Salico -

Updates

11.14.2024

Thank you for a great trip!

- We finished all our planned DOEs done
  - Collected data for our second prototype
  - Our current prototype was okay, but we will need to descope for our time and resources
- Very valuable experience to gain insight on the operation
- Had a great time speaking with you and learning all about the farm!

Agenda

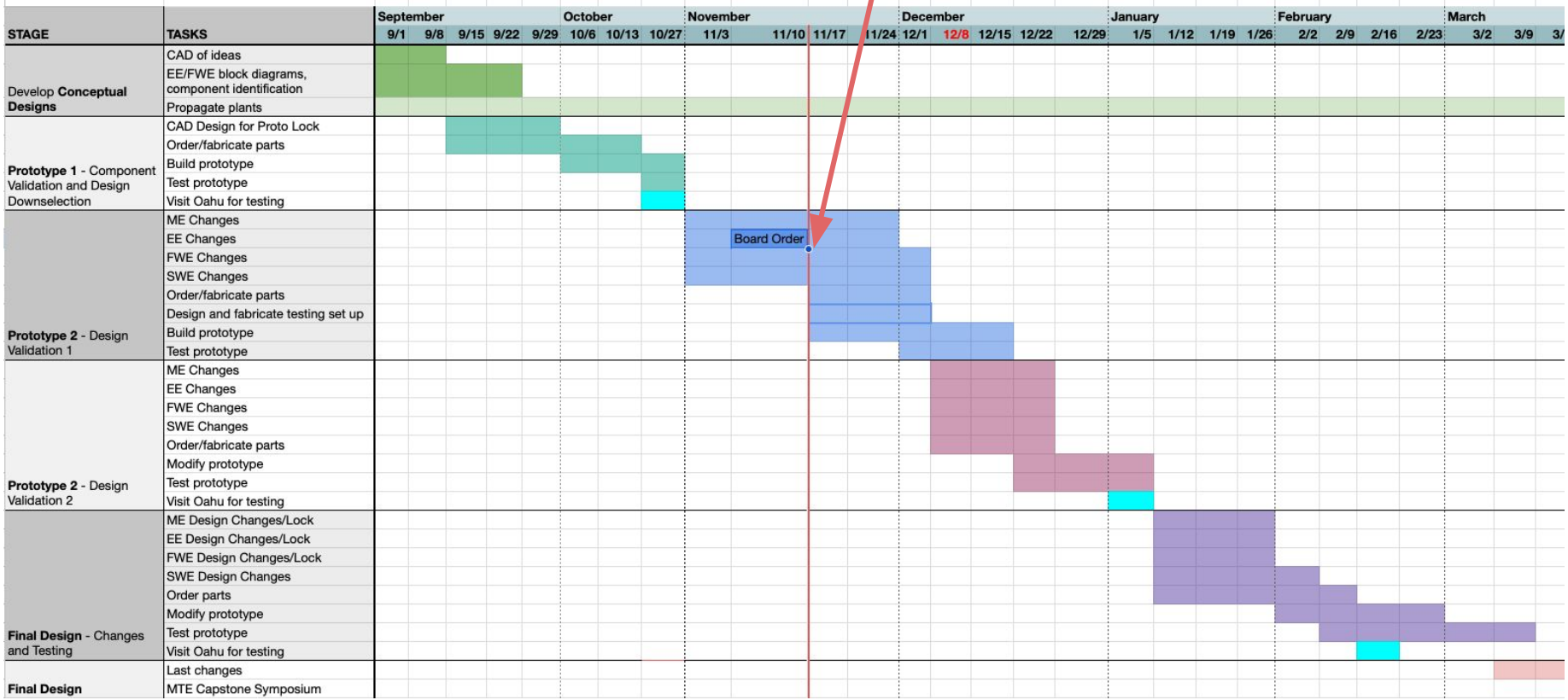
1. **GENERAL**
    - Photos, videos, USB stick
    - Propagation update
    - Schedule
        - Travel plans
2. **TESTING OBSERVATIONS**
3. **DESCOPING**
    - Descoped design goals
    - Farm modifications needed
4. **IMPLEMENTATION & DESIGN UPDATES**
    - Actuation methods
    - EE/SWE Updates
5. **NEXT STEPS**
    - Ongoing prototyping plans
    - Funding

General

- Photos and videos are all uploaded here: https://drive.google.com/drive/folders/1mbJ4uTX1HhwPok4WoW2EuhC-bx9t1hcW?usp=drive_link
  - But I will send you a USB stick in the next few days with everything!
- Propagation update: only 2 plants left standing...

