

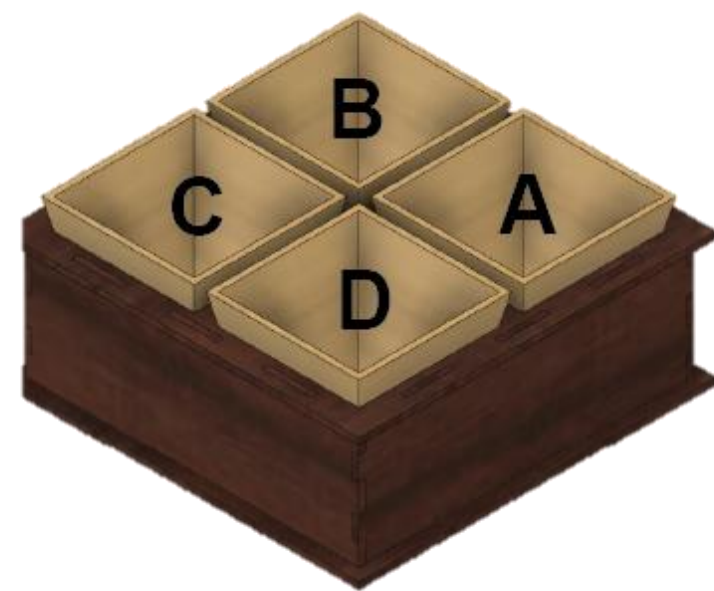
Green Machine: Seeds Mission

Introduction to Engineering Design: Professor Peter Sunderland (Section 0302)

Jake Chapman, Chloe Connolly, Xan Herbert, Matthew Nover, Nathan Perry, Jack Spoleti, Adam Zennia

Introduction

The Green Machine was tasked with the Seeds Mission. Each group in the course section was assigned a different mission and common vehicle constraints such as:



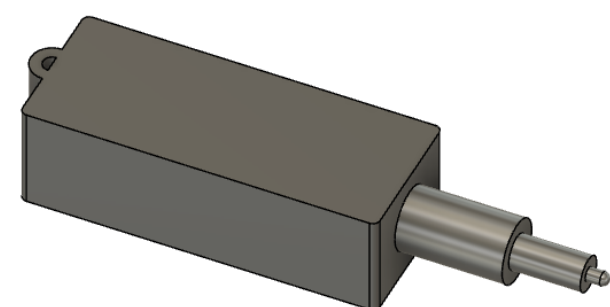
- Must be between 0 and 3 kg
- The battery cannot be lithium
- There should be a kill switch
- An ArUco marker must be on top of the car
- Total costs must be under \$320

The common goal of the ENES100 course was to successfully meet bi-weekly construction milestones while demonstrating proficiency in C++ programming language, laboratory tools, and digital design software such as Autodesk Fusion 360.

