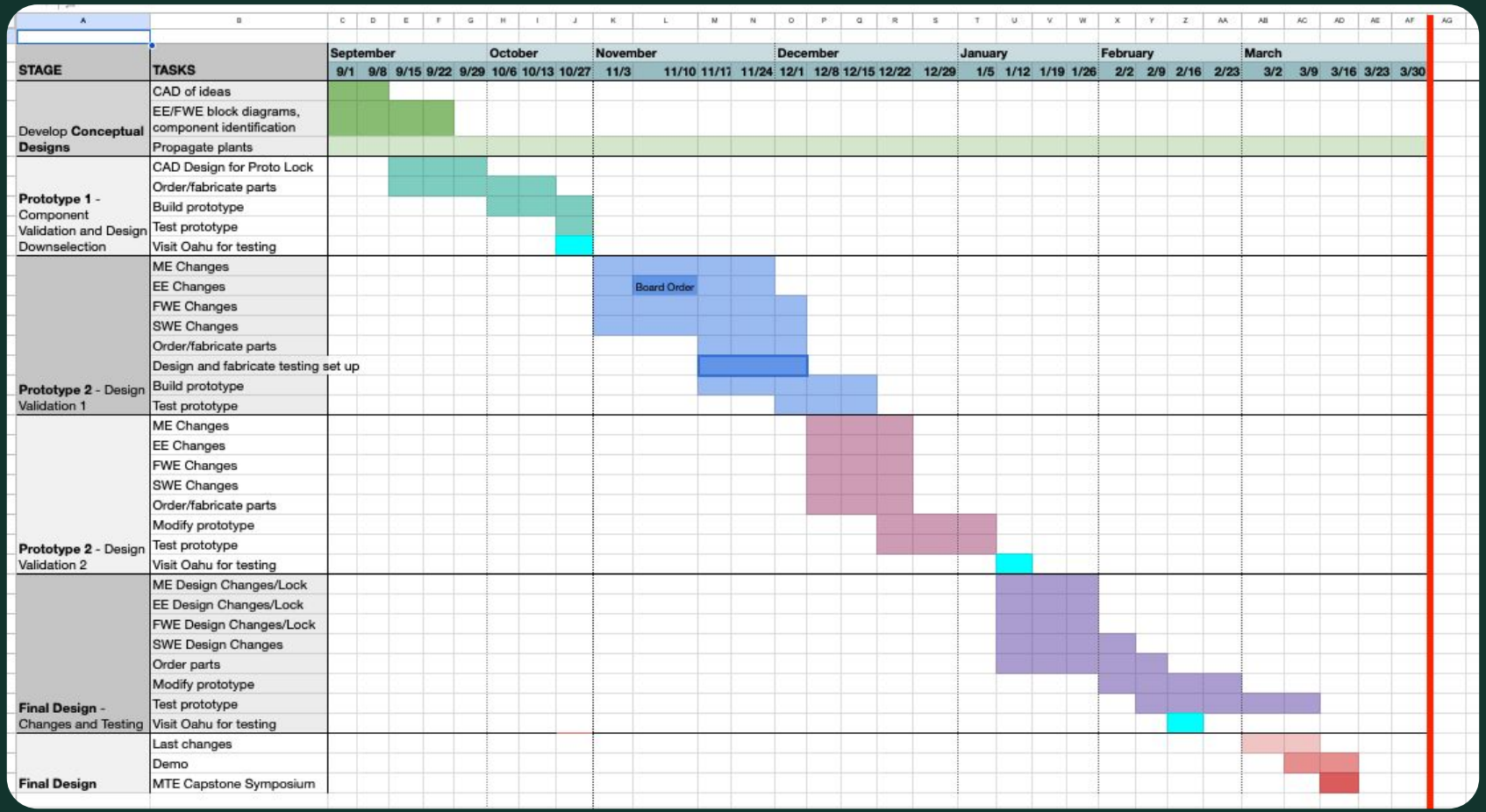
SALICO

Project Update

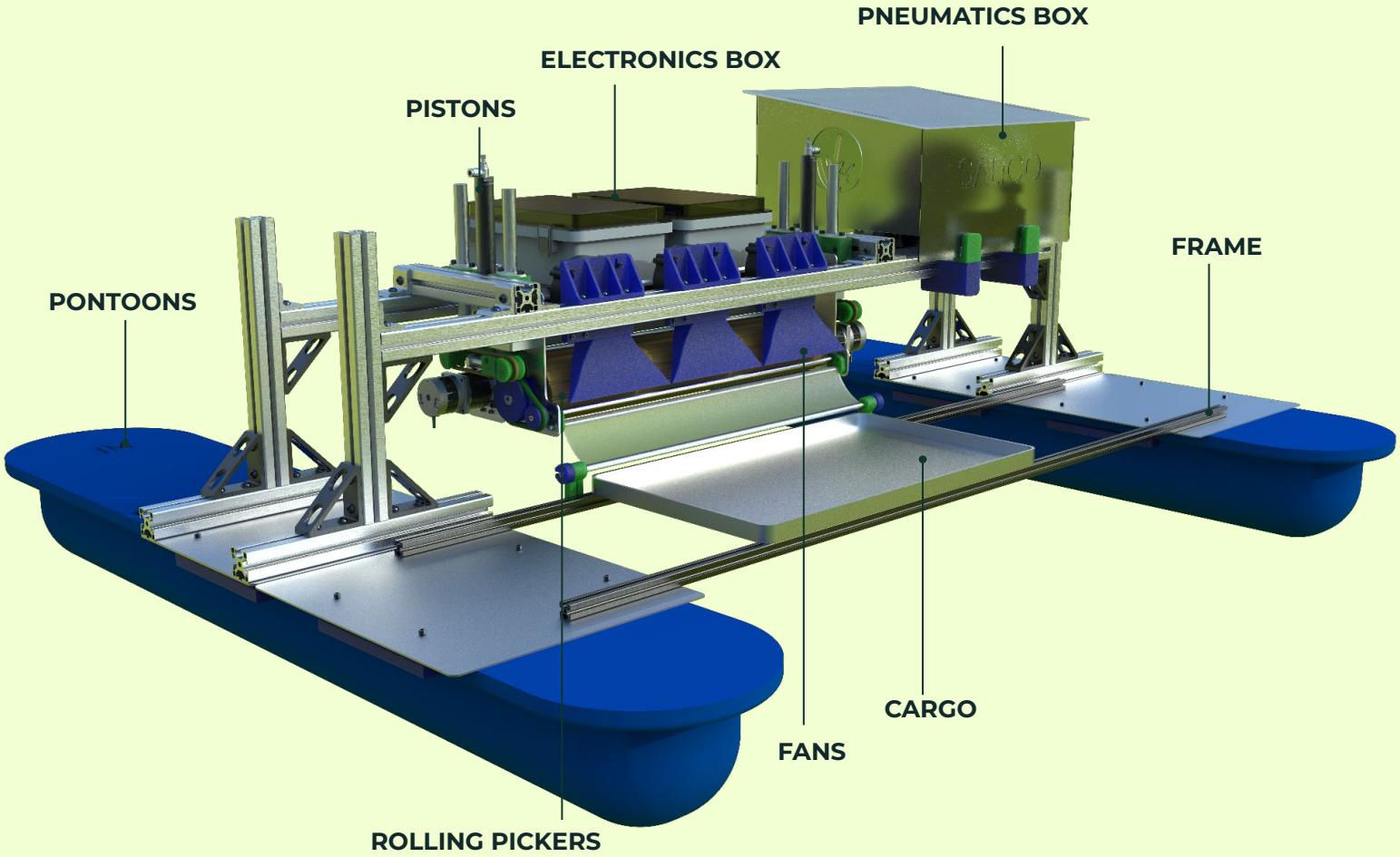
03.28.2025

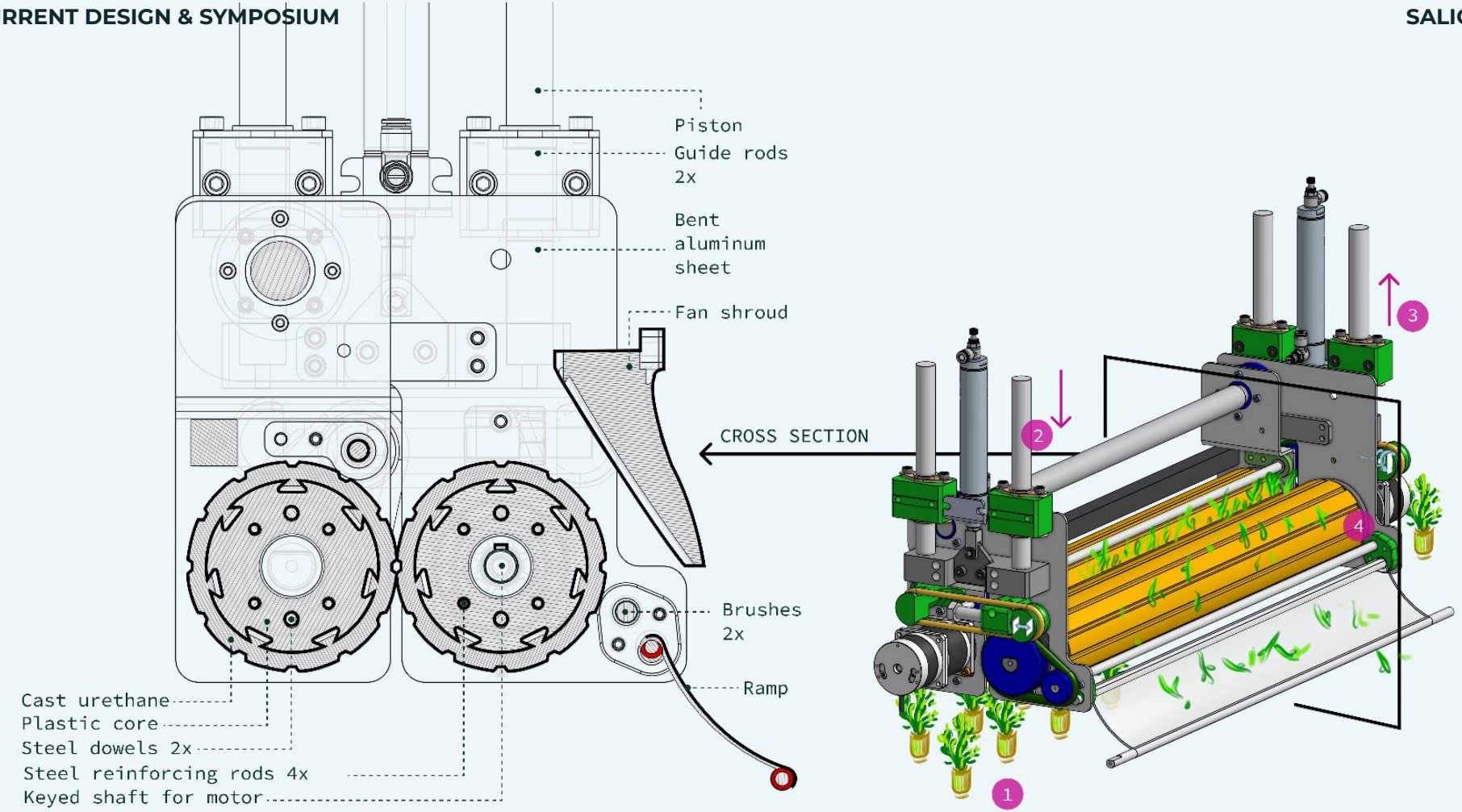

September
October
November
December
January
February
March
9/1 9/8 9/15 9/22 9/29 10/6 10/13 10/27 11/3 11/10 11/17 11/24 12/1 12/8 12/15 12/22 12/29 1/5 1/12 1/19 1/26 2/2 2/9 2/16 2/23 3/2 3/9 3/16 3/23 3/30
STAGE
TASKS
Develop Conceptual Designs
CAD of ideas
EE/FWE block diagrams, component identification
Propagate plants
Prototype 1 - Component Validation and Design Downselection
CAD Design for Proto Lock
Order/fabricate parts
Build prototype
Test prototype
Visit Oahu for testing
Prototype 2 - Design Validation 1
ME Changes
EE Changes
