Samuel Estrin's Portfolio

Updated: July 13th, 2021

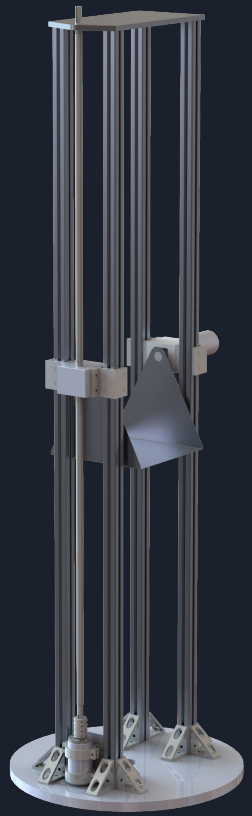
Robotic Camera Dolly

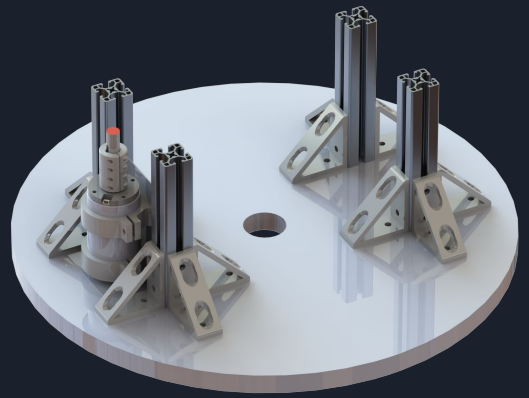
Robotic Camera Dolly - Full Assembly

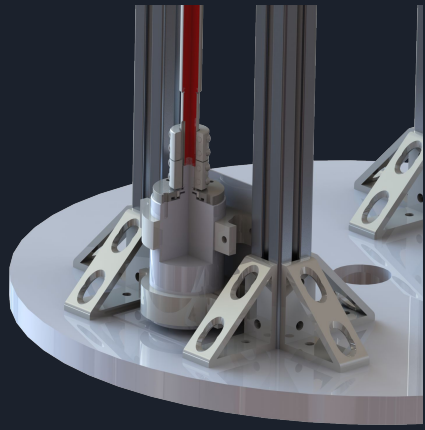
- Camera placed on a free-moving robotics system
- Drive base has 3 degrees of freedom
- Elevator on drive base provides 2 additional degrees of freedom
- Allows for translation in x, y, and z as well as pitch and yaw
- X and Y range limited only by available floor space

Robotic Camera Dolly - Elevator Structure and Drive

- Acme Lead screw
  - Specifications:
    - Diameter: ¾”
    - Lead: 0.200”
    - Material: 304 SS
    - Pitch: 0.200
    - TPI: 5
  - Driven by a VEXpro CIM motor
- Linear sliders
- 6ft vertical movement
- Camera Basket
  - Angle controlled by CIM motor with 20:1 gear ratio

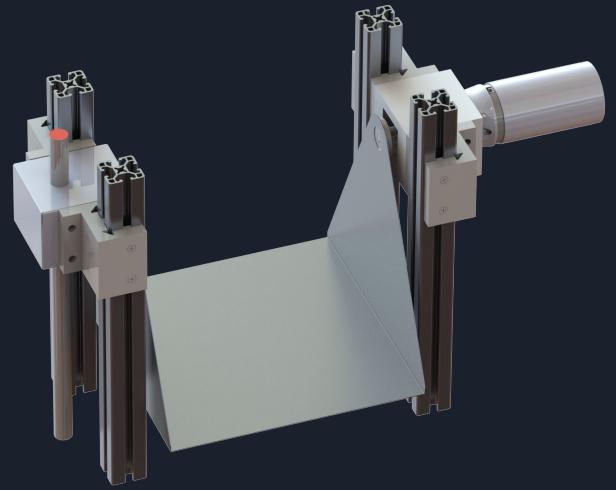






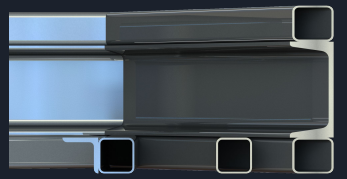
Robotic Camera Dolly - Tilt Control Basket

