Reducing Desertification by Drones' Seeds Dispersal
Capstone 2.0 PROJECT

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Introduction

Problem Statement:

Design and develop a drone-based seed dispersal system to mitigate desertification. The system should also be cost-effective and eco-friendly.

Constraints:

- The seed dispersion system must be able to disperse the seeds safely and handle different types of seeds.
- The Computer vision must be able to analyze large amounts of data in real-time with low computational requirements.

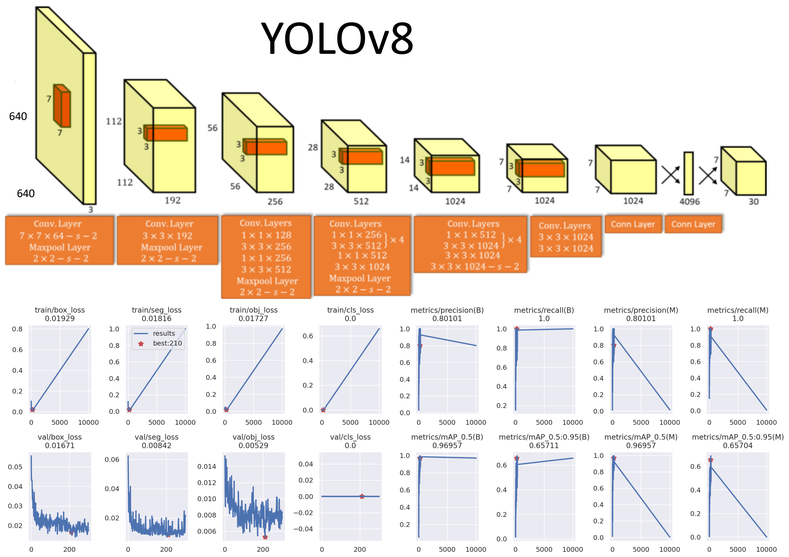
Specifications:

- Flight time of at least 8 minutes
- Flight range of at least 3 kilometers
- Land recognition software must be at least 80% accurate
- Seed capacity of at least 300 grams

How it works

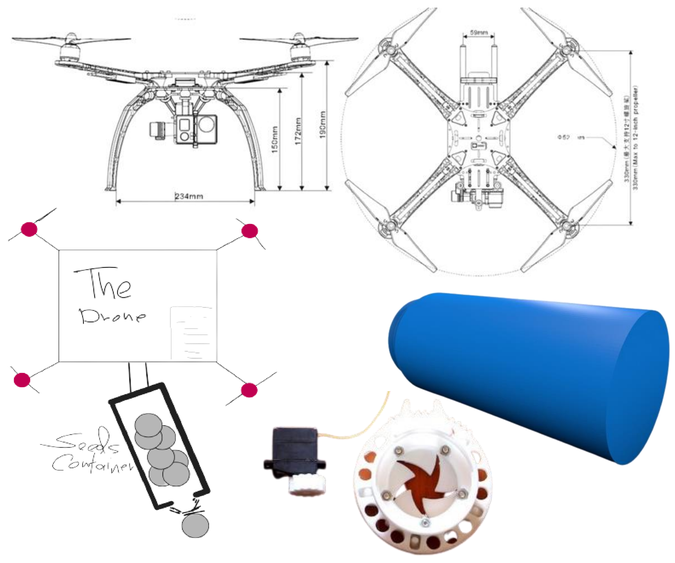
The system will utilize computer vision for accurate selection of optimal seed distribution areas and distinguish between waterways and arid regions. Integration with weather prediction systems will enable seed dispersal optimization based on current and forecasted conditions, maximizing efficiency and minimizing negative environmental impact.