FWE Changes
SWE Changes
Order/fabricate parts
Design and fabricate testing set up
Build prototype
Test prototype
Board Order
Prototype 2 - Design Validation 2
ME Changes
EE Changes
FWE Changes
SWE Changes
Order/fabricate parts
Modify prototype
Test prototype
Visit Oahu for testing
Final Design - Changes and Testing
ME Design Changes/Lock
EE Design Changes/Lock
FWE Design Changes/Lock
SWE Design Changes
Order parts
Modify prototype
Test prototype
Visit Oahu for testing
Final Design
Last changes
Demo
MTE Capstone Symposium

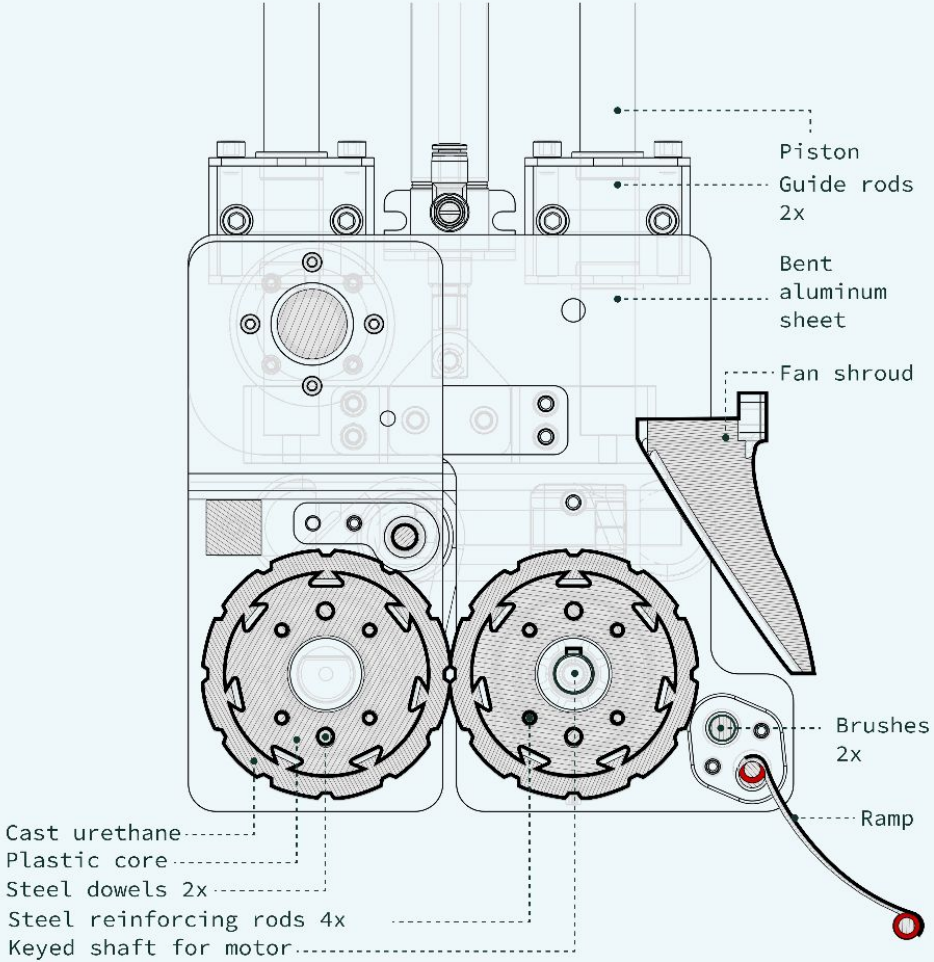
AGENDA

1. CURRENT DESIGN
2. SYMPOSIUM DAY
3. AWARDS AND FUNDING UPDATES
4. DESIGN RECOMMENDATIONS
5. CURRENT PLANS
6. FUTURE PLANS

