

1. B

# CYSF LOGBOOK

-2024-25-

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Wed, Sept. 13/2024

On this day, we started to think about what our project should be about. Some examples of the things we thought about was CARBON CAPTURE, WAYS TO HELP WITH DROUGHT and REFORESTATION WITH THE HELP OF DRONES. As you could see, all of our ideas were based on our interests which were biology, and environmental nature based.

Out of all of these ideas we landed on 2 main: CARBON CAPTURE & REFORESTATION. At the end, we decided on Reforestation with the help of drones.

Thurs, Sept. 19/2024

Today we came up with the big question: "CAN DRONE TECHNOLOGY BE USED FOR THE REFORESTATION OF TREES?"

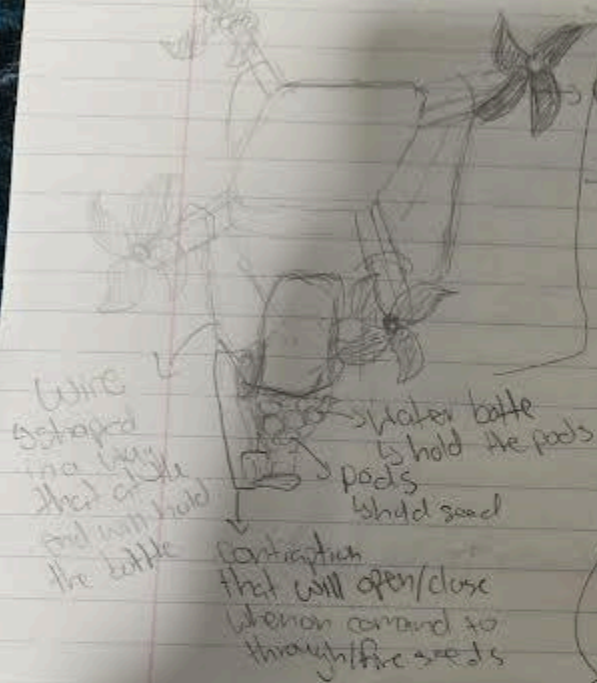
We then came up with our guiding questions.

Sat, Sept. 28/2024.

On this day, we started to do brief research, and start to plan how we want to build the drone.

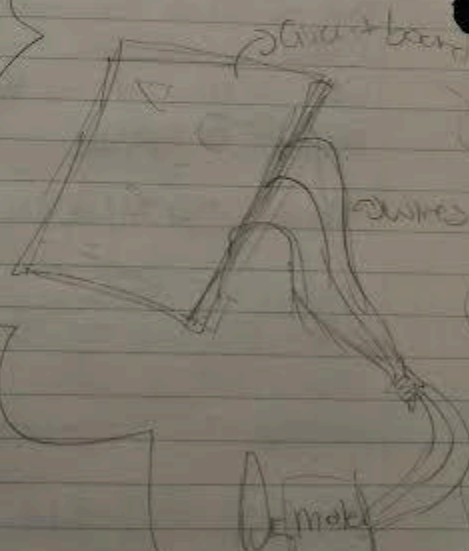
Tue, Oct 1 / 2024

Today, we really started to dig deeper and focus on our design. This is what we came up with:



→ going to buy a drone from Amazon or any other website

OPEN/CLOSE CONTRACTION/SYSTEM



wed, oct. 2 / 2024

Today we really started to deeply think about  
how our project is going to look like. We  
are doing an innovative project so this is the basic  
layout of what/when we are going to do things.

### PROBLEM:

- problem - hypothesis
- questions

### METHOD:

- Research
- how to build the drone/machine

### ANALYSIS:

Speed of how many it can plant?

Falling speed of the pod.