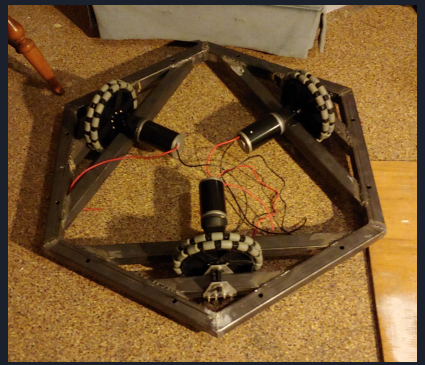
- ❏ Basket with adjustable depth for different sized cameras
  - ❏ ⅛” 3003 Aluminum sheet
- ❏ Sliders
  - ❏ Carriage Material: Aluminum
  - ❏ Bearing Material: UHMW Plastic
- ❏ CIM Motor
  - ❏ Versaplanetary Gearbox 20:1 Gear Ratio
  - ❏ Needs to produce 300 in-lbs of torque for
    50lb camera

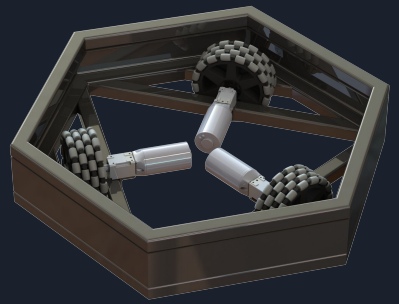


Robotic Camera Dolly - Base Design

- Primarily comprised of steel for weight and structural strength
  - Welded square tube
  - Bolted-on C channel
- Electronics to be mounted on acrylic sheet



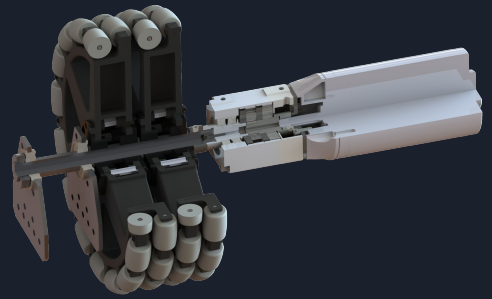




Robotic Camera Dolly - Base Design

- As can be seen in the pictures, the complete base of the robot was constructed
- My team and I cut all of the steel and assembled all of the parts together
- I welded the whole structural frame of the base together

Robotic Camera Dolly - Drivetrain



- Kiwi Drive
  - Holonomic
  - 3 sets of omni wheel
- Drivetrain
  - 12:1 gear ratio
  - 2 wheels on each axle
  - Attached directly to frame

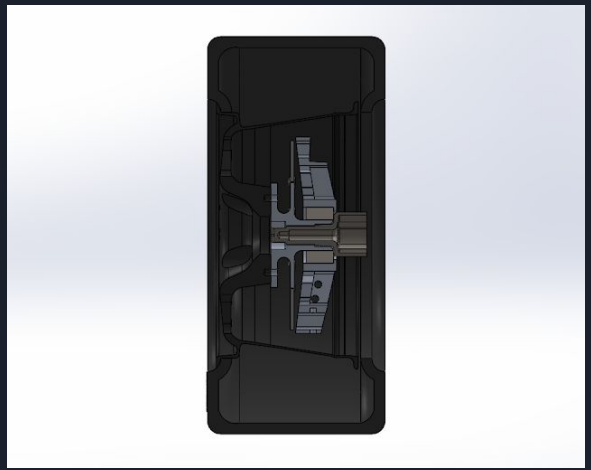
Formula SAE Electric Vehicle

Formula SAE EV - Full Assembly w/o Body

- This is a rendering of the complete design of the car, without the body. I worked on the wheel assembly and suspension of the vehicle.

