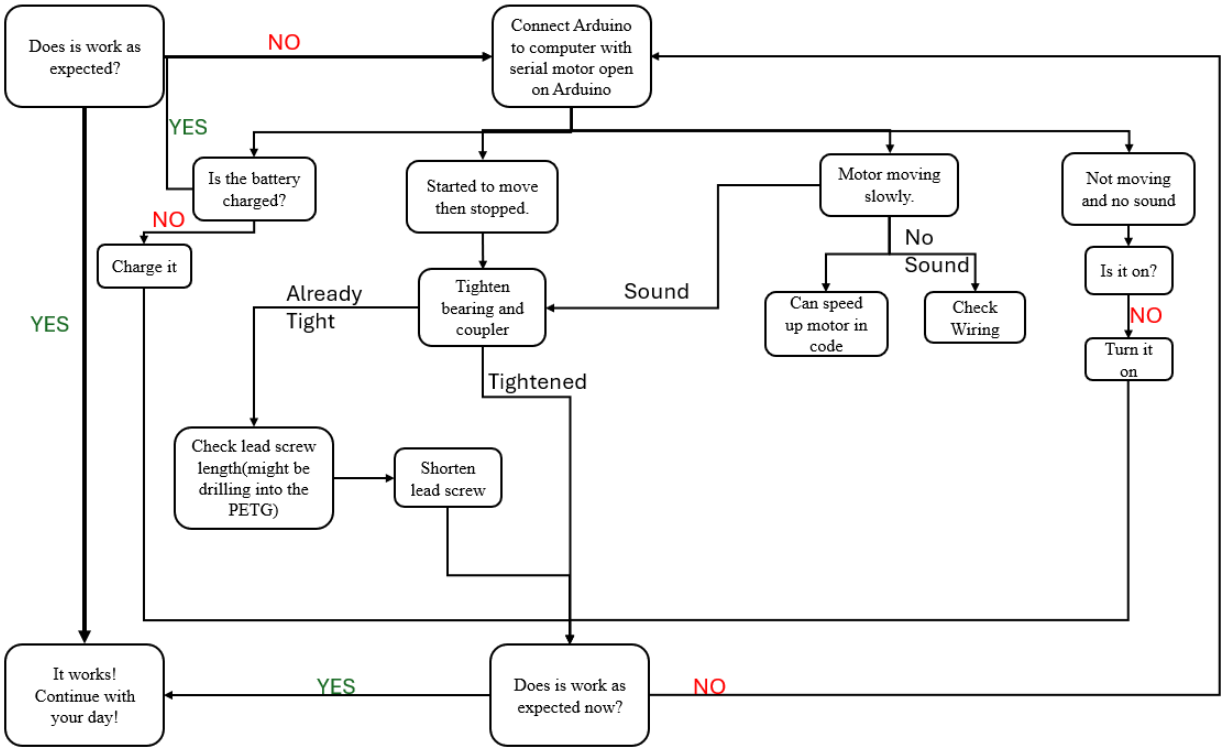
Do not use any disinfectant or water to clean electrical components. Use a dry paper towel and wipe the electronic parts. If it is wet do not turn it on until it is completely dry. Make sure to test the adaptive feeder on its own first to make sure everything works correctly. If everything moves correctly it can be used as normal.

Chip and motor regular checkup

Check the wires for any pinching or the soldering for dulling, rough, or cracking in appearance to ensure the soldering of the electrical components are still at max efficiency.

Trouble Shooting

Problem	Possible Problem	Solution	Did it fix the problem?
For any problem start at the code, its designed to help isolate a problem.	Have the serial monitor open connected to the Arduino.	Read the serial motor for hits on any buttons that are not working and follow comments for helpful hints.	YES/NO
Not moving and no sound	A wire may have come undone	Check Wires	YES/NO
	Is it on?	Turn on power	YES/NO
Moved but stopped at motor (after hitting green button)	Did the power get turned off?	Turn on the power	YES/NO
	Are any wires loose?	Check wires plug in any loose wires	YES/NO
Started to move and stopped or not moving with a grinding sound	Is the bearing tight?	Tighten the bearing	YES/NO
	Is the coupler tight?	Check the coupler and tighten	YES/NO
	Is the lead screw too long?	Shorten the lead screw and make sure it has smooth end	YES/NO
Motor moves to slow	Check the code	Follow the comments to change the speed	YES/NO



File Links

GitHub Link with all the SolidWorks File and Code:
https://github.com/robodoc24/AdaptedFeeder

YouTube channel: https://www.youtube.com/@AdaptiveFeeder