Problem Definition

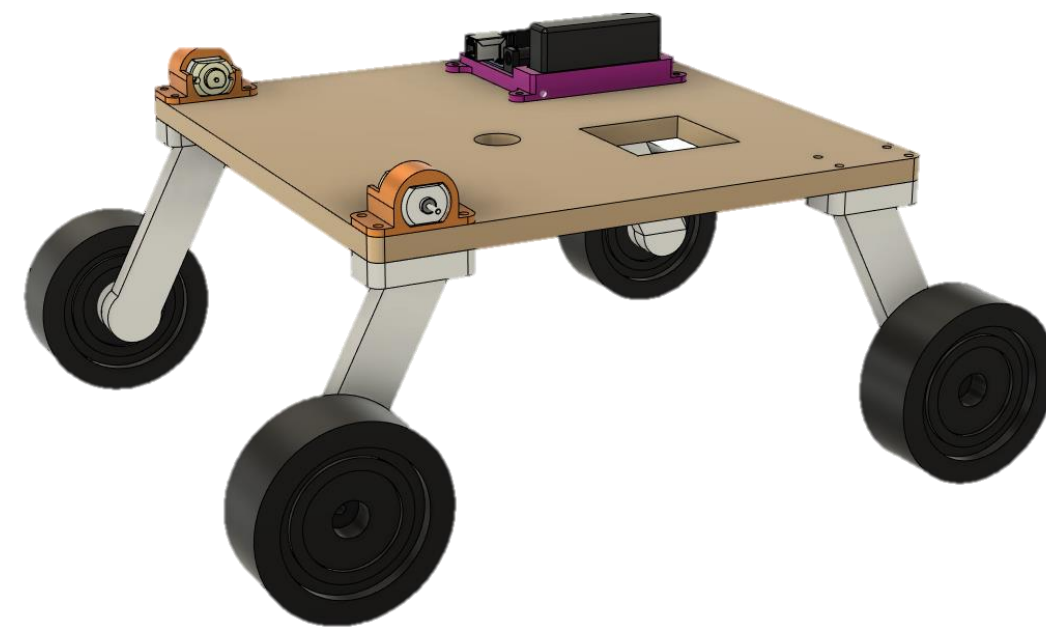
Design an autonomous over-terrain vehicle under \$320 which can identify plots containing plantable substrates and precisely plant a lima bean into one of those plots while navigating physical obstacles.

