

FETCHER: Sample the Forest

Drone Sampling Technology to Obtain Biological Data

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Background

Ecologists struggle to take samples from the tops of trees and plants in inaccessible locations like cliffs and canyons. Fetcher is a drone with a plant sampling drone attachment designed to solve this problem. Fetcher is created to fly to the desired plant sample, cut the plant sample, and retrieve it so the user can use it for plant physiology and tissue research.

Overview

We overhauled a cutting attachment that was difficult to fly and aim for plant sampling. Our team categorized the problem areas: safety, ability to aim Drone Arm, and weight. In order to improve the safety, we added a dual saw guard. During aiming, the Arm was allowed to swing freely during flight. To address this, we implemented a locking joint which limits the Arm's swinging to 15 degrees. It can also prevent the Arm from swinging when in a locked position, allowing for more precise aiming. Heavy parts were replaced to save weight. Finally, a new dual camera system was also added to aid the pilot for flying and seeing the cut being made.

Testing

A new and lighter motor was chosen to power the saw. Various branches were collected and fed into the saw for cutting.

Branch Diameter (mm)	Cut Outcome Pass/Fail
5	Pass
6	Pass
8	Pass
9	Pass
13	Fail
14	Fail

Figure 4: Cutting tests

Design

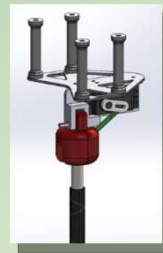


Figure 2: Joint Mechanism



Camera 2



Figure 3: Cutting Mechanism

Figure 1: Breakdown of Drone

Cutting Mechanism

- Dual saw guard
- Integrated branch feeding and safety mechanism
- Covers over 90% of the blade

Joint Mechanism

- New ball joint that prevents spinning
- Restricted conical motion to 15 degrees
- Locking pin allows for more precise aiming

Analysis

A main focus we had was to reduce weight where possible. This would increase flight time and make flying the system easier.

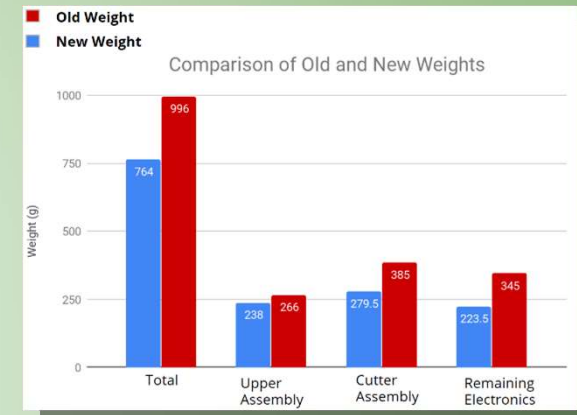


Figure 5: Breakdown of weight distribution

In total, the system weight was reduced by 25%. To achieve this, we took a two-fold approach. First, all unnecessary components were removed. Second, we determined the bulkiest parts of the system which had the largest weight saving potentials.

Conclusion

- Consistently cuts branches up to 12 mm
- Average flight time is 9 minutes
- Range of the arm has been limited to 15 degrees
- Implemented fully functional and protective guard

Acknowledgements

Special thanks to Carla D'Antonio, Ryoko Oono, Dave Bothman, Tyler Susko, Steve Laguette, Kirk Fields, Roger Green, Trevor Marks, John and Sheila Lake, and Alexis Desbiens