SeedSetter: A Drone-Based Seed Planting System Designed to Prioritize Seed Germination for Reforestation Efforts

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Purpose: The world loses billions of trees each year, and current reforestation efforts cannot keep pace. Drone-based seed planting has emerged as a promising solution, with current systems primarily relying on aerial dispersal, either by dropping or firing seed pods. While these systems can plant 40,000 seeds per day, often only 10% successfully germinate. This project presents SeedSetter, a novel seed planting system designed to prioritize seed germination by drilling a hole and inserting a seed pod into the ground, providing enhanced protection from environmental threats. Methods: The system was designed in CAD and constructed from 3D-printed parts, acrylic tubes, and standard electrical and mechanical components. An Arduino microcontroller was programmed to autonomously execute the planting sequence. Testing evaluated the reliability of the system's drilling and seed release, the duration of each planting cycle, and the germination rate of the planted seeds in a controlled indoor test environment. Results: The system achieved a planting success rate of 77.5%, demonstrating reliability for a first prototype. It also produced a germination rate of 80.6%, significantly higher than current systems, though the slower planting speed resulted in fewer seeds that were successfully planted and germinated. Conclusions: The high germination rate indicates reduced seed waste and improved reforestation efficiency. Additionally, the system's ability to plant seeds with adjustable depth is well-suited for sensitive species. The system is not yet fast enough to fully replace high-speed systems; however, this approach is more effective than aerial seeding in certain scenarios.

Awards Won:
Fourth Award of $600