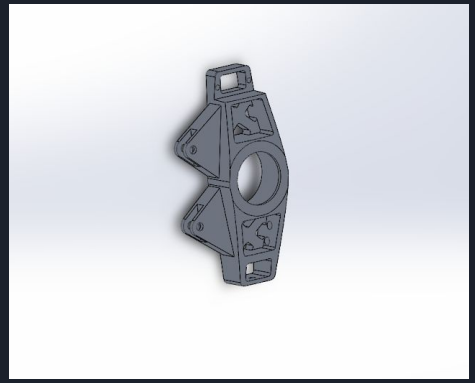
Formula SAE EV - Wheel Assembly

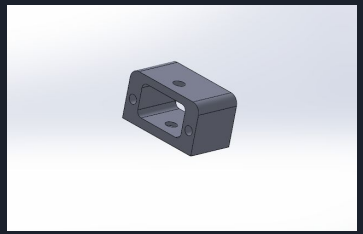
- This is a rendering of the wheel assembly. The full wheel assembly includes the upright, brake rotor, spindle, upright top attachment, tripod housing, brake caliper, a-arms, wheel, tire, and a-arm bearings.



Formula SAE EV - Uprights

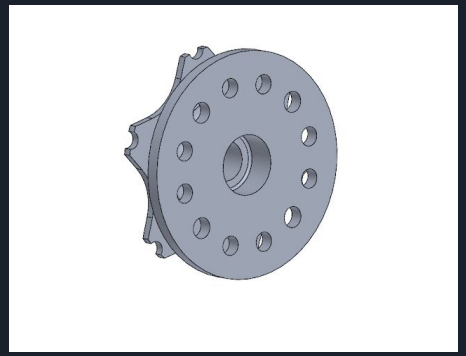
- The uprights main purpose is to provide physical mounting and links from the suspension arms to the hub and wheel assembly, as well as carrying the brake components.
- I went through 18 different design revisions of the upright.
- It is made out of 6061-T6 aluminum.
- The small part on the right attaches to the top of the upright through its three mounting holes
- Its distance off the upright can be changed to adjust the camber of the wheels from 0 to 1.5 degrees.
- It is made out of 6061-T6 aluminum.

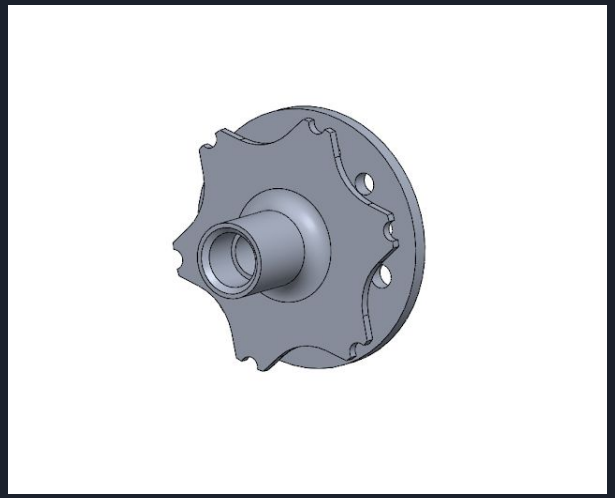




Formula SAE EV - Spindles

- The spindles main purpose is to attach the wheel rims to the wheel assembly through the rims 4 mounting holes, and 8 locator pins.
- The locator pins center the rim on the spindle, while providing extra support for the bolts attached to the mounting holes.
- The spindle attaches to the brake rotor on its six floating rotor pin hole mounts. The spindle also attaches to the half axles through the use of a tripod housing and tripod bearing.
- It is made out of 6061-T6 aluminum.





Formula SAE EV - Spindle and Brake Rotor

- The purpose of the brake rotor is to sit in between the brake pads of the brake caliper, and act as a plate for the brake pads to push on to stop and slow the vehicle.
- The brake rotor is mounted to the spindle through the use of rivets and retaining rings.
- The brake rotor is made out of 4130 steel.
- The mounting method of the brake rotor allows it to float off of the spindle to lower the amount of heat flow from the brake rotor to the spindle.
- Another reason why the brake rotor floats off of the spindle is to account for the expansion of the brake rotor while under a thermal load.