Success rate of germination

number of pods per unit of time

germination  
type of seed  
to pods

### CONCLUSIONS:

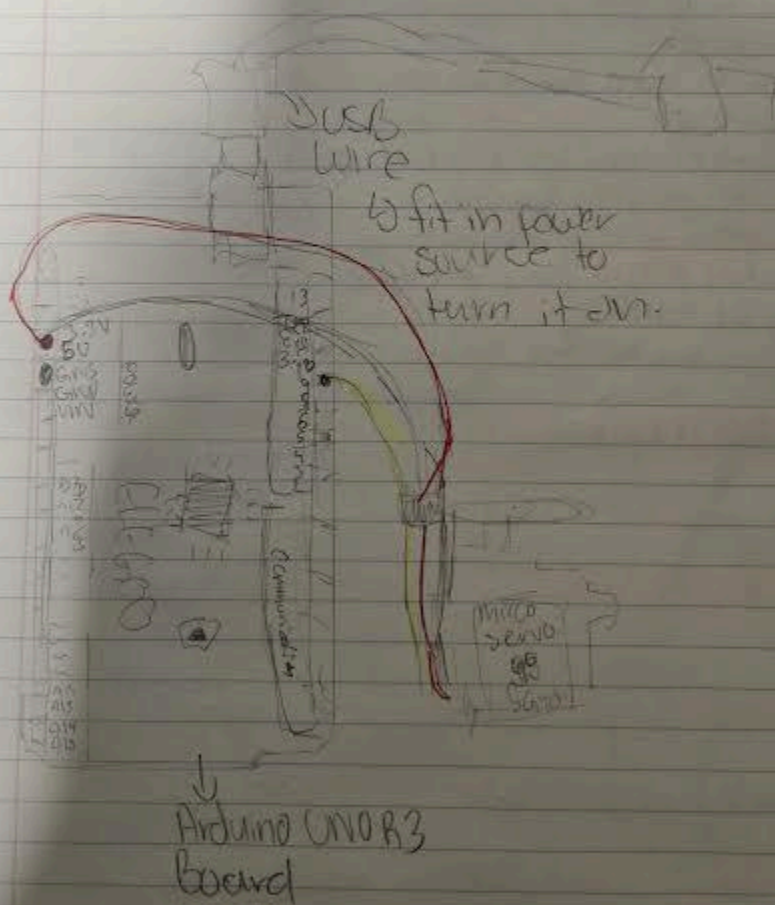
- answers to the problems
- Does drone technology actually help with reforestation?

### APPLICATION:



Sat, Oct 5/2024

Today, Numa Research in depth and found  
a servo motor called an Arduino Sweep. It is a  
servo that rotates a servo motor some number  
of degrees with an infinite loop. Today, Numa  
built the first attempt of the Arduino board.  
This is how it looked like:



Mon Oct 7/2024

Today, Dominick and Iannick both started to work on deeply researching. Here are all of the topics/questions that we covered today:

### DEFORESTATION IN CANADA:

- happens because of things like agriculture and wood furniture industries and paper industries

### REFORESTATION IN CANADA:

- A company called "TREES CANADA"
- reasons why reforestation is important
  - ↳ Biodiversity ↑
  - ↳ Habitat improving
  - ↳ Oxygen increase

### WHAT IS CO<sub>2</sub> CAPTURE/CSS?

- process in which CO<sub>2</sub> is directly captured from the air.
- Trees do this through a process called photosynthesis.

### HOW MUCH CO<sub>2</sub> DO TREES CAPTURE?

- About 10-40 kg per year
- 2.3 kg - 0.83 kg per year
- This is affected by things
  - species of trees
  - Environmental conditions
  - disturbances

HOW DOES THIS IMPACT CO<sub>2</sub> change?

- carbon cycle

- trees release CO<sub>2</sub>, but they capture more than they release.

Tue, Oct. 8/2024

Today, we continued to research. This is a brief overview of what we researched.

ARE WE PLANTING TREES AS FAST AS WE ARE LOSING THEM?

- yes because many people donate money to help organisations

- every year humans plant 1.83 million trees

WHAT ARE SEED FIRING DRONES?

- Drones that fire seeds to help with reforestation

HOW DO DRONES HELP REFORESTATION?

- they plant trees to help with reforestation

- this decreases climate change

WHAT ARE THE PODS MADE OUT OF?

- waste biomass

- any biodegradable things



Tue Oct 15 / 2024

Today, we did the method. Here is a list of things we did.

### Materials:

- Added images of the materials needed to build the circuit.
- (Arduino Board, Servomotor, Hook-up wires)

### Procedure:

- Added images of how to build the basic circuit.