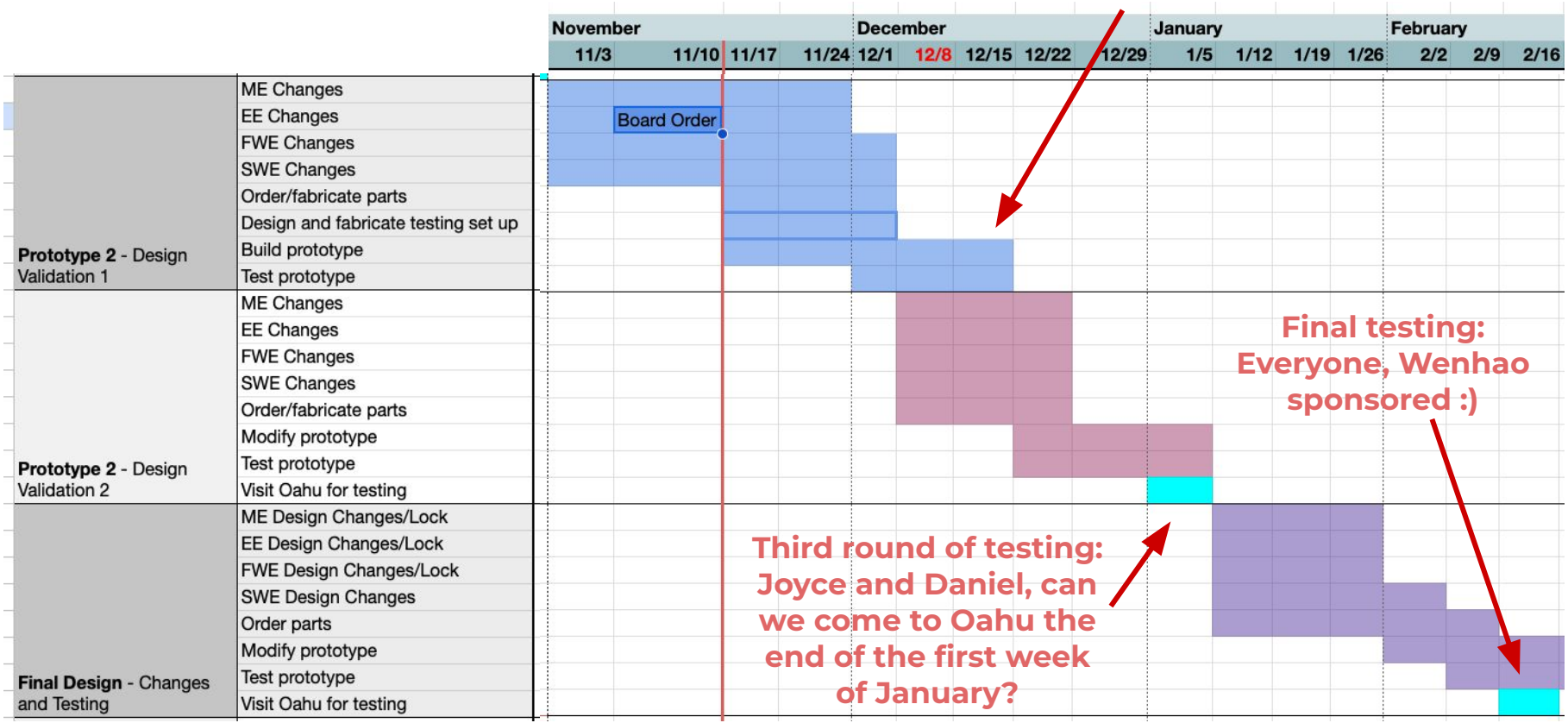
Schedule

We are here



Schedule & Travel Plans

Prototyping and one round of testing before the winter break

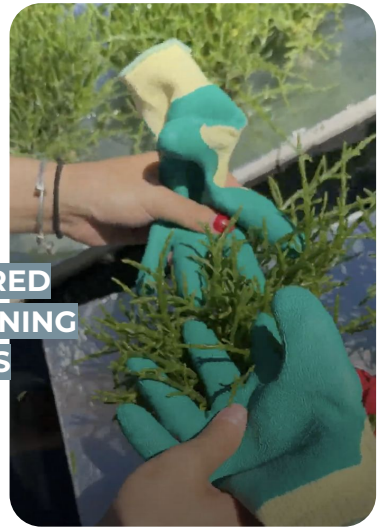


Testing - Mechanism

Claw mechanism

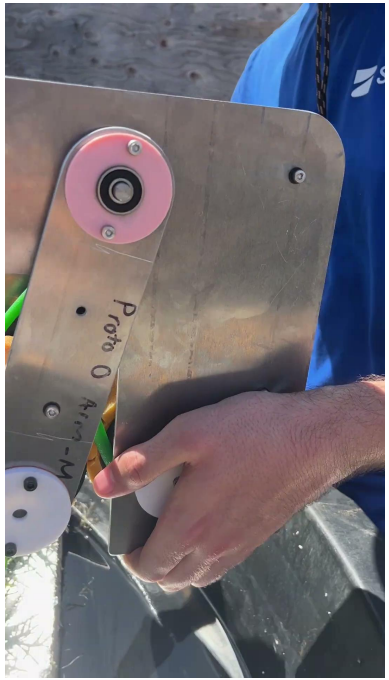
Very hard to thread the claw prongs into the plant stems without destroying

Yield is low when pulling, would need to thread first then tighten somehow then pull (still not great outlook)



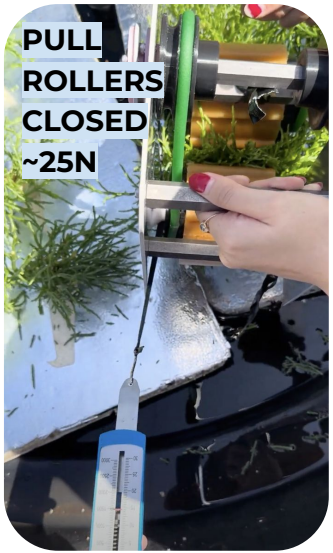
Roller

Worked decently and proves to be a promising path forward!



Testing - Forces

PINCHING: Should have an adjustable spring for the pinching force since a slight adjustment can change whether woody or tender parts will be picked.