Key Feature: Seed Planting Apparatus



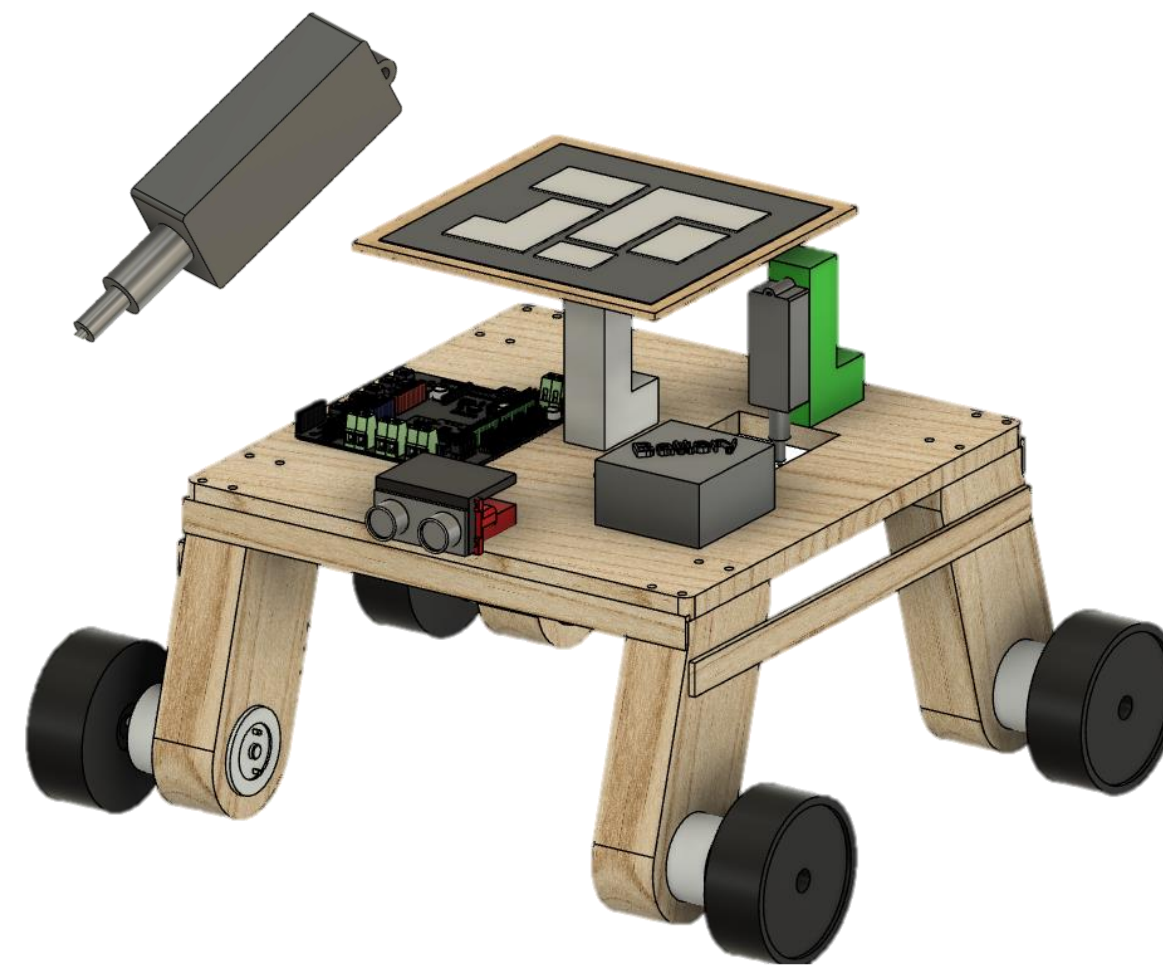
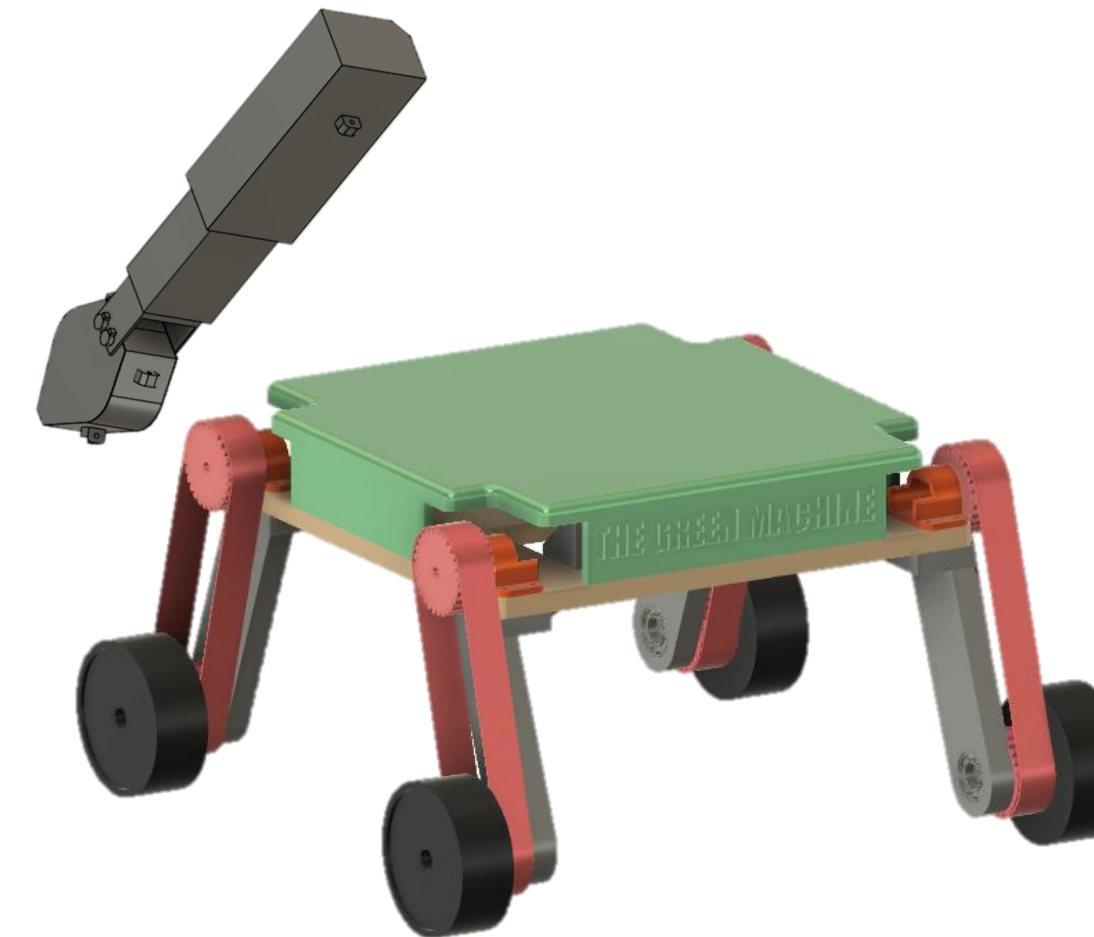
The seed planting apparatus is mounted on the top of the chassis and descends using a motor controller. The lima bean is lightly stuck to the point of the electric push rod.