CURRENT DESIGN


PNEUMATICS BOX
ELECTRONICS BOX
PISTONS
FRAME
PONTOONS
CARGO
FANS
ROLLING PICKERS


Piston
Guide rods
2x
Bent
aluminum
sheet
Fan shroud
CROSS SECTION
Brushes
2x
Ramp
Cast urethane
Plastic core
Steel dowels 2x
Steel reinforcing rods 4x
Keyed shaft for motor
1
2
3
4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sheet
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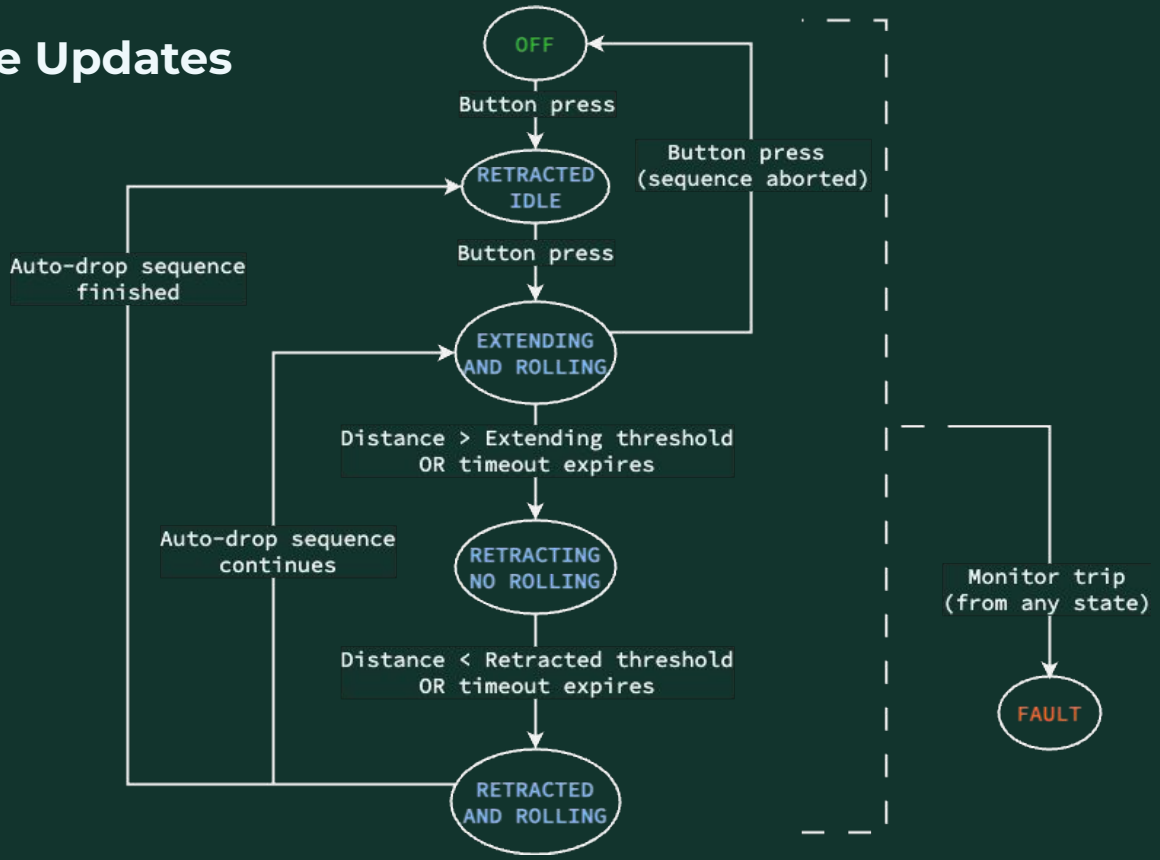
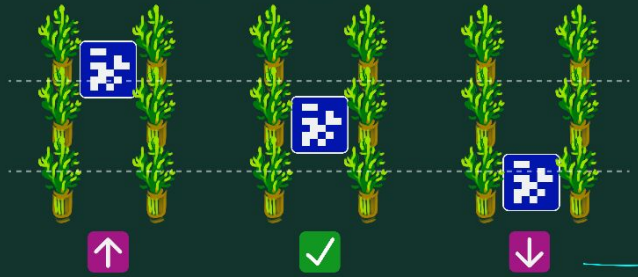
Brushes
2x
Ramp
Cast urethane
Plastic core
Steel dowels 2x
Steel reinforcing rods 4x
Keyed shaft for motor

State Machine Updates

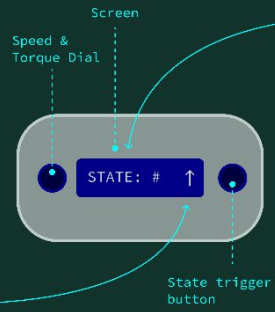


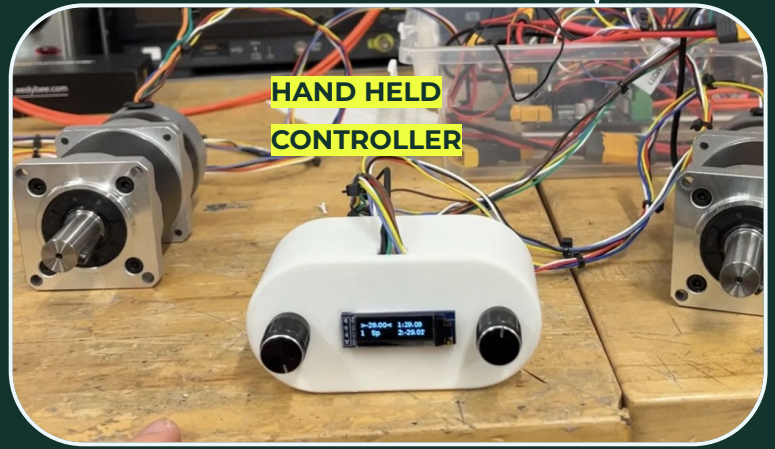
CAMERA VISION

- Used to **detect location** of each row of plants
- Correct positioning **indicates to operator** that robot is **aligned correctly**