Force to pull medium out: ~15-25N minimum, depends on root growth

Force to pull cone out of platform: from ~25N to well above 30N

Density of plants (sparse case): approximately 70 tips for 100x110x85mm box.

Force (N)	# of Tips	N/tip
20	30	0.67
2.5	5	0.50
15	50	0.30
10	32	0.31
17	45	0.38
12	40	0.30
15	35	0.43
10	40	0.25
20	35	0.57
20	40	0.50

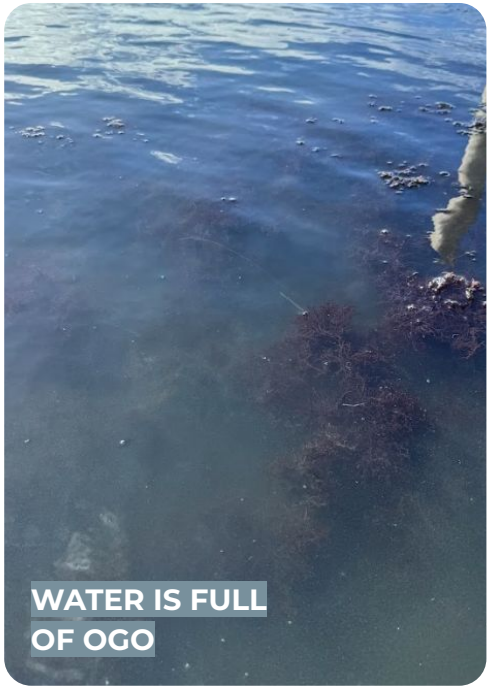
Testing - Spacing and Pond Observations

Spacing between cones is always 6 in, however space between growth is different. Measurements of 5 spaces:

X Distance (mm)	Y Distance (mm)
0	0
35	20
60	30
75	30
100	35
120	55

Testing - Water Quality

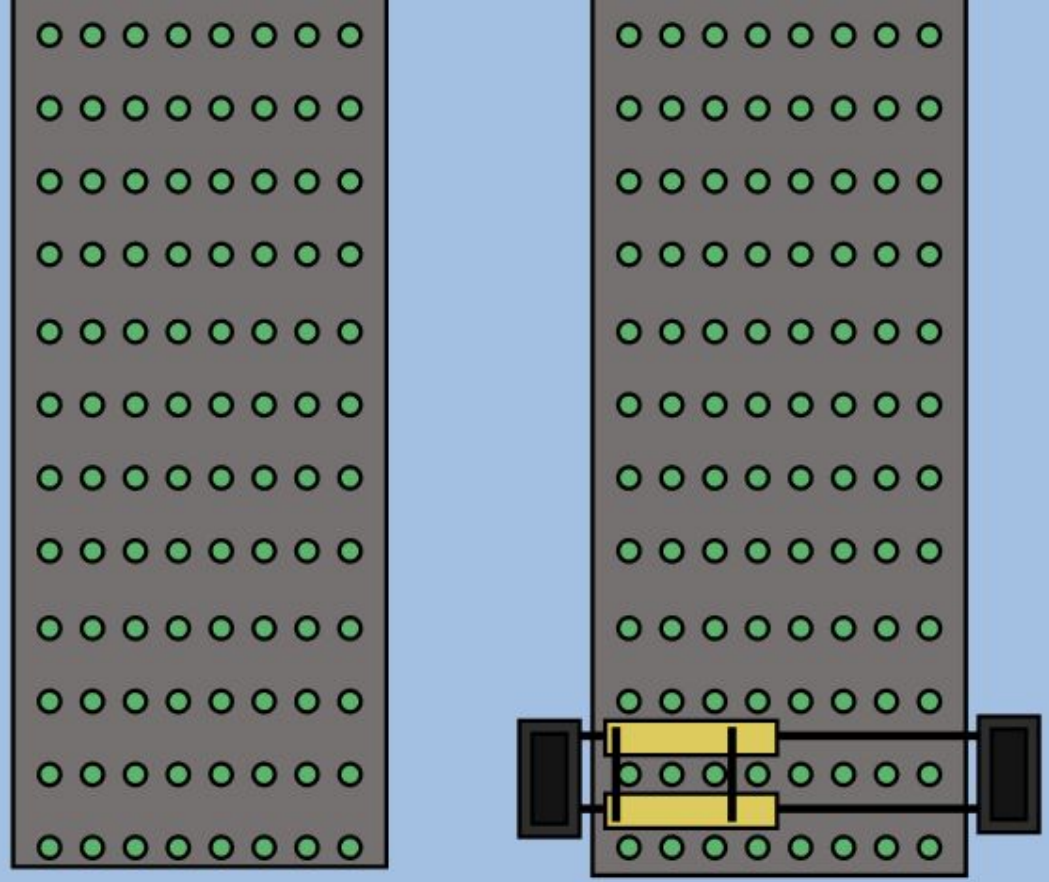
Ogo is a type of Hawaiian seaweed and actually one of their main crops, it's all over the pond floors and cleans the water (black ish seaweed). They float around the water (no roots). No propellers for traversal.