### Code:

- Added the code that we used to program the circuit

Mon, Oct 21 / 2024

### Procedure:

- Added Second step.
- Use the Software Program "AROUND IDE" to add the code onto the board.

Fri Oct 18/2024

Today we were looking at the water bottle that we will be using as a container for the seed dropping mechanism. This is the water bottle that we decided on:

- FIJI WATER BOTTLE

This is because these water bottles are more heavy duty. This will make them stronger and better for our prototype.

OR

We could also use some sort of rock or small pipe that will fit perfectly with the circumference of the pod.

### POD MEASUREMENTS:



→ Image of pod

Diameter:  
0.6 inch

Radius:  
0.3 inch

Circumference =  $2\pi r$

1.884

$$2 \times 3.14 (0.3)$$

$$2 \times 3.14 \times 0.3 = \frac{1884}{1000} = 1.884$$

Circumference is 1.884 inch. This should be about the circumference of the pipe.



Sun Oct. 27/2024

## Designing the pod

### 1. pod structure:

- shape: spherical round shape (help evenly distribute impact)

### 2. Seed compartment:

- to hold seed in place could be made out of mesh or other fabrics.
- it could also hold the nutrients needed for the survival of the seed (nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, etc)

### 3. MCC Layer

- add it to the outside.
- make sure there is room for oxygen/air to flow through

OR

The outside layer be bi-waste. This can be pulp.

Mon, Oct. 28/2024

Going with idea #2.

We are going to make pulp:

- Blueberries (phosphorus)
- Banana peel (nitrogen) (potassium)
- Orange peels (nitrogen) (potassium) (calcium)
- Avocados (magnesium) (sulfur)
- Pinks (sulfur)

## Application

- how larger surfaces could use the space to help our pod production

Tested out how the pods would be like if we used pulp. We shaped them & put it into the fridge.



The seed structure was mostly green with the specks of orange peel.

Sat, Nov, 2/2024

Today, we created the actual pod that we will be using. We inserted pine tree seeds right in the center.

Here is a diagram to show how they looked like:



→ 0.6 inch in diameter  
↳ purple/brown/black

Sun, Nov, 3/2024

Pod proportions:

Total weight: 83g  
 Avocado: 8g → 9.6%  
 Orange: 15g → 18.07%  
 Banana: 36g → 43.3%  
 Kiwi: 10g → 12.04%  
 Blueberries: 14g → 16.8%

2 Avocado  
 15 pulp

Mon, Nov 4/2024

- Today we wanted to add a clay layer to the outside of it.

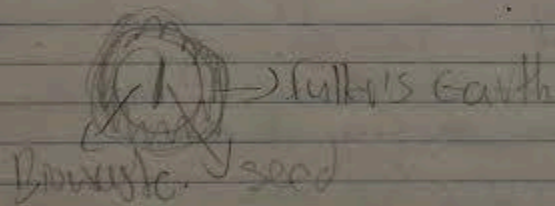
- we chose Multani mitti (Fuller's earth) as it contains many minerals/nutrients like MAGNESIUM, CHLORIDE, CALCIUM, BENTONITE (True Remedies - Health Benefits of Multani Mitti)

Tue, Nov 5/2024

- Today, we were sent the links for the EXSR PLATFORM.

- We added the basic project info.

- Also, we created the final pod.  
Here is a diagram



- 2 cups of Mitti (green pods for covering)
- 1 cup of water pods



Nov 5, - Nov 17.

In this period of time, we focused on refining the main shut mechanism.

- searched up ideas on how the larger companies make shut the mechanism.  
(unfortunately found no information.)
- searched up ideas on shut S.P.T.

→ got idea  
use servo motor, by IR sensors to open & close latch over long periods of time.