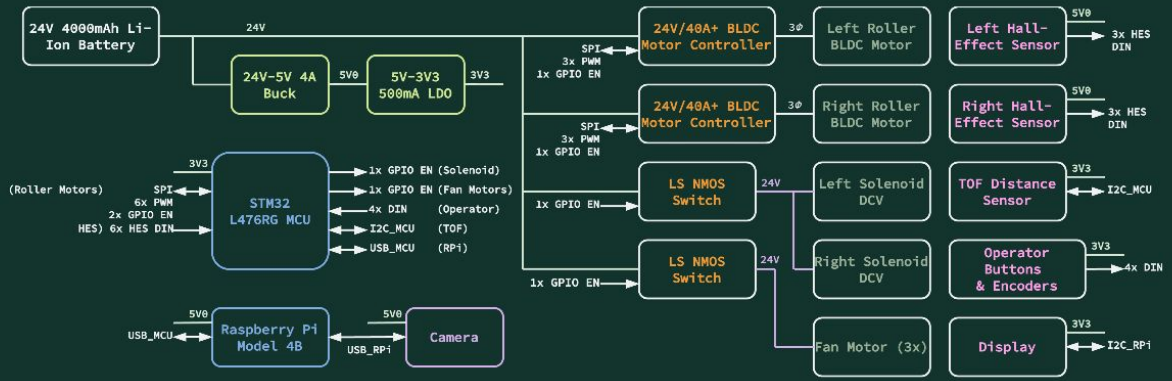


CONTROLLER

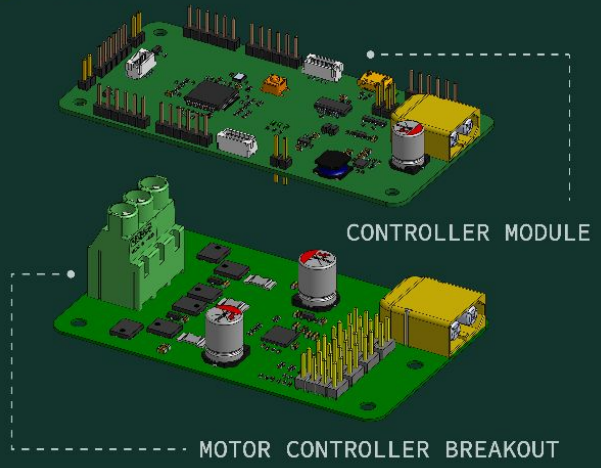




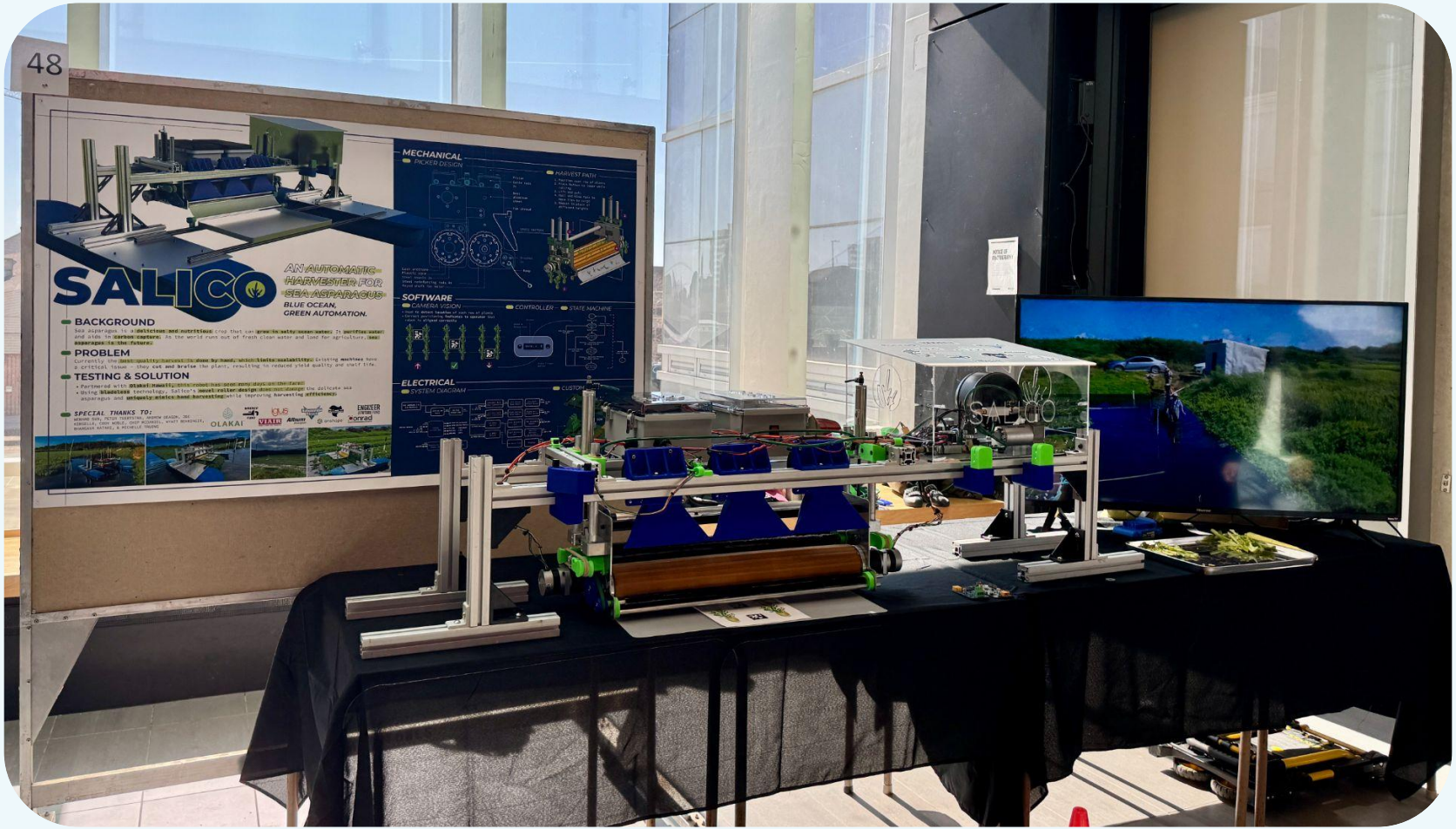
SYSTEM DIAGRAM

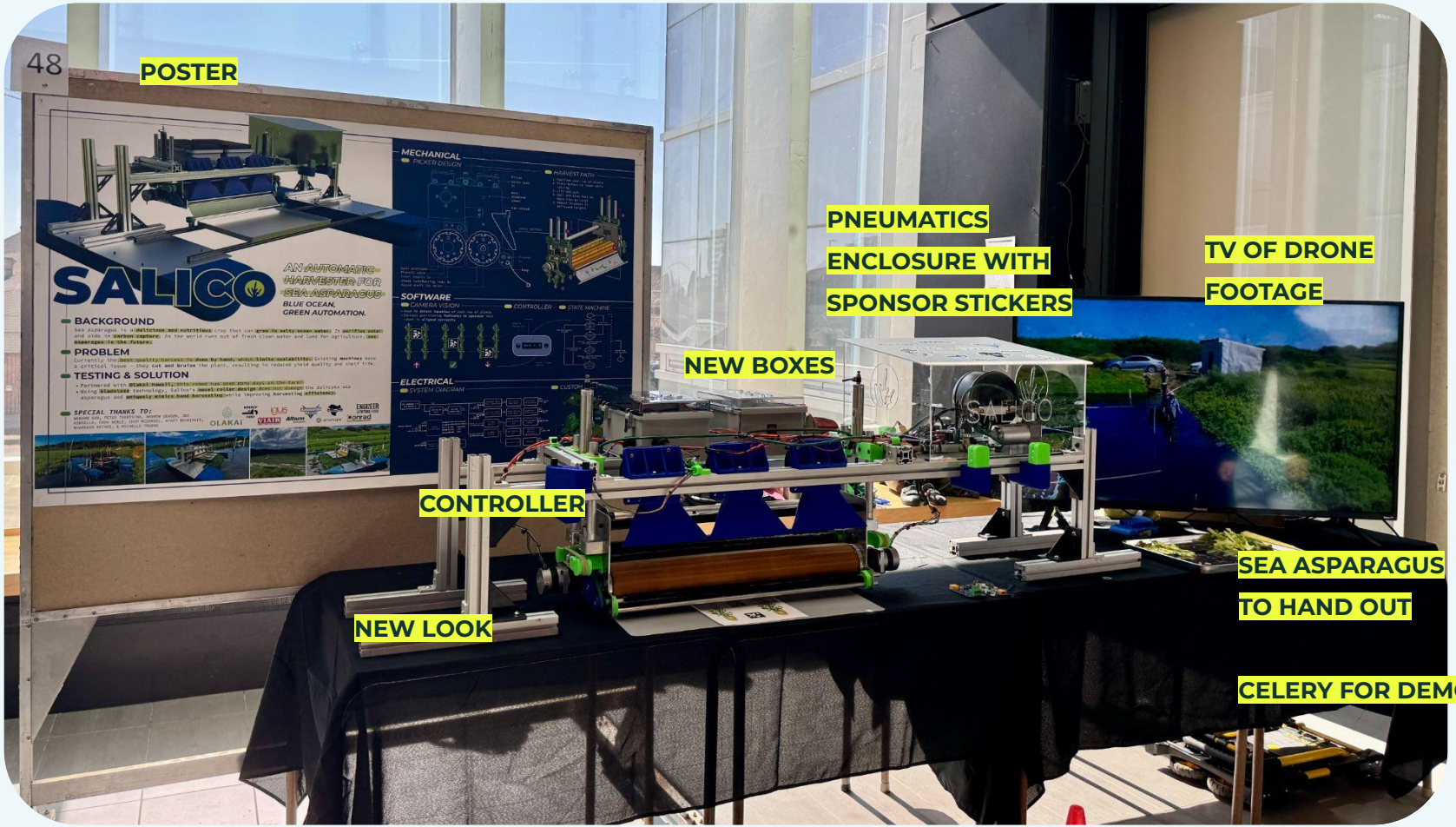


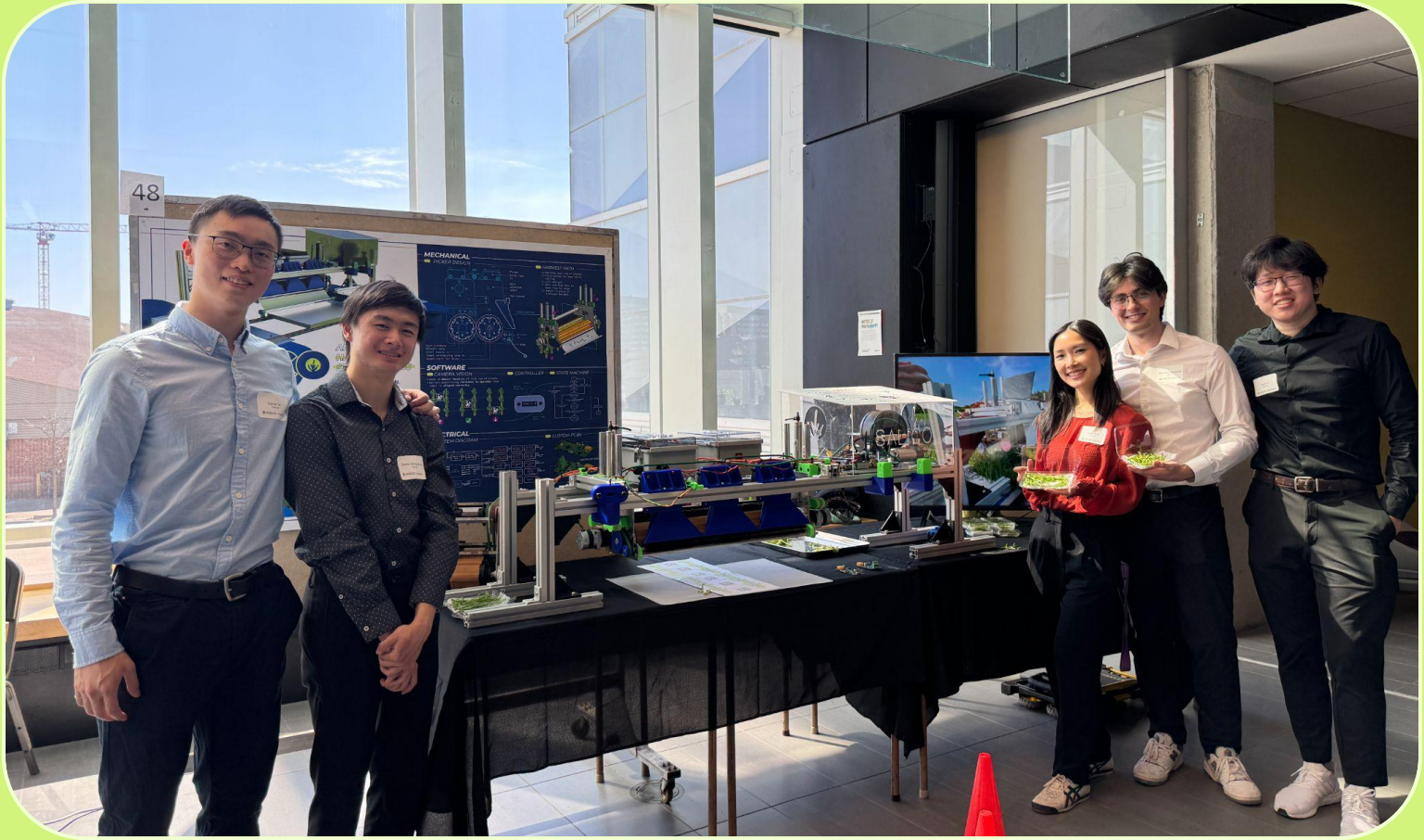
CUSTOM PCBS



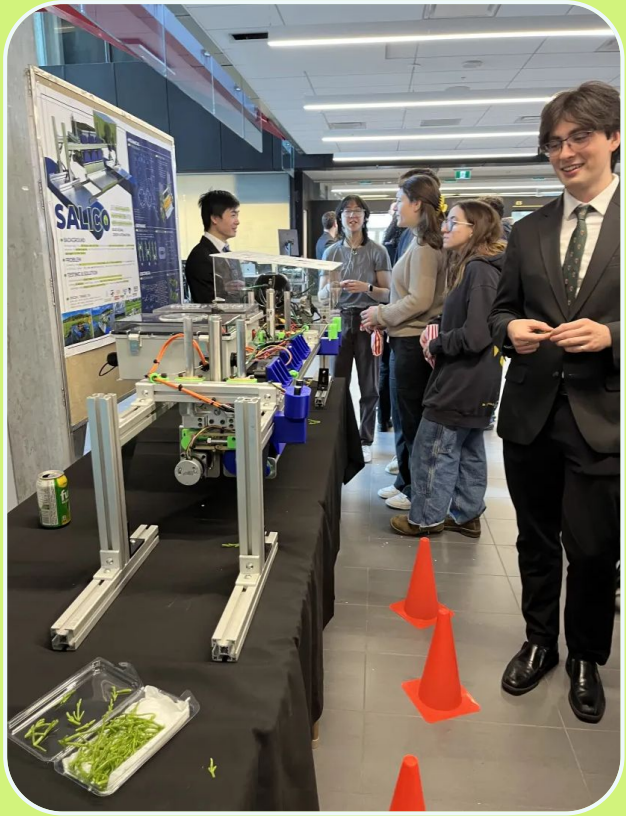
SYMPOSIUM DAY!

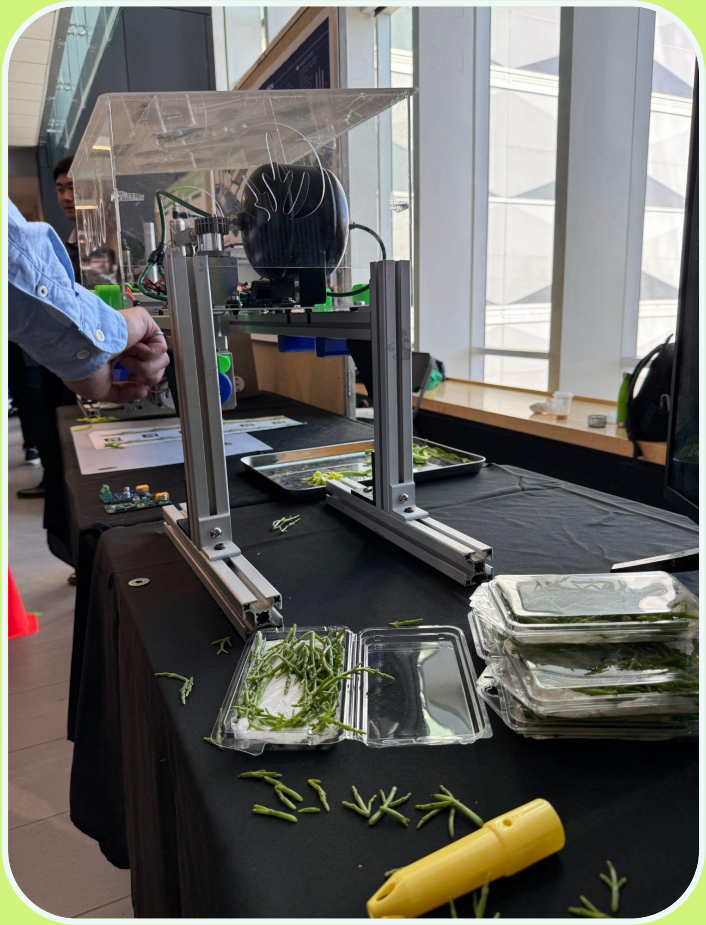

48
SALICO
AN AUTOMATIC HARVESTER FOR SEA ASPARAGUS
BLUE OCEAN, GREEN AUTOMATION.
BACKGROUND
PROBLEM
TESTING & SOLUTION
SPECIAL THANKS TO:
MECHANICAL
PICKER DESIGN
HARVEST PATH
SOFTWARE
CAMERA VISION
CONTROLLER
STATE MACHINE
ELECTRICAL
SYSTEM DIAGRAM
OLAKAI
SALICO


48
POSTER
SALICO
AN AUTOMATIC HARVESTER FOR SEA ASPARAGUS
BLUE OCEAN, GREEN AUTOMATION.
BACKGROUND
PROBLEM
TESTING & SOLUTION
SPECIAL THANKS TO:
MECHANICAL
PICKER DESIGN
HARVEST PATH
SOFTWARE
CAMERA VISION
CONTROLLER
STATE MACHINE
ELECTRICAL