Descoping

#1 Picking half a row at a time

#2 Human-guided repositioning for each row



Modifications to the Farm

#1 Remove every other row to create space for alignment and apriltags

#2 Straighten the cones by adding ribbing

Implementation

#1 Top-down picking approach with multiple passes (most similar to our tests in Hawaii)

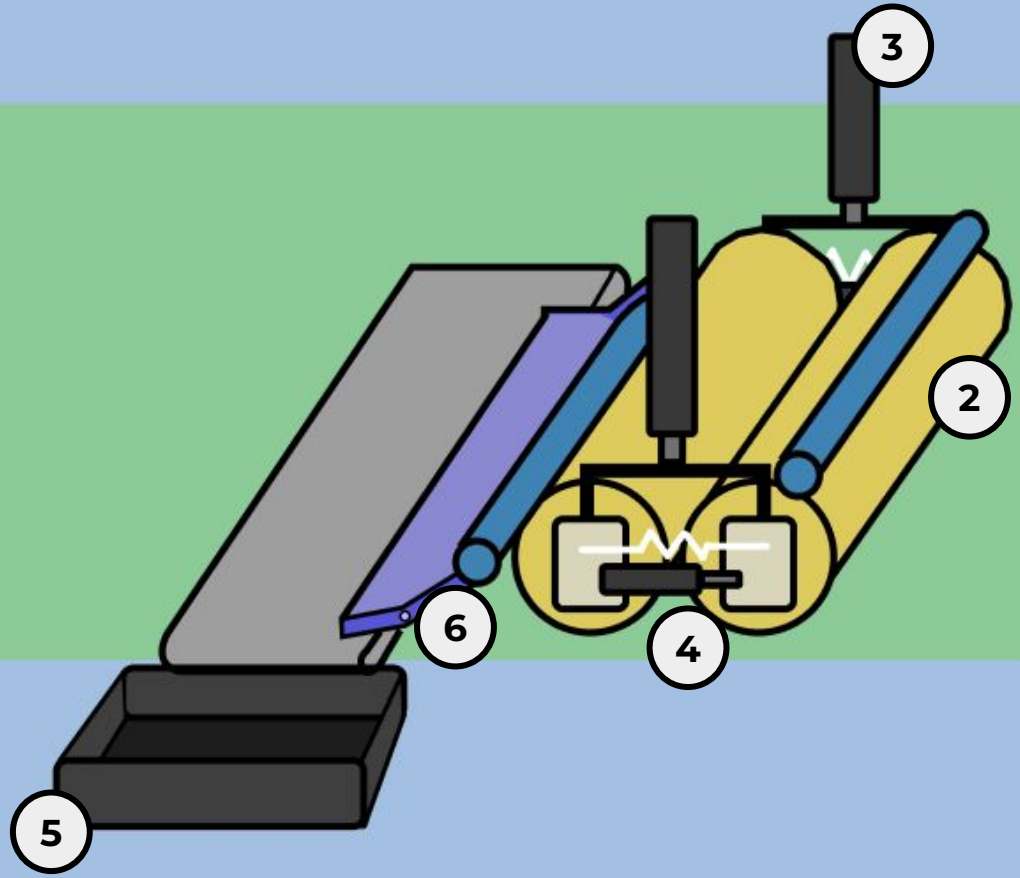
#2 Roller material will be urethane with a texture latex sleeve

#3 Pistons and springs for up down and in out motions

#4 One motor for each roller, direct drive

#5 One sided collection bin, tips pushed in using brushes and air

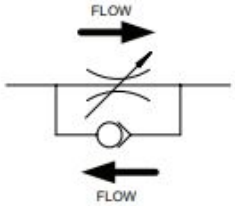
#6 “Hinged” ramp for temporary storage in lower position