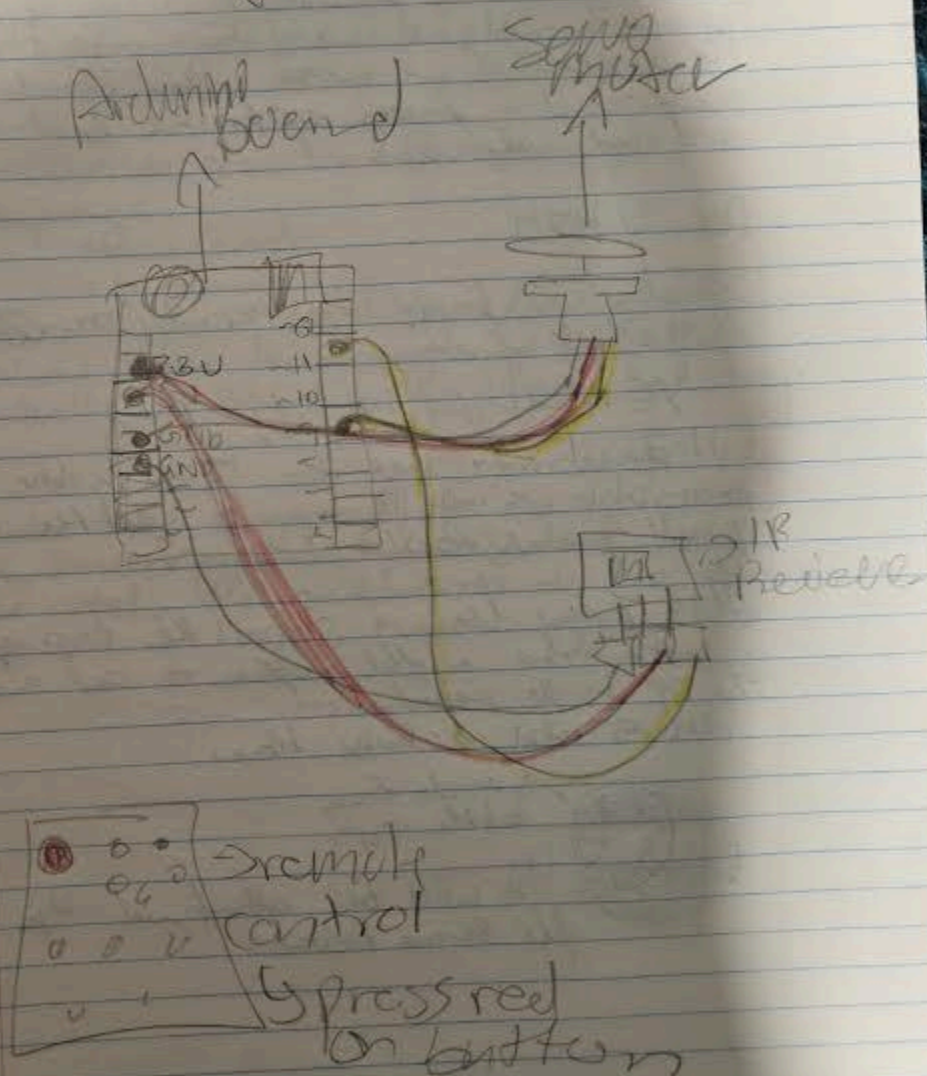
Nov. 17

- Nauri built the newest version of mechanism to try it out.

SUCCESS

Nov. 19/2024

Here is a diagram to show how it looks.



Nov. 21/2024

Today, we were starting to shift air sensors from building to building.  
In other words we were trying to find the drone that we were using. Today we found a few options but they are not official.

Dec. 3/2024

Today, we bought the newly made drone off of amazon.

YEAHHH!!!!

It should arrive by the 17. So in the mean while we will be trying to add the small touches to the mechanism.

Also today I made shaped the cap of my bottle into a flat surface to act as the cap to the mechanism.

Here is what it looks like.



I made from bottle cap.

It will be attached to the same mechanism.



Dec, 9, 2024.

Today, we finalized the mechanism.  
- We glued all of the components  
& ~~and~~ connected it to the  
~~the~~ bottle using adhesives.

- also, we also omitted 2 major  
companies:

- flashforest
- bi restoration

To interview them/ask a few questions  
about Drone Technology, and how they  
actually do things in the larger industry.

- we also now have most of the  
parts only thing left to do is order  
the inner pipe, and ~~finish~~ ~~the~~ how  
to attach the mechanism to the drone.

Dom, Ver 22/05/21

Today we started building the platform needed for the drone.