SYSTEM DIAGRAM
PNEUMATICS
ENCLOSURE WITH
SPONSOR STICKERS
TV OF DRONE
FOOTAGE
NEW BOXES
CONTROLLER
NEW LOOK
SEA ASPARAGUS
TO HAND OUT
CELERY FOR DEMO


48
MECHANICAL
SOFTWARE

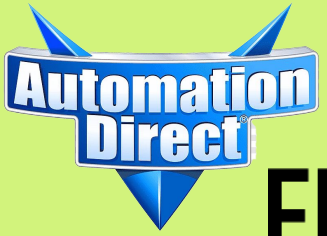

48
SALICO
MECHANICAL
HARVEST PATH
SOFTWARE
BACKGROUND
PROBLEM
TESTING & SOLUTION

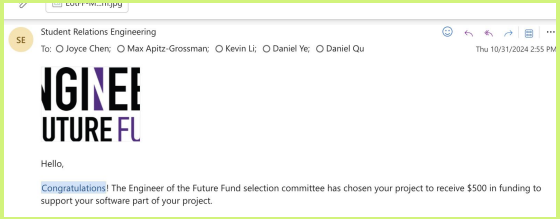

SALICO

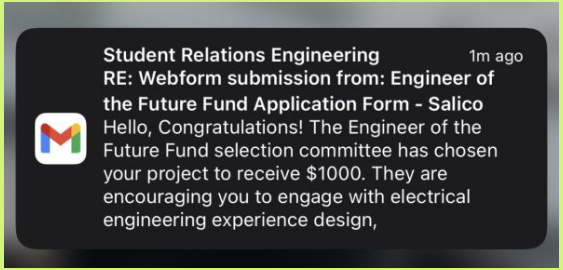


AWARDS & FUNDING!

Partners so far...

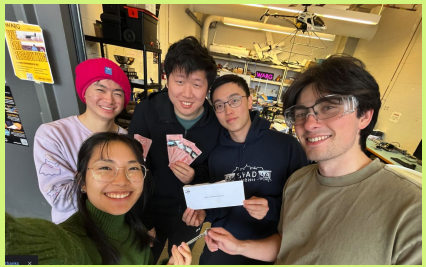






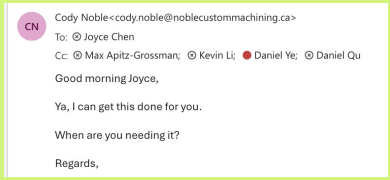
ENGINEER OF THE FUTURE FUND

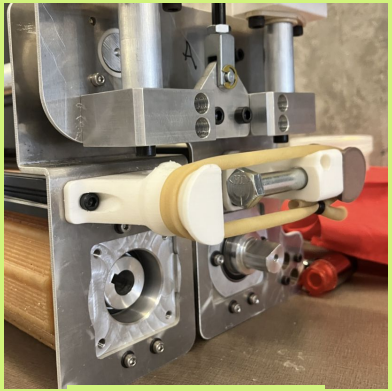
- $1500



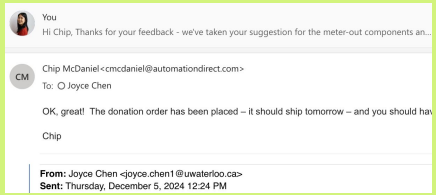
WRENCH FUND

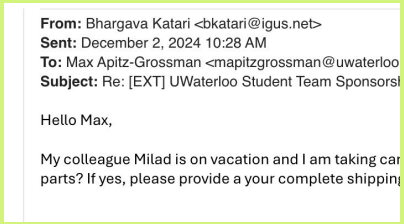
- $300

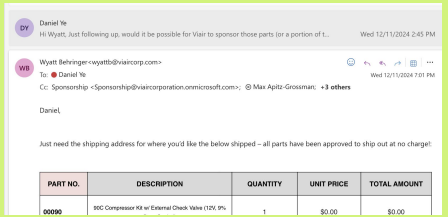




NCM INCORPORATED







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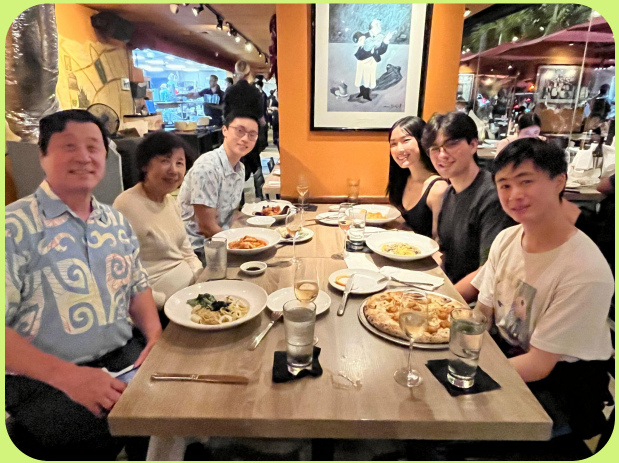