Design Evolution



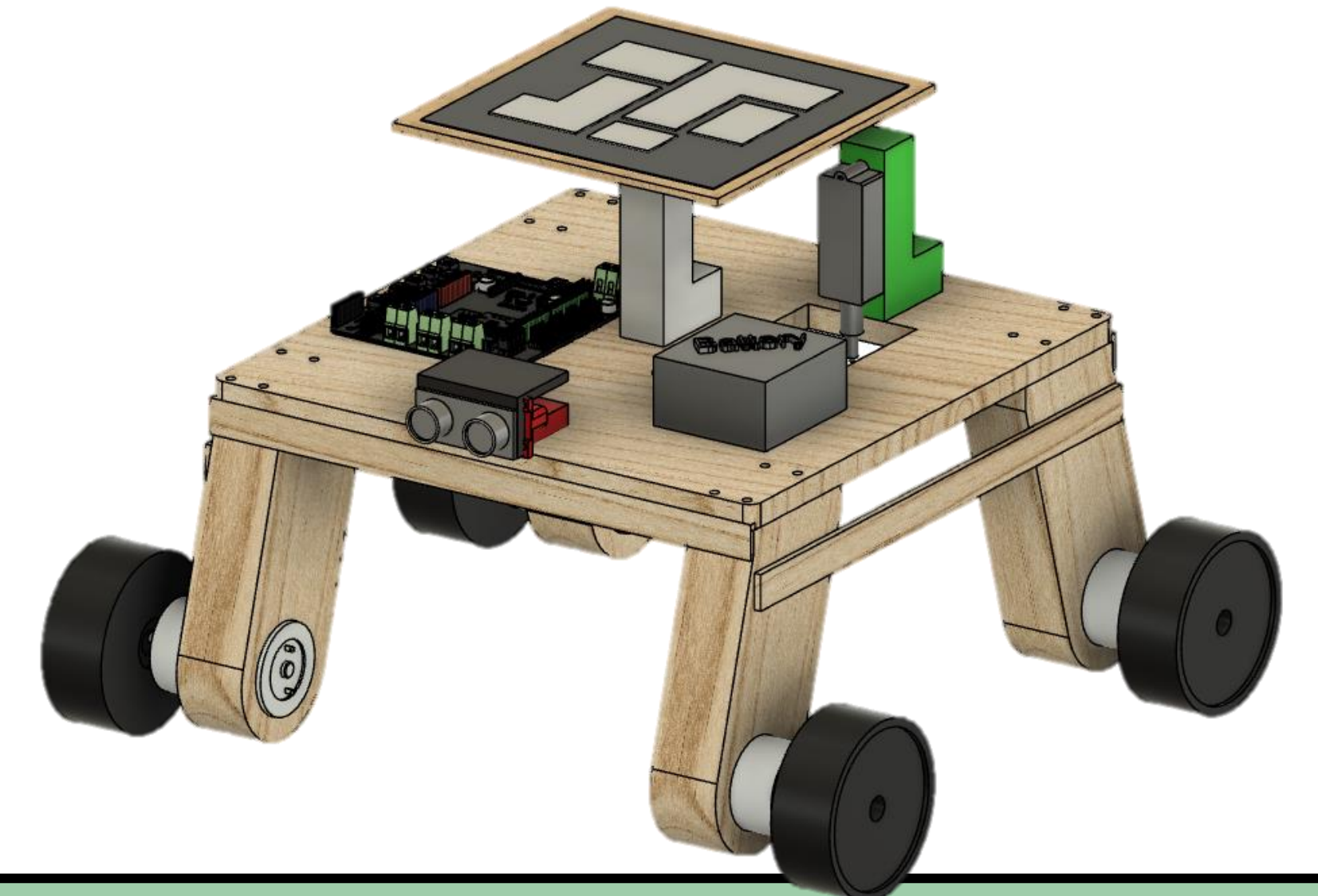
First design with motors on the chassis of the OTV and the intention of belts. No mission apparatus ideas yet, rough design.