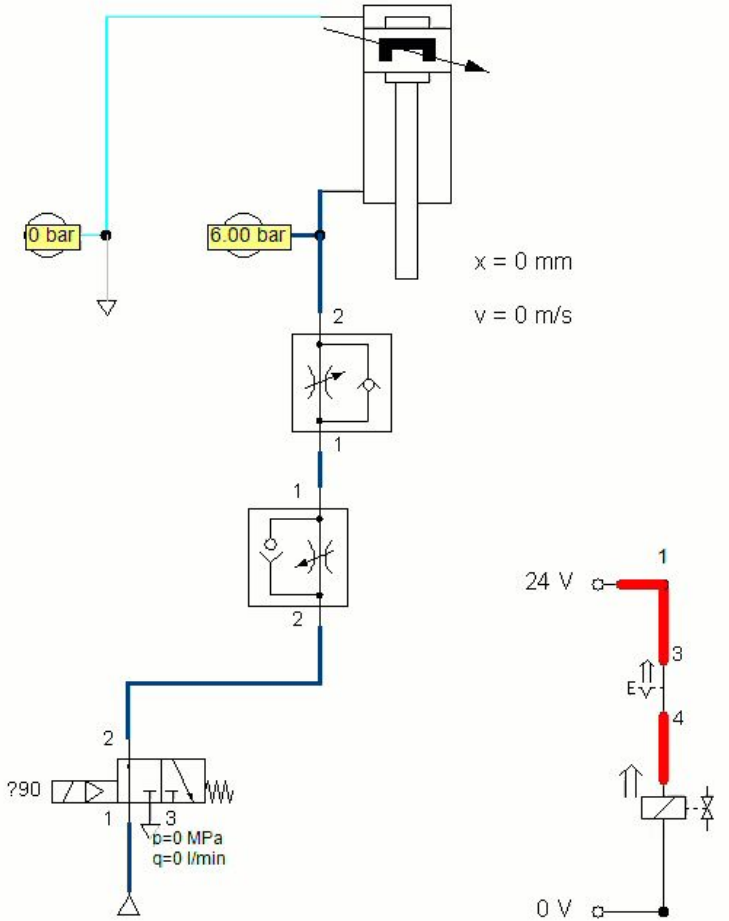


ME Updates: Pneumatics

Piston Diameter Calculations

7/8 in. Bore, Double-acting, Front Nose Mount





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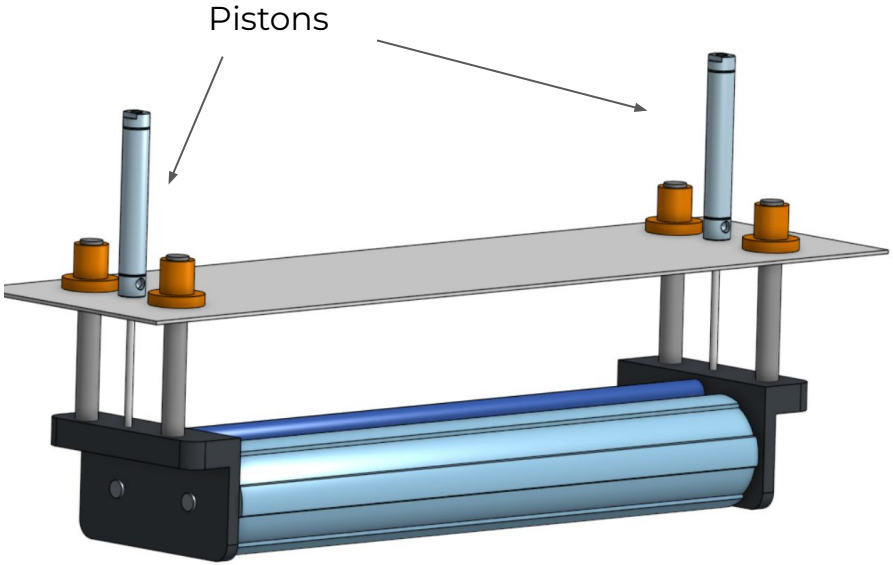
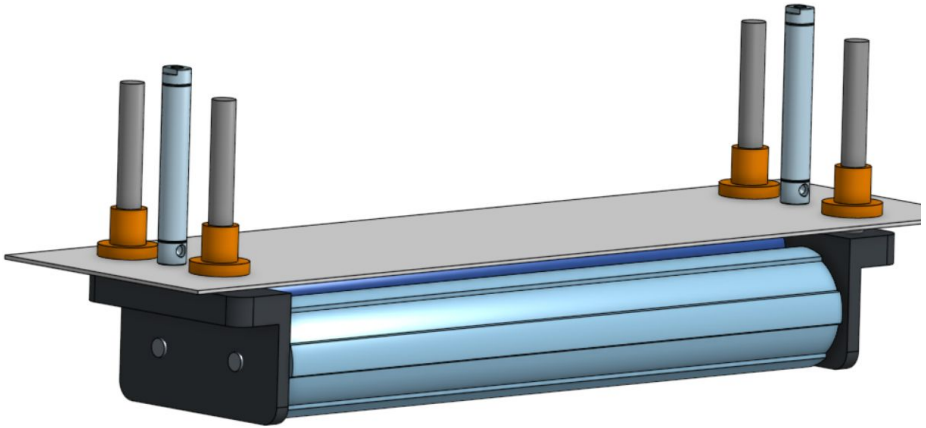
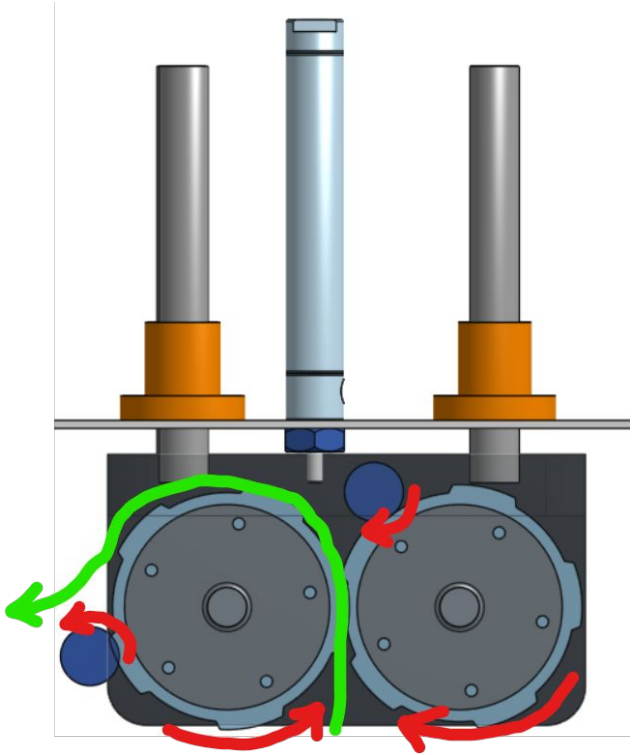