OLAKAI - $7176

NORMAN ESCH PITCH COMPETITION

PITCH COMPETITION FINALIST - $5000

PEOPLE'S CHOICE AWARD - $4500

BEST OVERALL PROJECT - DYSON HEADSETS

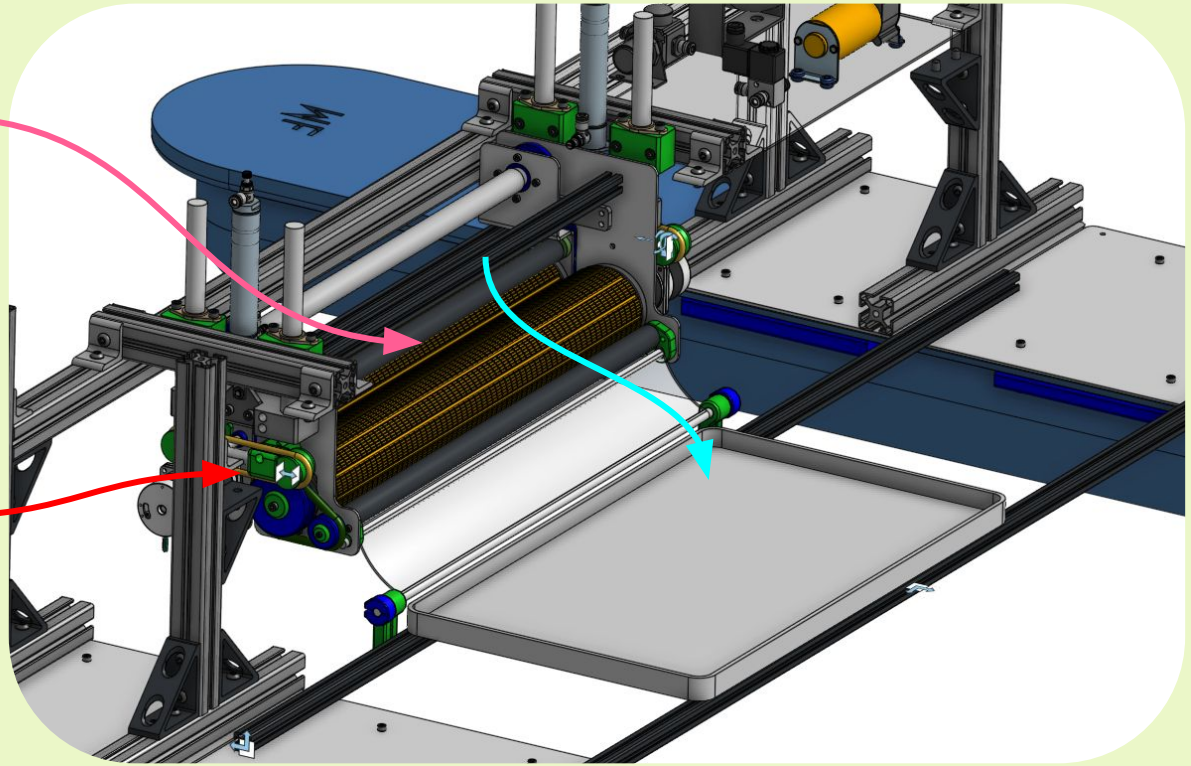
Budget Category	Budget Amount (CAD)	Amount Spent (CAD)	Amount Remaining (CAD)
Hardware parts	$4,000.00	$4,359.75	-$359.75
Software fees	$0.00	$0.00	$0.00
Operational items	$1,000.00	$658.46	$341.54
Travel fees	$7,000.00	$11,197.26	-$4,197.26
Total	$12,000.00	$16,215.47	-$4,215.47
Funding - MTE481 (Split)	-	$750.00	-
Funding - Engineer of the Future Fund (Split)	-	$1,500	-
Funding - Wrench Fund (Received by Joyce)		$300	
Funding - Wenhao <3 (Received by Daniel Ye)		$7,175.32	
Funding - Norman Esch (**PENDING**)		$9,500	
Remaining Total	-	-$3,009.85	-

YAY!

DESIGN RECOMMENDATIONS

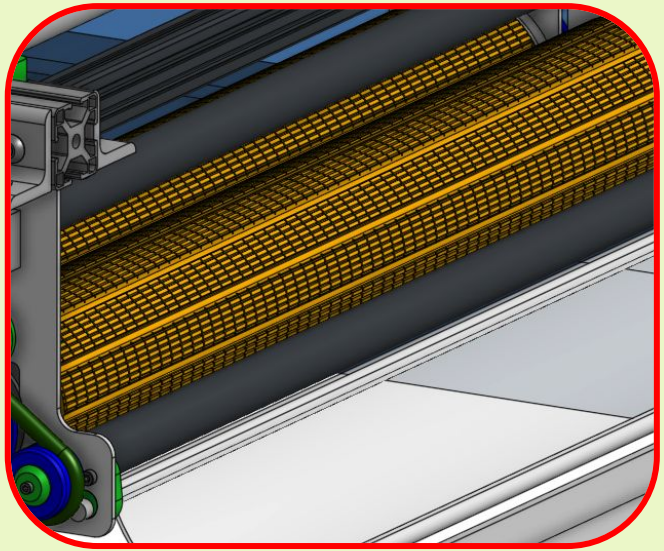
WHAT WORKED WELL:

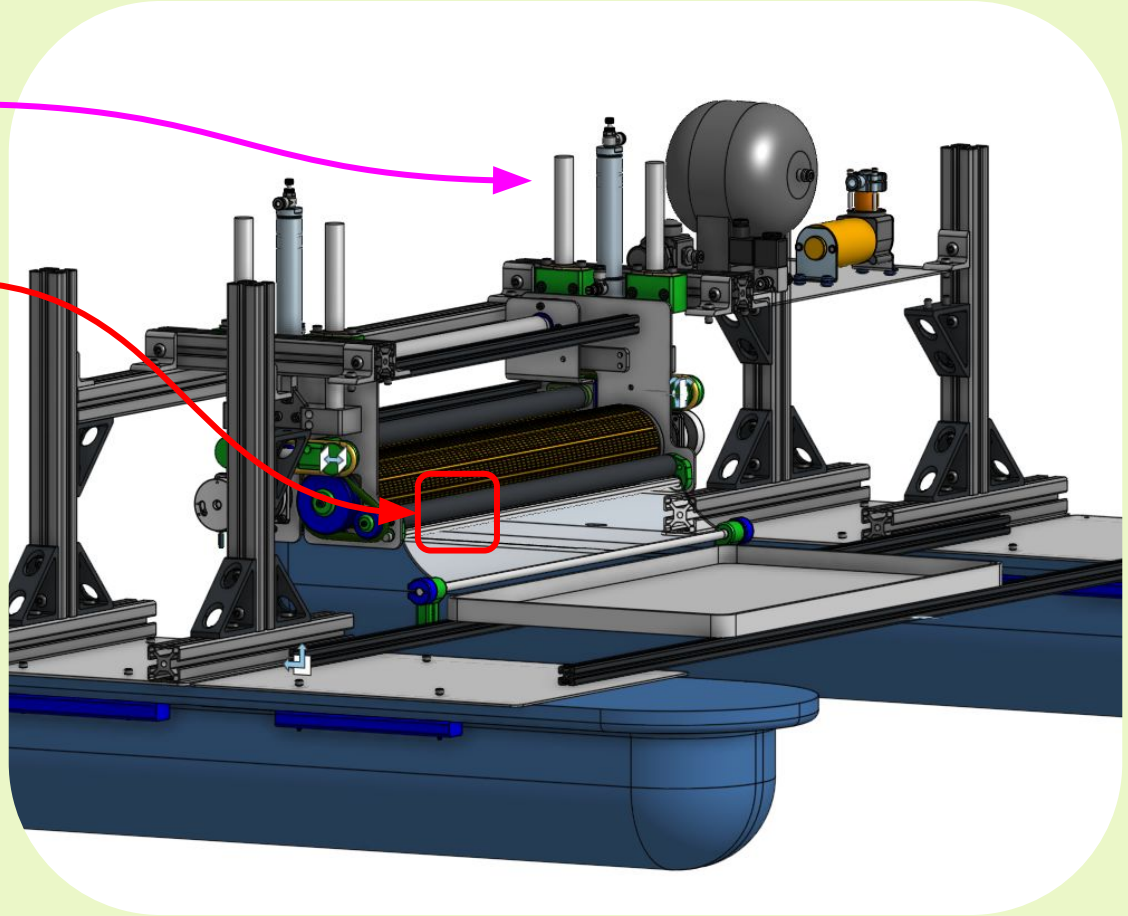
1. Picking 4 plants at a time.
2. Good grip and rigidity.
3. Brush system accurately directed tips.
4. Everything floated well on the ponds.
5. Pneumatics were strong & fast.
6. Pulleys never slipped.



