Sentien Payload Delivery System

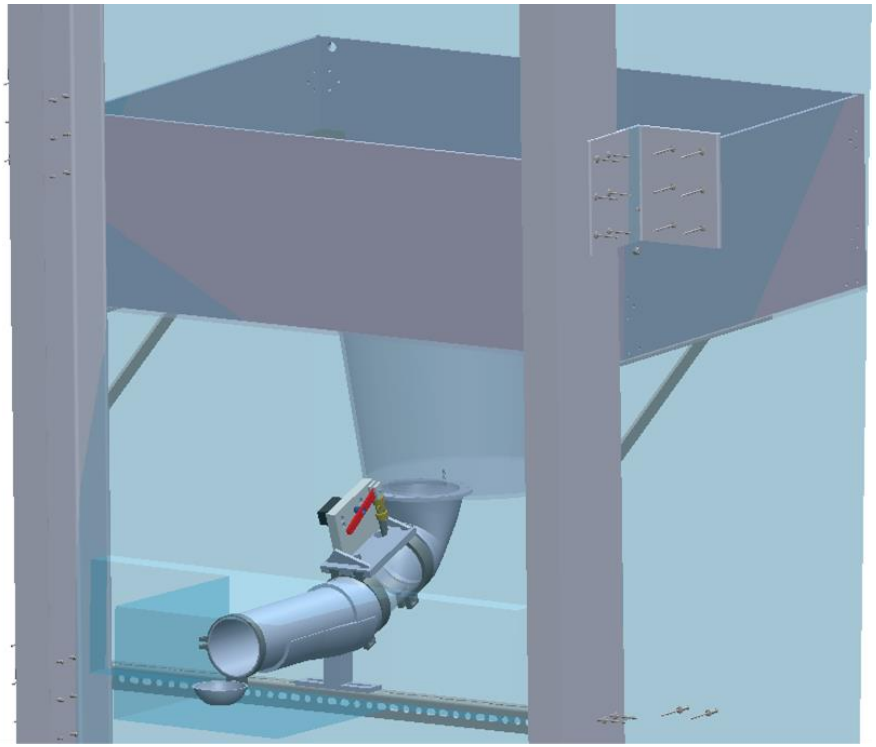
Berkeley Engineering Solutions

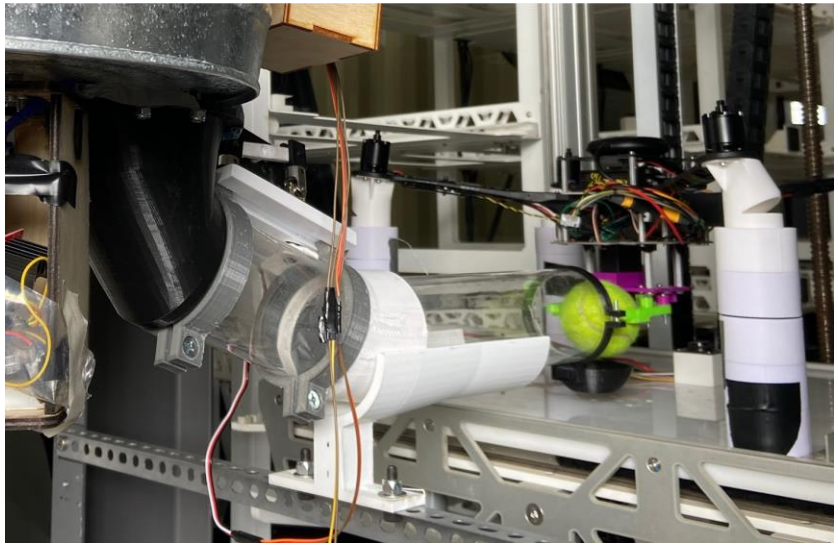
Spring 2023

Khaled, Asusena, Reagan, Aashrith

Berkeley
UNIVERSITY OF CALIFORNIA

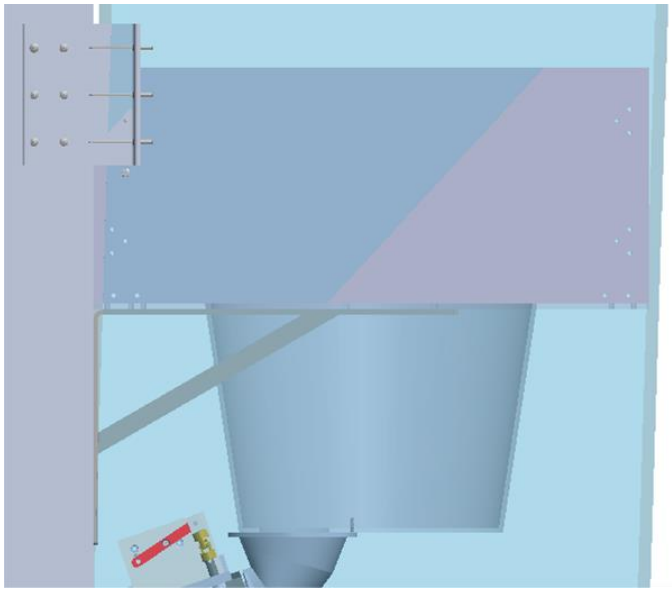
Full Project Assembly

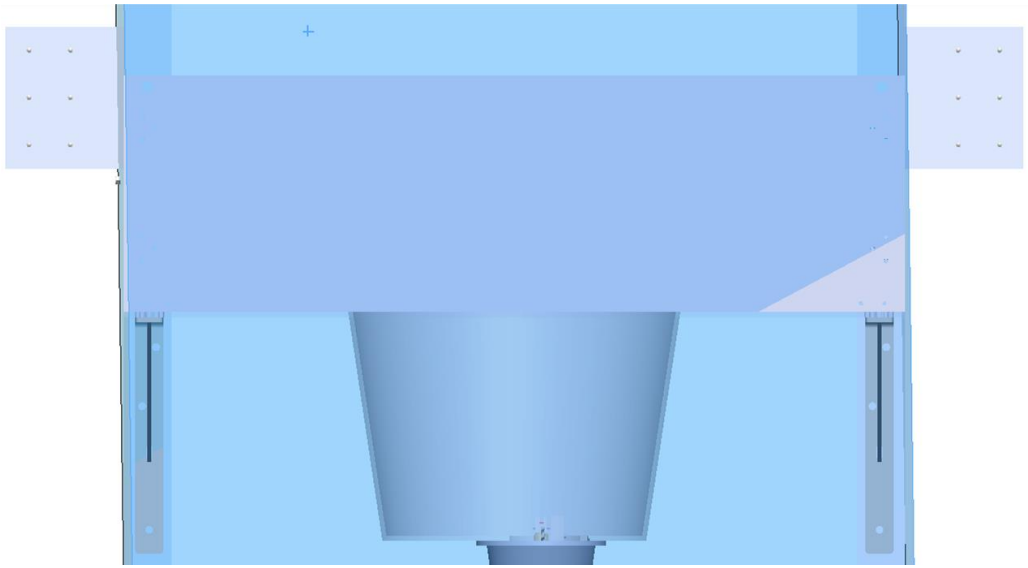




Container Subsystem

- 5x ¼” acrylic panels assembled together with brackets and bolts
- Laser cut for proper size and bolt holes
- Circular hole in the bottom panel to fit the active paneling system (circular rim of bucket; See next slide)
- Two holes to attach rope from trailer for extra support