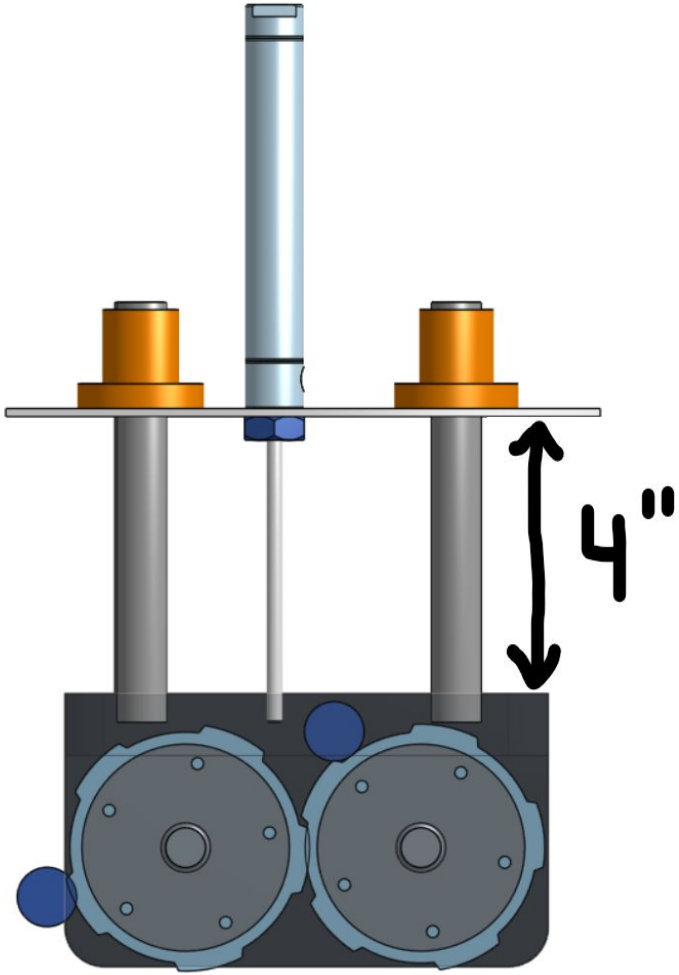
DOWN STATE



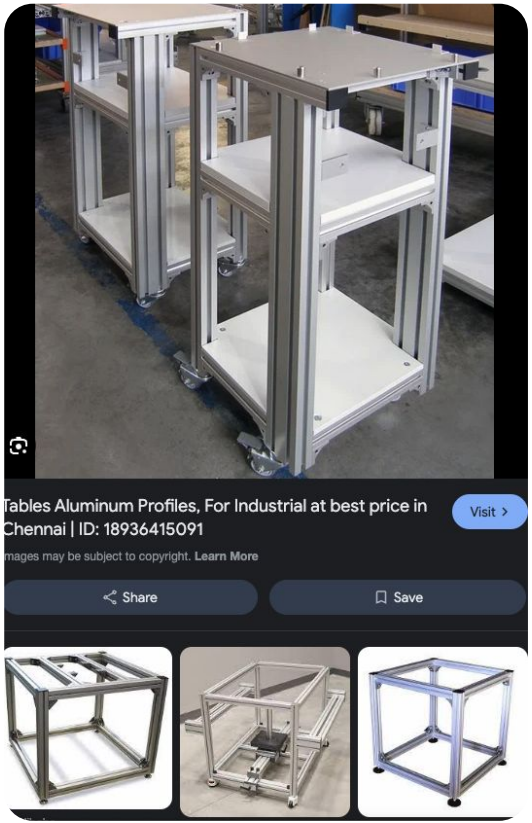
UP STATE

ME Updates: Pneumatics

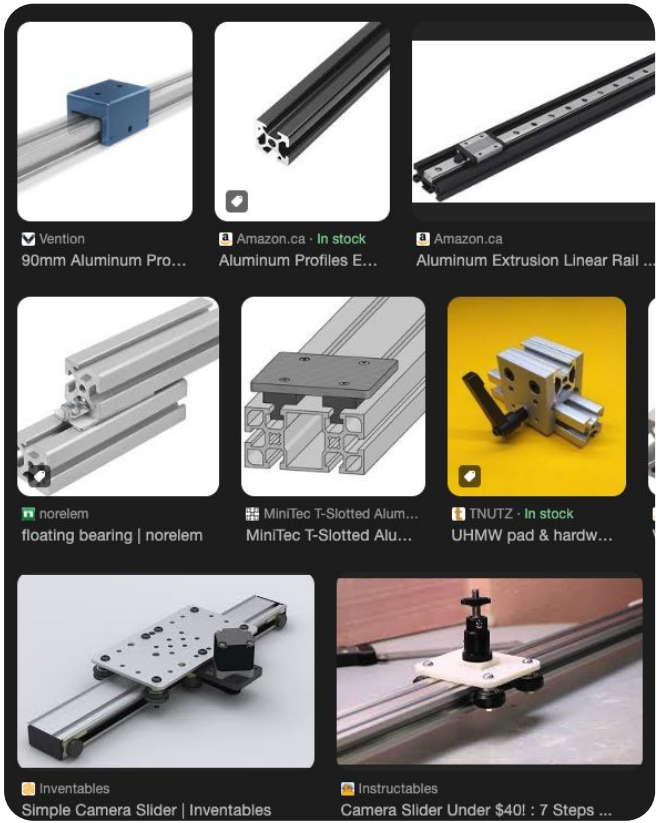




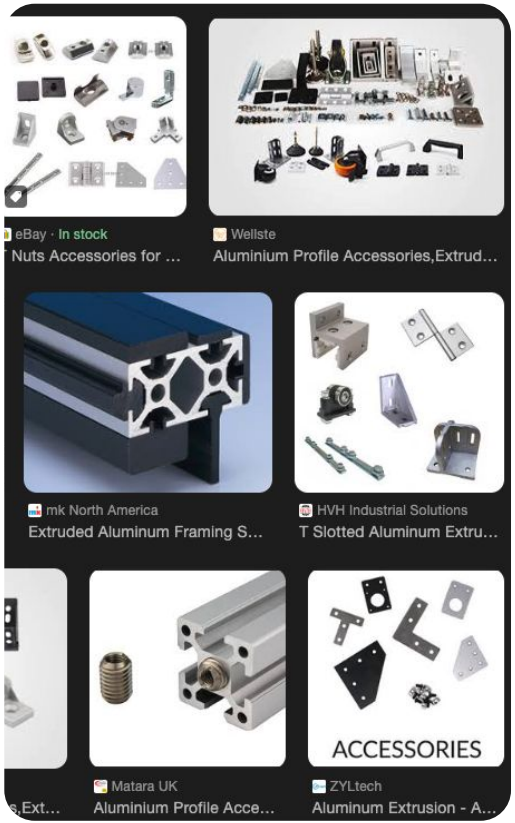
Frame



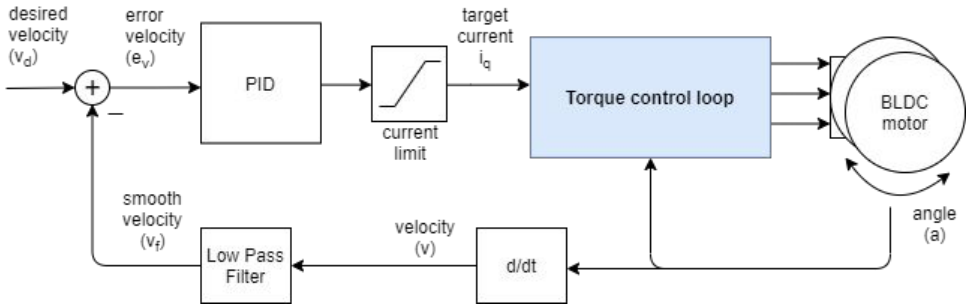
Rail



Attachments



FWE Updates: Roller BLDC Motor Control