Computer Vision Model

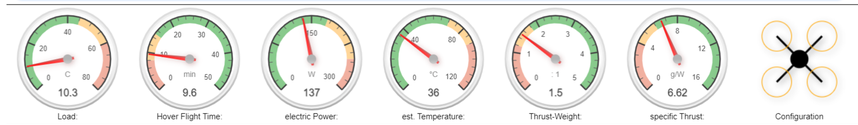


- 275 annotated images for waterways
- Fine-tuned YOLOv8 for instance segmentation
- Archived mAP > 95%

Drone Design

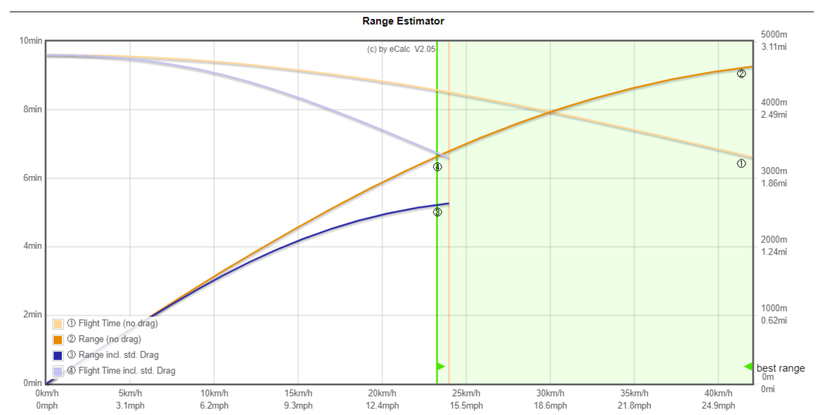


Testing Results



Remarks:

Battery		Motor @ Optimum Efficiency		Motor @ Maximum		Motor @ Hover		Total Drive		Multicopter	
Load:	10.35 C	Current:	8.65 A	Current:	12.94 A	Current:	6.63 A	Drive Weight:	876 g	All-up Weight:	1900 g
Voltage:	10.63 V	Voltage:	10.74 V	Voltage:	10.56 V	Voltage:	10.82 V		30.9 oz		67 oz
Rated Voltage:	11.10 V	Revolutions*:	9030 rpm	Revolutions*:	8445 rpm	Revolutions*:	6050 rpm	Thrust-Weight:	1.5 : 1	add. Payload:	575 g
Energy:	55.5 Wh	electric Power:	92.9 W	electric Power:	136.6 W	Throttle (log):	61 %	Current @ Hover:	26.53 A		20.3 oz
Total Capacity:	5000 mAh	mech. Power:	77.6 W	mech. Power:	112.2 W	Throttle (linear):	70 %	P(in) @ Hover:	294.5 W	max Tilt:	40 °
Used Capacity:	4250 mAh	Efficiency:	83.6 %	Power-Weight:	287.6 W/kg	electric Power:	71.8 W	P(out) @ Hover:	232.9 W	max. Speed:	44 km/h
min. Flight Time:	4.9 min				130.5 W/lb	mech. Power:	58.2 W	Efficiency @ Hover:	79.1 %		27.3 mph
Mixed Flight Time:	8.1 min			Efficiency:	82.2 %	Power-Weight:	155.0 W/kg	Current @ max:	51.76 A	est. Range:	2634 m
Hover Flight Time:	9.6 min			est. Temperature:	36 °C		70.3 W/lb	P(in) @ max:	574.6 W		1.64 mi
Weight:	396 g				97 °F	Efficiency:	81.1 %	P(out) @ max:	449.0 W	est. rate of climb:	3.8 m/s
	14 oz			**Wattmeter readings**		est. Temperature:	31 °C	Efficiency @ max:	78.1 %		748 ft/min
				Current:	51.76 A		88 °F			Total Disc Area:	20.27 dm²
				Voltage:	10.63 V	specific Thrust:	6.62 g/W				314.19 in²
				Power:	550.2 W		0.23 oz/W				



Conclusion

In conclusion, this project successfully achieved the goal of using a drone to disperse seeds and contribute to the fight against desertification. However, there is still room for improvement in the design to make it withstand better harsh environmental conditions such as strong winds or sandstorms.

Overall, this project highlights the potential for drones to play a valuable role in environmental conservation efforts and provides a foundation for future advancements in this field.