Second design with crane-like mission apparatus and cover on top of the vehicle. Motors are on top of chassis with belts attached to the mounts. Photoresistor mission system.



Final design with electric push rod mission apparatus, motors on the bottom of the legs, and a color sensor mission system. ArUco Marker attached onto a mount instead of a cover.

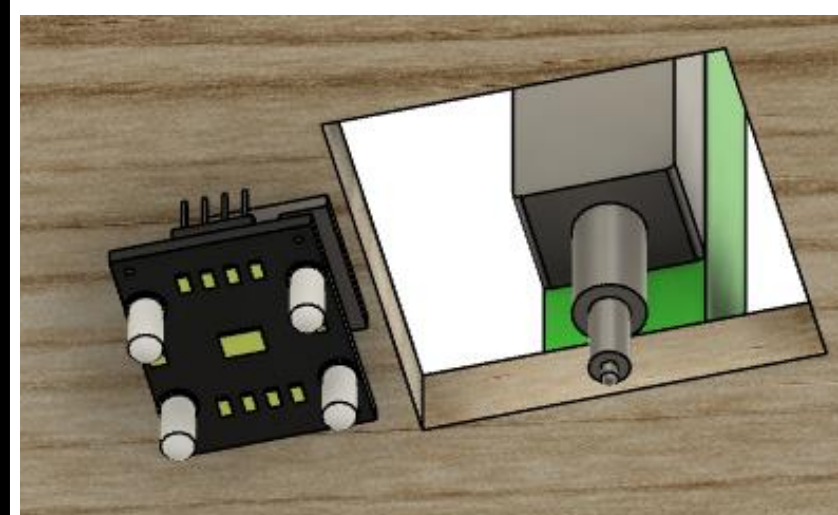
Final Design



Performance Evaluation

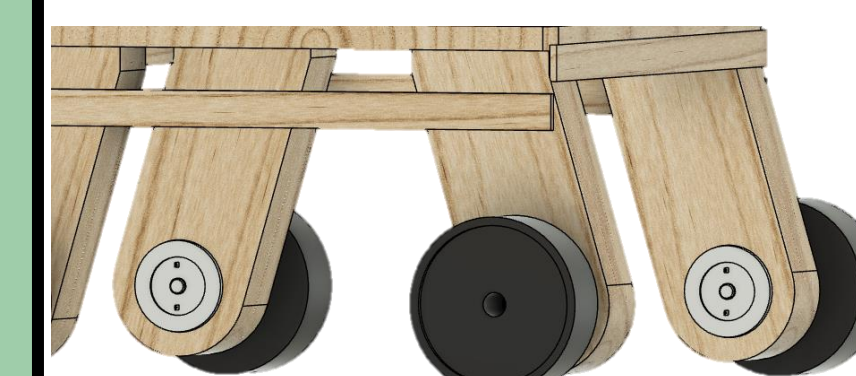
Our final performance evaluation received scores of 20/120 and 20/120. The points which the OTV received were for navigating to the mission site. Before the final performance, the vehicle was navigating through obstacles and made it over the log, but there were code issues the day of the trial. With more time, the OTV would have most likely succeeded at the entire mission.

Key Feature: Soil Detecting Color Sensor



A color sensor which can detect blue, green, and red-light intensities is mounted on the underside of the vehicle to detect orzo versus rocks according to color.

Key Feature: Elevated Chassis



The chassis is elevated 100 mm off the ground to drive over the mission plots pictured in the objective. This allows it to collect color sensor data from above.