RECOMMENDATIONS:

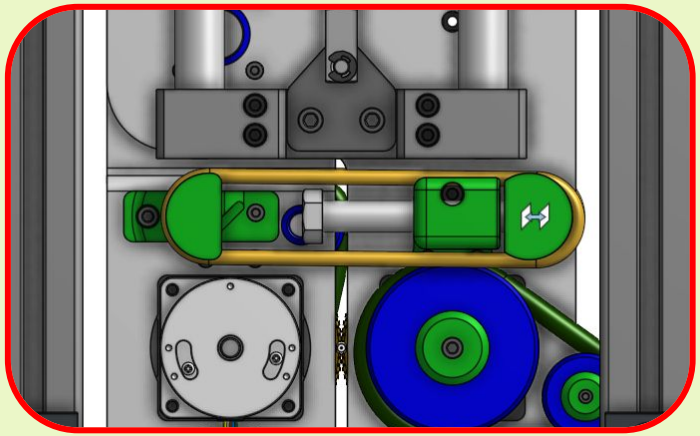
- Improve **pneumatic** system more **precise** & consistent. The piston and rods are too sensitive.
- Tune **brush-ramp connection**.

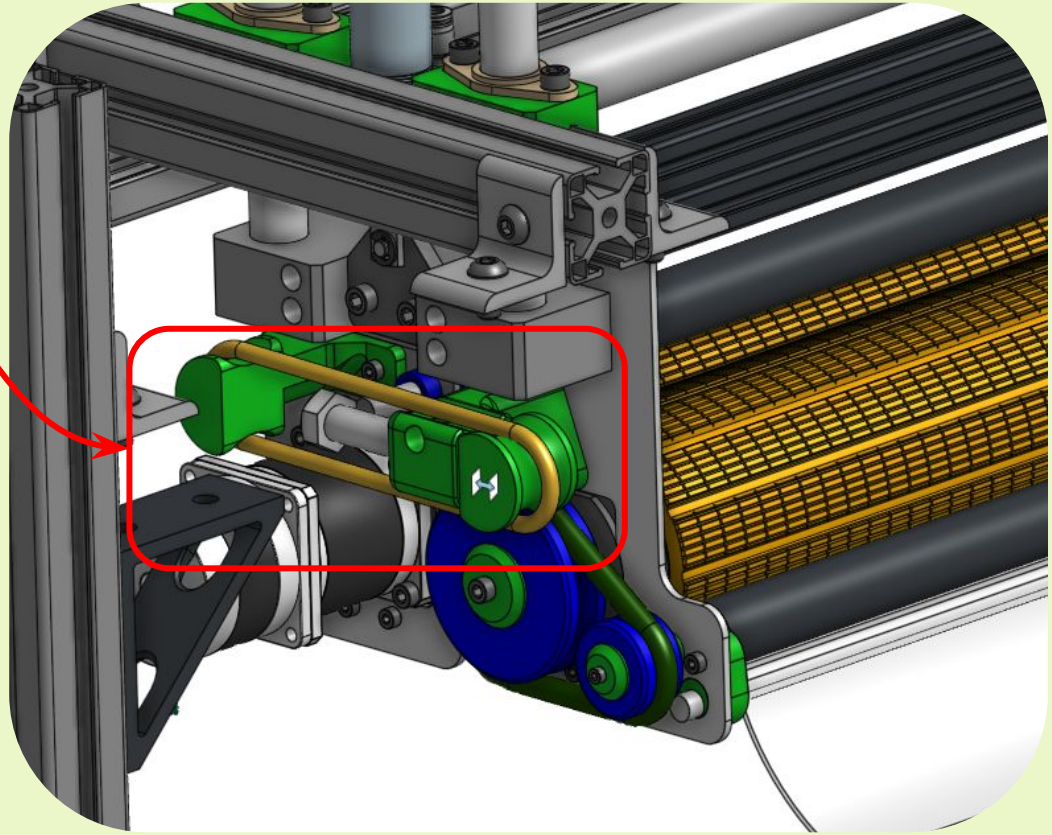




RECOMMENDATIONS:

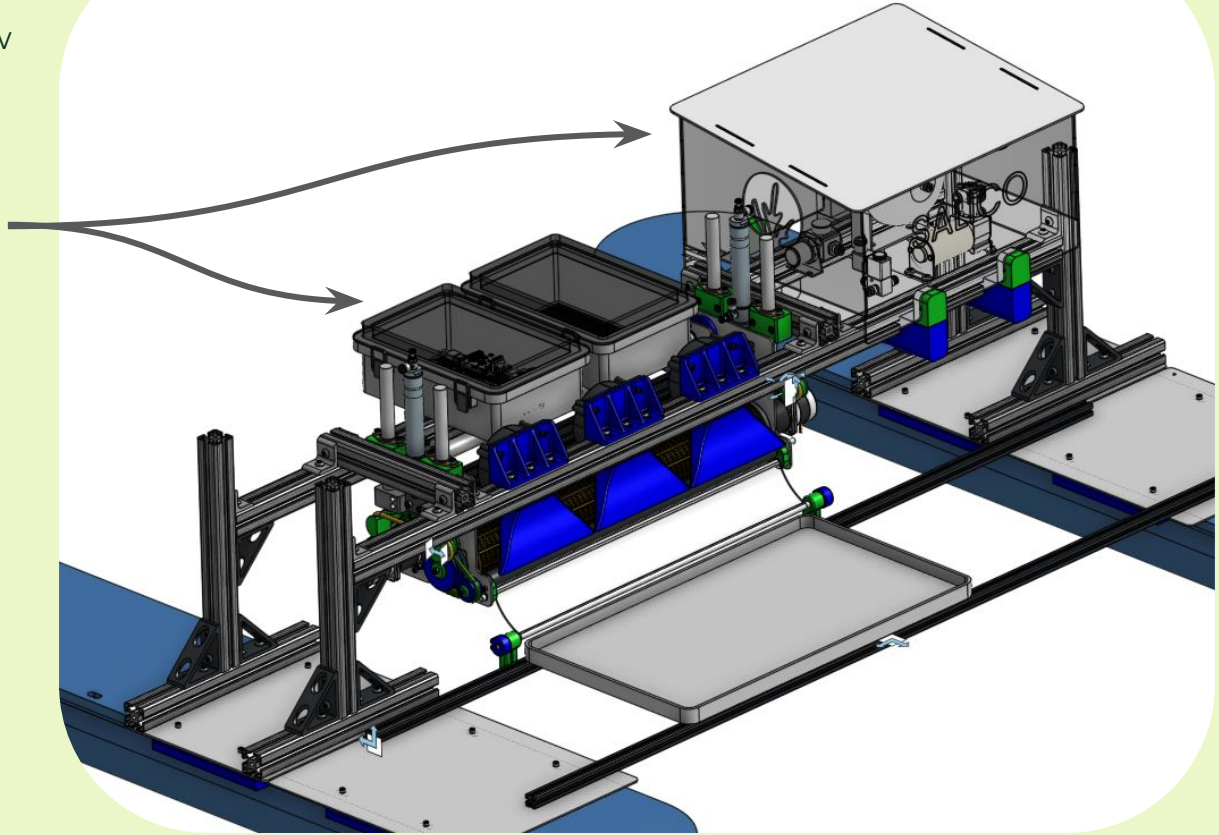
- The assembly is very **bulky** and **hard to handle**, ideally should be robust and **user friendly**.
- The tension **spring** should be constant force or electronically **adjustable**.





