Zot Bot

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Executive Summary

Starships are the main form of food delivery for hungry UCI students. However, they are not meant to go off road and must travel around Aldrich Park to get to their destinations. This leads to long wait times for the customer and risks the food getting cold. The Zot Bot team plans to achieve fast and reliable food deliveries with its all-terrain vehicle's ability to drive through Aldrich Park and traverse any hills, holes, and other obstacles that it may face.

Design Goals

- Safely travel through the diverse terrain of Aldrich Park
  - this includes grass, hills, bumps, etc.
- Does not cause damage to the terrain in Aldrich Park
- Can carry an average sized meal with little to no spillage
  - i.e. McDonald's Big Mac and Small Fries
- Affordable
  - Should cost less than the team budget of $750

Key Features

Gyroscope
- Fabricated rods to allow for free rotation
- Rods drilled into pelican case to isolate motion
- Ordered and tested springs to dampen any excess motion

Pelican Case
- Researched different sizings to fit on the chassis while still fitting the food inside. Also took into account the pricing for each case.
- Measured food and cut out optimal size in the foam.
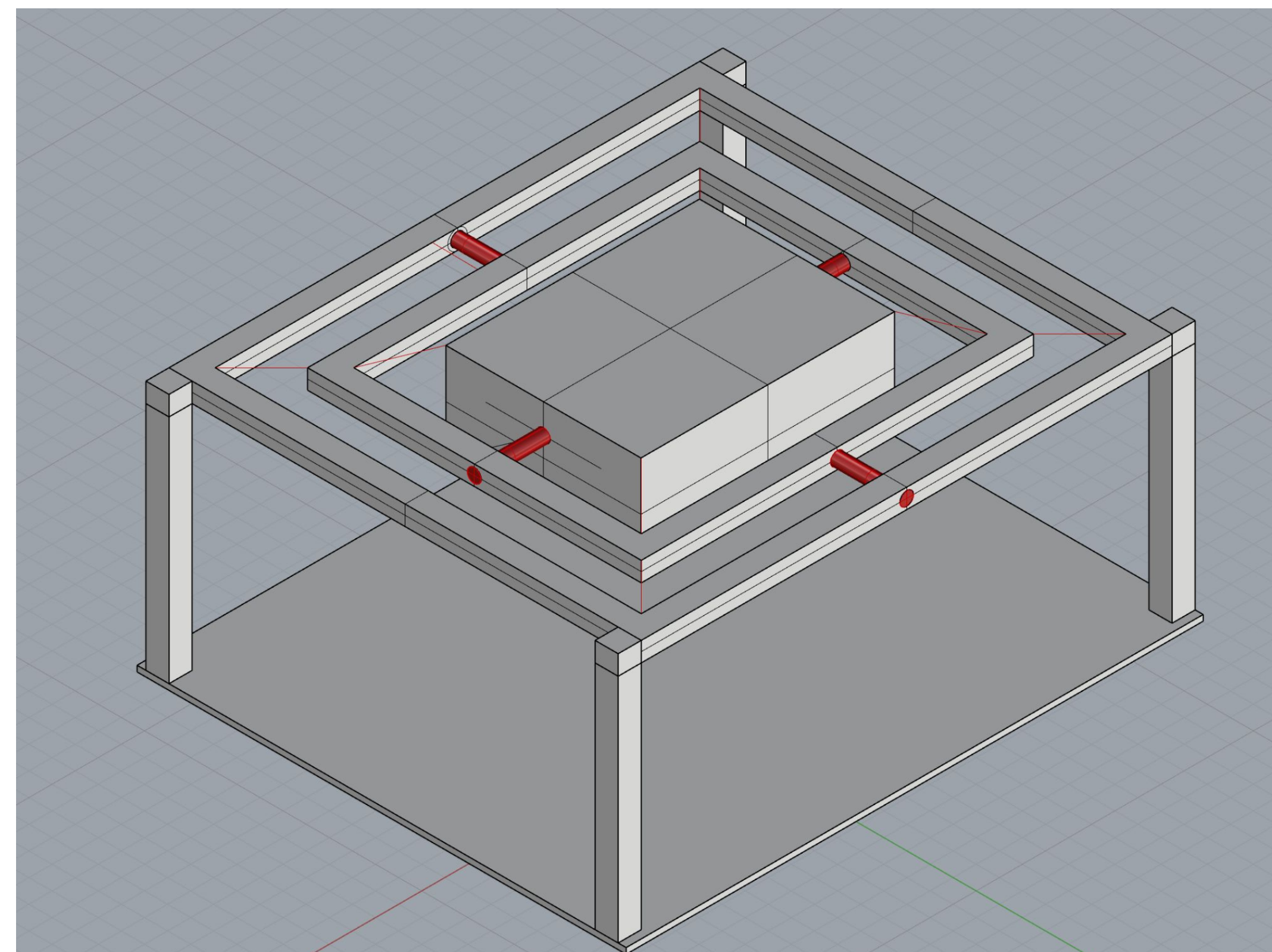
RC Chassis
- Researched several chassis to meet the design requirements, taking in several factors such as power, size, and cost.

Design Process Analysis

Determine required payload size/weight, measure terrain, and research RC Car specifications ➡ Brainstorm stability mechanisms and possible RC Car modifications ➡ Select an RC Car to modify and a stability mechanism to implement (gyroscope + Pelican case) ➡ Build gyroscope prototype and integrate it onto RC Car chassis ➡ Test complete design in desired terrain with payload ➡ Iterate design as needed

Final Gyroscope Assembly

Bottom plate will be mounted on to off-the-shelf RC car chassis

Detailed Problem Statement

UCI's Aldrich park contains rough terrain, thick grass, and steep hills. Because of this, existing autonomous delivery vehicles bypass the park. The task is to design a remote controlled vehicle that can make deliveries, like a MacDonald's BigMac sandwich (.78lbs in weight and 150mm x 93mm x 150mm) , across the park. This vehicle must be able to traverse the 12 cm holes, 7 cm high grass, and 20 degree hills present at Aldrich park. In order to prove its usefulness, the vehicle should be capable of making deliveries that are faster than existing methods. The budget provided to create this vehicle is $750.

Design Shortcomings

- More shaking and bouncing than initially anticipated - had to adjust design
- Battery life was weak, making it difficult for testing and verification - ordered bigger batteries for longer drive time
- Suspension was too weak to hold up the weight of the gyroscope - 3D printed stoppers to keep the chassis at an optimal height

Specifications

Size: 46cm x 32cm x 33cm
Weight: 4.55kg
Wheels: 105 mm diameter, 61 mm width
Torque: 2.2kg

Future Improvements & Impact

The project was limited to a 10 week quarter. Therefore, the scope of this project did not allow for proper research and optimization of *all* components. In the future, more options for different tires, steering, and suspension should be considered in order to optimize performance. More time to test the final design also would have helped. The development of this improved Zot Bot vehicle can affect the environment positively as well, as it is design to reduce the travel times and distances, future applications of the technology can allow food to be delivery with less fuel or battery power gone to waste. future iterations with autonomy can also increase its factor of safety and reliability as well as reduced cost of labour.

Acknowledgements