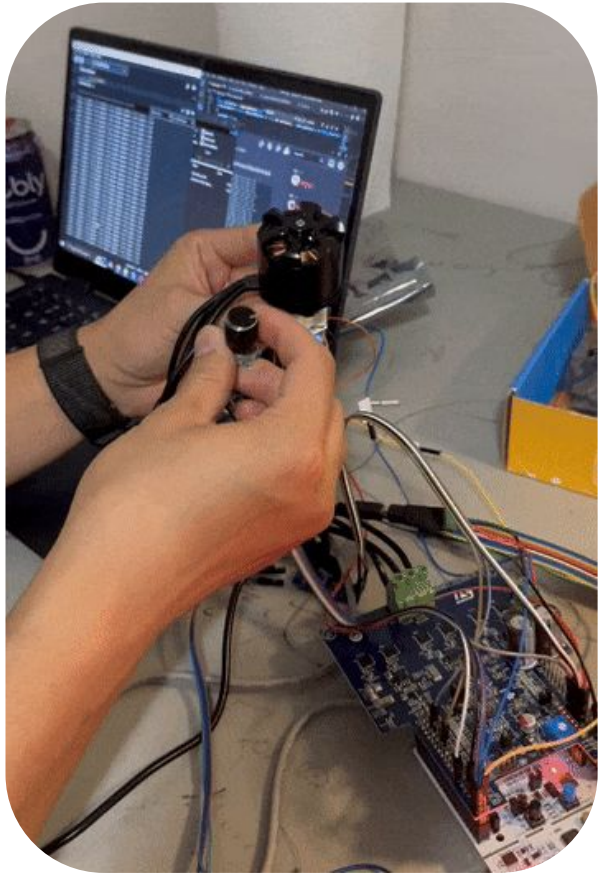


https://docs.simplefoc.com/velocity_loop

- Closed loop velocity control using magnetic angle sensor
- Torque limiting using phase currents
- 2ms (minimum) RTOS motor thread validated

Additional Sensing

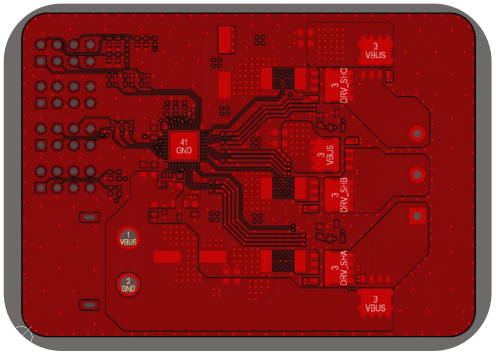
- Buttons for operator input
- Limit switches for triggering conveyor