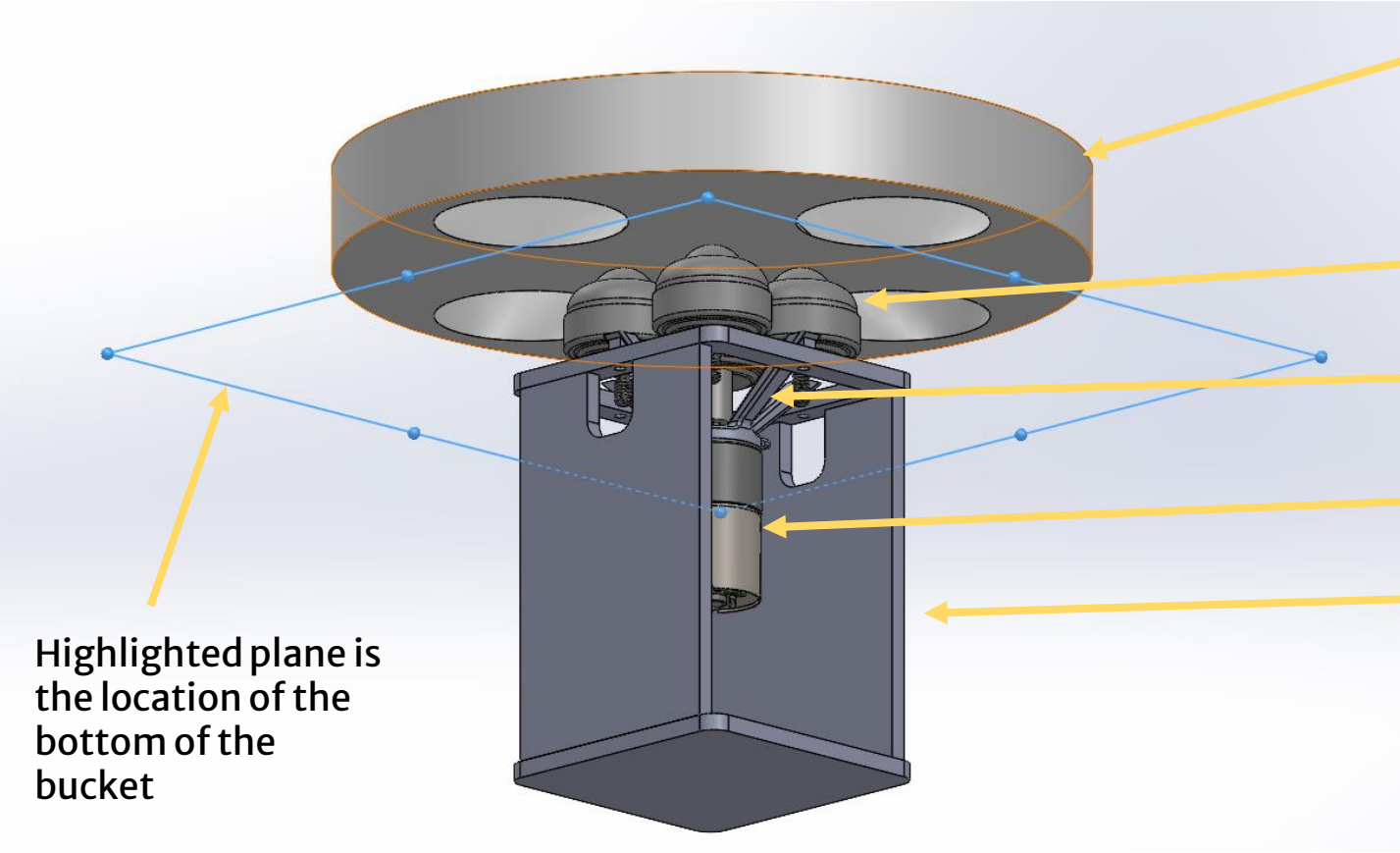




Active Funneling Subsystem

- A passive funnel that connects the container to tubing would jam as multiple tennis balls would clog together near the narrow end of the funnel
- The active funnel system solves that by letting one ball into the tube at a time.
  - Steel bucket with a hole on the bottom.
  - Integrated spinning plate with 4 cutouts for balls
  - As balls fall into the bucket, they fill the slots in the plate, which spins and thus drops one ball into the hole at a time
- Spinning plate powered by:
  - 30 rpm, 12 volt DC motor
  - 3 Li-ion 3.7 volt batteries
  - Arduino Uno + L298N Motor Drive Controller
- To support weight of tennis balls, 4 ball transfers placed under the spinning plate
- Housing for electronics