RECOMMENDATIONS:

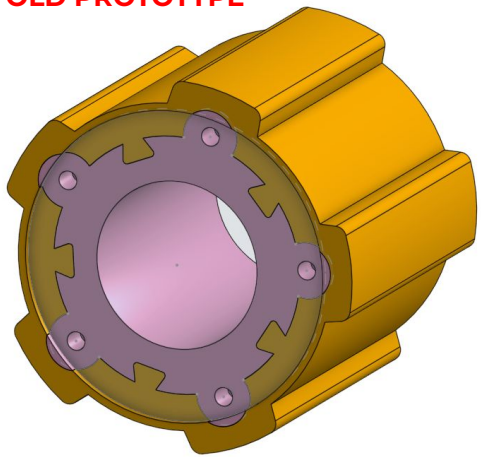
- Reduce the number of screw sizes used. **Simplify** the **assembly**.
- Make the **covers to weatherproof the system**.

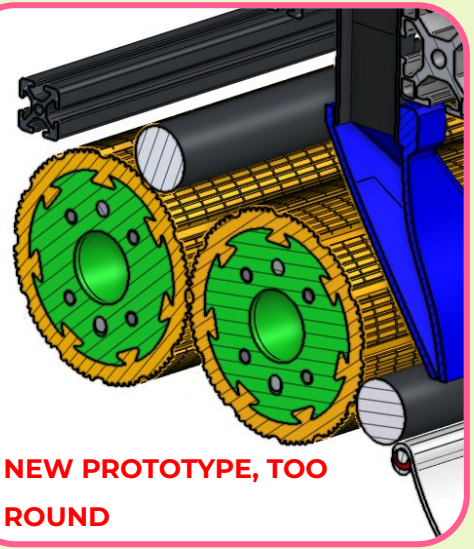


RECOMMENDATIONS:

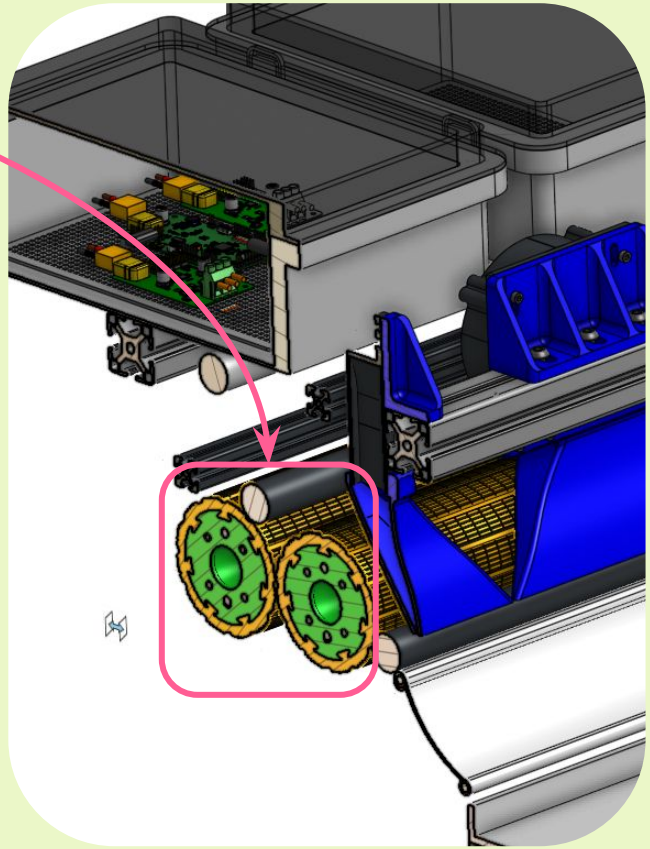
- **Roller geometry** should be more gear-like.
    - More experimenting with shapes is required

OLD PROTOTYPE

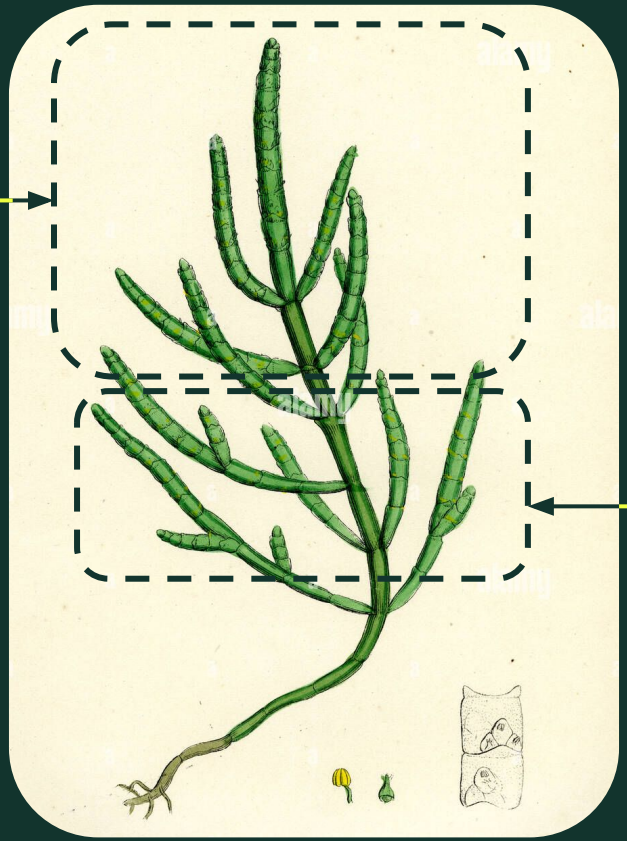




NEW PROTOTYPE, TOO ROUND



PICKED

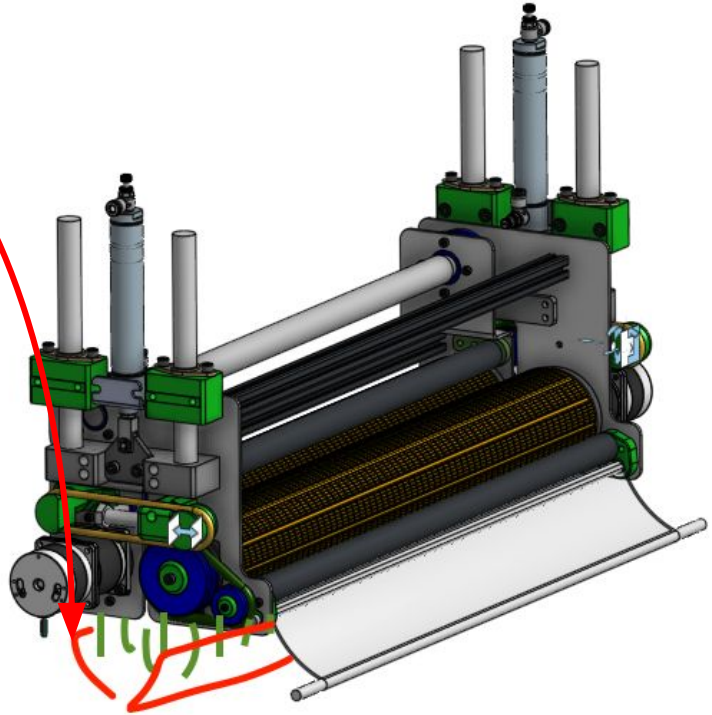


MISSED

RECOMMENDATIONS:

- Try smaller rollers
- Add tusk-like system to prop up plants and hold them down.
- **Cones** still need improvements to stop them from being pulled up.

HOLD DOWN THE CONE



HOLD UP THE PLANTS

A combination of the **roller geometry** & **brush ramp connection** problems caused many harvested tips to never make it to the ramp. (It was better using the new harvest procedure)

Entire robot is **unwieldy, hard to handle**. A redesign could be more robust, light, and user friendly.

The **cones** still kept being **pulled up**. We ended up working on directly planted roots.

Pneumatics and electronics still need proper **enclosures, covers, and sound damping**

WHAT WORKED WELL:

1. BLDC motor controllers work reliably across the wide range of RPM and bus voltage.
2. Pneumatic relay circuit with hysteresis works reliably cycling between 85-105 psi.
3. Bus power harnessing with rugged connector interfaces (XTs) demonstrated robustness against vibration and weathering.
4. Source-side protection circuits such as BMS (RCP, OVP, UVP, etc.), fuse, and toggle switch were effective for minimizing propagation of electrical failure across subsystems.

RECOMMENDATIONS:

1. Improve isolation between motor phases and sensitive digital/analog interfaces.
2. Design and implement a system-tailored controller module to reduce harness complexity, improve harness reliability, and minimize form-factor of sub-circuits.
3. Implement load-side protection circuitry (RPP, RCP, OVP, UVP, etc.) to reduce propagation of electrical failure.
4. Use environmentally-tolerant harness termination for digital/analog interfaces with mechanical enclosures.

WHAT WORKED WELL:

1. Closed-loop speed control of motors with torque limiting
2. Clear operation states with easily adjustable timings
3. Operator controller interface was easy to use

RECOMMENDATIONS:

1. Improved sensing on up/down piston motion for more effective automated picking
2. Adjustable roller speed control based on piston drop speed
3. More reliable controller interface (debounce buttons and fix screen issues)
4. More reliable monitoring interface to ensure correct fault detection for safe operation

BLUE **OCEAN**,
GREEN **AUTOMATION**.

THANK YOU