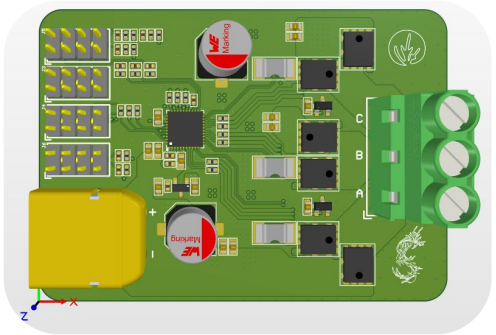


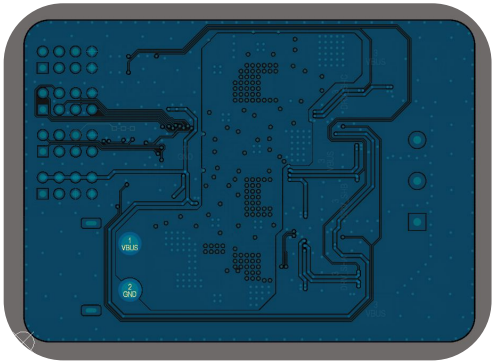
EE Updates: Motor Controller

- First set of motor controller boards designed, ordered
- ETA in 2 weeks for 2nd proto testing and implementation

PCB	PCB Prototype	$18.81	Salico Picker Motor Controll...
	Order #: Y7-3643804A	10pcs	Production Progress
	Build Time:3-4 days		
	Product Details		
Stencil	SMT Stencil	$7.11	Salico Picker Motor Controll...
	Order #: SO12411136063-364380...	1pcs	Data Preparation
	Build Time:1 day		
	Product Details		

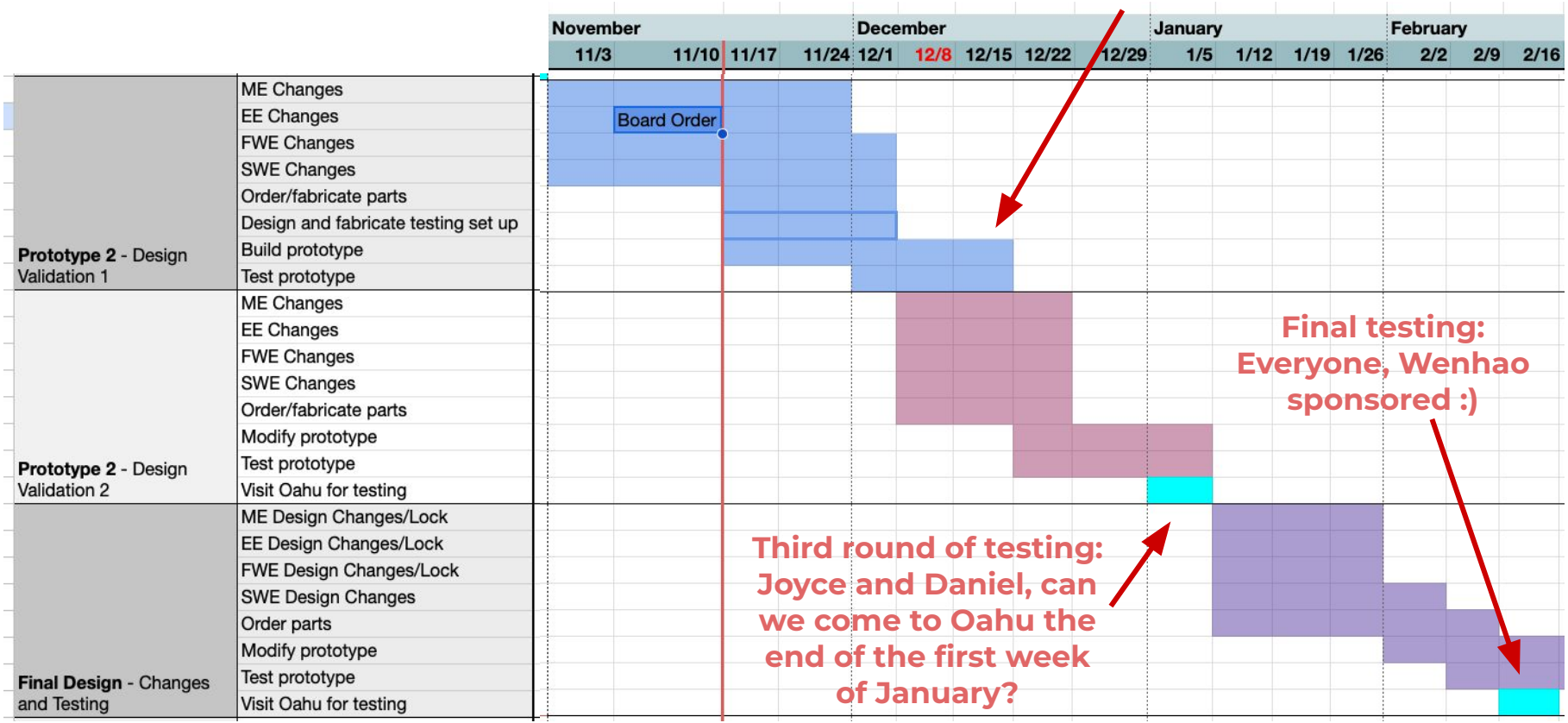






Next Steps & Travel Plans

Prototyping and one round of testing before the winter break



Funding

We have:

- $750 by default from the course
- $500 from Engineers of the Future Fund yay!

We are trying for:

- Calling sponsors for: pistons, aluminum extrusions, filament, PCBs, other hardware
- Applying to:
  - Gregory E Zinc (one award, valued at up to $3,000 for renewable energy)
  - Sustainability award (for projects that address one of the United Nations Sustainable Development Goals, $500-1000)
  - Norman Esch award (minimum of six awards, ranging in value from $5,000-$12,000 each for entrepreneurship)
- Hatch: putting together a deck with some of our work, renders, and photos

Thank you!