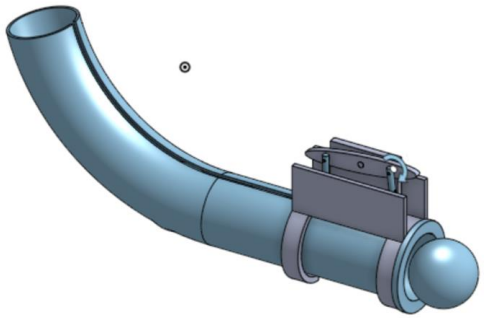
Active Funneling Subsystem



*Steel bucket is hidden. See location of bottom plate.

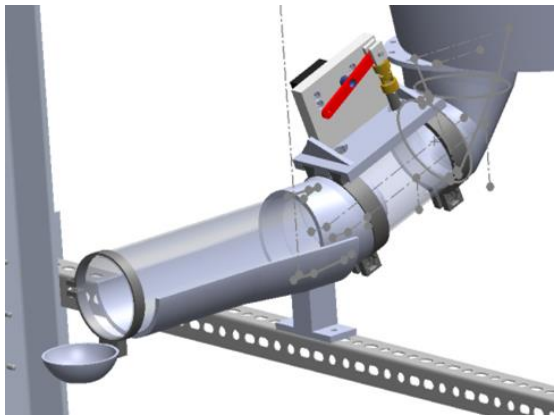
Indexing Subsystem

- inspired by skee-ball indexing mechanism
  - a tube system connecting the active funneling subsystem to the end effector subsystem
    - involves use of universal joints (with rods that insert into the tube) connected to horn adapters, which are connected to a custom-printed servo horn
    - use of a DS3235 35KG Coreless Stainless Steel Gear Waterproof Digital Servo
    - Oscillation between 0 to 15 degrees with the click of a push button (Arduino Nano, 10k Ohm resistor)

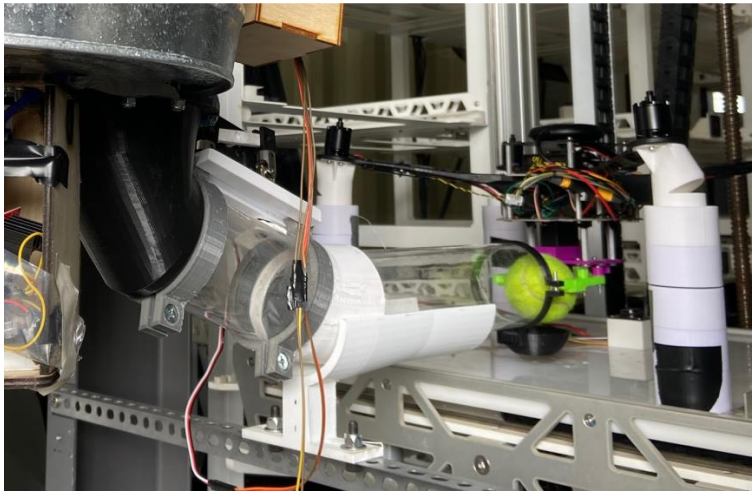


initial index design

laser-cut prototype



final CAD design



indexing system mounted on trailer

Video of indexing function

End-Effector Subsystem

- Prototyped multiple designs for End-Effectors (Linkage, Worm Gears, Different Number of End Effectors)
  - Ended up with 2 armed linkage system
- S3003 Servo utilized in the mechanism, with stall torque of 3.2 kg/cm
- Powered with 9V battery, Arduino Nano and HC-05 Bluetooth module
  - All Electronics stored away from the actuator, in middle area of the drone to limit footprint
  - Bluetooth module used to allow for wireless control for a mechanism that is going to be inaccessible most of the time

Future Changes:

- Reducing standoff sizes to attach with bottom plate of drone, as opposed to adhesive that is currently use.