We also started to think about the analysis:

The distance in which the pods will land <sup>eg. 1m</sup>

$$(m) = (1m/s) / (\text{PODS/s}) \quad \rightarrow \text{Shooting fall per sec}$$

- PODS/s: represents the rate at which the pods fall
- 1 m/s: This is the chosen constant speed
- Distance (m): The distance the drone travels before the pod hits the ground

1. We will measure how much fall per second on average.

2. To figure out falling speed:

2. Success rate:

- need for our launch
- ↳ Estimate
- ↳ Seed
- ↳ Weather conditions

OR

$$\text{Germination success rate} = \left( \frac{\# \text{ of seeds germinated}}{\text{Total seeds}} \right) \times 100$$

Mon, Dec, 23/2024

Today we started testing the mechanism to figure out its analysis.

First we timed it to see how many seeds/parts fell out in one second on average. We tested this 10 times.

| Number of times | amount of parts that fell |
|-----------------|---------------------------|
| 1               | 2                         |
| 2               | 2                         |
| 3               | 2                         |
| 4               | 1                         |
| 5               | 2                         |
| 6               | 3                         |
| 7               | 1                         |
| 8               | 2                         |
| 9               | 2                         |
| 10              | 3                         |

CALCULATIONS:

$$2+2+2+1+2+3+1+1+2+3 = 19$$

$$19 \div 10 = 1.9$$

$$1.9 + 0.1 = 2$$

We got 1.9 which can be rounded up to 2



Now to figure out the distance that the pods will be planted at:

$$(5\text{m/s}) / (\text{pods/s} = 2) = 2.5\text{m}$$

So, when a seed is dropped, it will travel 2.5m, meaning each seed should be planted at a 2.5m distance.

To figure out the success rate.....

Research Notes:

~~estimated~~ only 3-25 seeds will germinate out of 100. If planted in a site of disturbance.

Because

- cold winters: long, cold winters in Canada with heavy snowfall can damage seeds.
- SHORT GROWING SEASON
- extreme weathers
- competition from other plants
- disease/pests
- herbivory
- seed quality

~~~~~  
If we add the pod, this can increase the germination success rate but they are never always sure.

- Nutrients = food source = healthy growth
- Protection = protection from harsh conditions = herbivory/pest

20....

$$\frac{15-25}{100}$$

x100

15-25%

The germination success rate is 15-25%  
& taken all conditions into consideration.

Tue, Dec, 24/2024

## Over All Analysis:

- room for improvement
- responds well to controls  
↳ sometimes didn't

## 1. DRONE DESIGN & ENGINEERING

payload delivery system.

- Seeds were placed in an area from where they were spaced to. Each seedling was about 2.5m apart (just as planned).

~~The~~ Drone was driven mechanically & did not run in to any issue

- Seeds ~~were not~~ did not land exactly where were expected to but they were close



## Seed Placement

- Seeds dropped right on top of soil, but over time should travel into the soil.

- Seeds were planted at a good distance from the species that we are trying to plant (Pine)

Planting mechanism (mainly used power of gravity) was safe for the seeds & did not cause any damage.

## 2. SAFETY & STABILITY

Controlling:

- drone was easy to navigate/maneuver

SAFETY:

- drone did not cause damage to any property/people

## 3. RANGE

- Drone that we had, had a maximum range of 150 meters.

## 4. GERMINATION RATES

- 15-25% are predicted to sprout

## OTHER QUESTIONS TO ANSWER:

- what unique features?? (limitations, etc)
- efficiency, cost-efficiency
- future scope
- improvements



January 3, 2025

Over the past few days we added the analysis  
on to the platform & digitized logbooks.

Now, we have started planning for the FUTURE  
SCOPS & CONCLUSION.

### FUTURE SCORE:

- The model that we made was at a very small, & "home-made" level.
- Future improvements when large-scale production can be made;
  - 3d printed/custom produced parts like the holder, custom drone, etc
  - The circuit ~~etc~~ can be made into a singular system & covered by another plastic layer to prevent damage.
- The pods can be further improved in many ways;
  - dried fully & add water rotation to prevent mold
  - add perservative to increase it's life before the pods rot or go bad.

### CONCLUSION

- Restate Problem
- explain what we were trying to achieve
- Was the problem solved by our innovation? Why?

Today we finished the project!