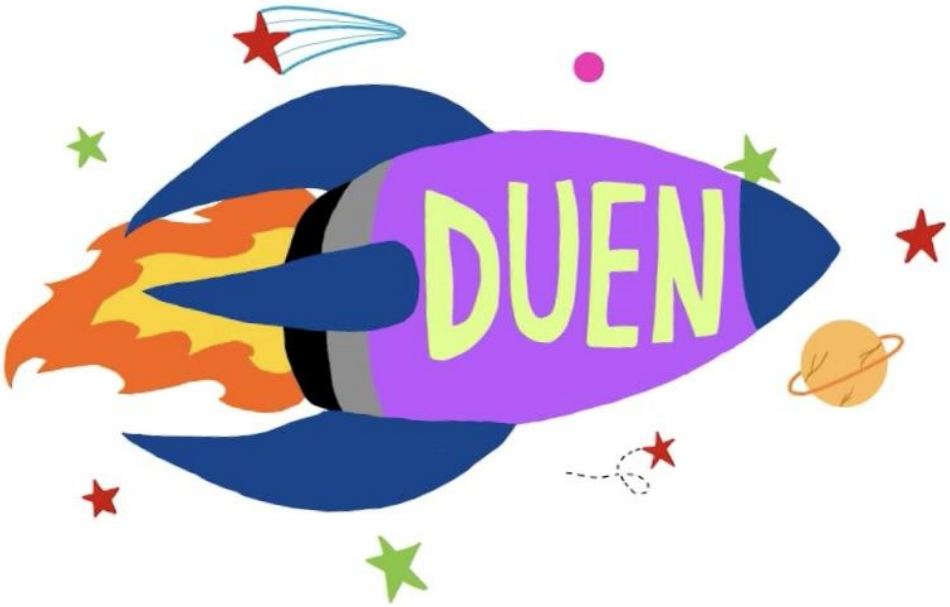
DUEN

ADVERTISING ROVER

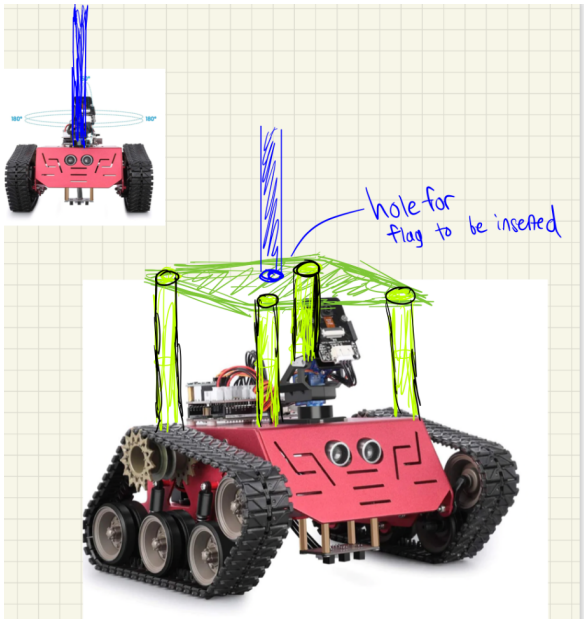
INSTRUCTION MANUAL

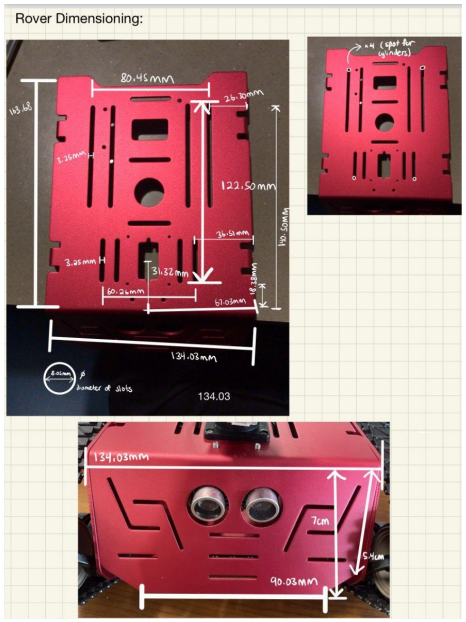
FALL 2023 CONSTRUCTION PROJECT



Design with Measurements

Dimensioning:

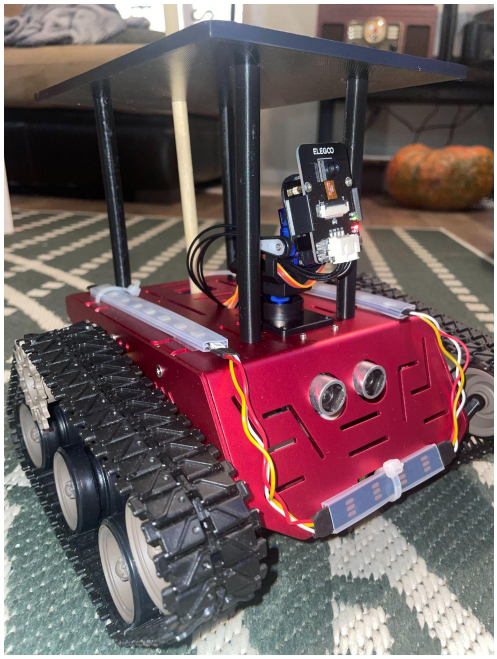




The Rover

Rover with Advertisement

Final Product:



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Purpose of the Advertising Rover

The Fall 2023 Cohort class designed and assembled a rover that will advertise the newfound Davis Undergraduate Engineering Network (DUEN). It is a creative and effective way to help out with tabling and bring in new members to the club. With the help of the installed LED strip and flagpole, the Advertising Rover will move around the MU grounds, using various modes of movement, in order to catch the eyes of bypassers. The purpose of the rover is to bring students interested in DUEN to the table so that its members can spread awareness about our club and our engineering initiative. As a discourse community that harbors a passion for computer science, engineering, and mechanical design, this project shows that we take our work here at DUEN seriously.

Physical Characteristics of the Rover:

Elements:

1) Rover (individual parts were put together to form the rover)
2) LED Strip (including the Arduino and power bank)
3) Flag (laminated paper) attached to 3D-printed flag pole
4) Self-made ensemble to hold up flag

Dimensions (LxWxH) and Characteristics:

- Rover (track to track): Utilizes a dual channel DRV8835 driver chip, a 7.4v Lithium Battery Pack and infrared tracking to make its way around.
  - Dimensions (mm): 178.50 x 127.00 x 123.00
  - Weight (kg): 1.64
- 3D Printed CAD Shell (rooftop Weather Protection):
  - Dimensions (mm): 163.68 x 134.03 x 10.00
- 3D Printed CAD legs (Attached to and Holding Up Rooftop):
  - Dimensions (mm): 85 (height) x Ø 9.40 (outer circle) x Ø 1.50 (inner drilled hole)
- LED Strip: Powered by power bank and controlled by Arduino Uno R3
  - Total Length (mm): 330
- Flagpole (Not Including Flag):
  - Total Height (mm): 546.1
- Flag (Not Including Pole):
  - Dimensions (mm): 177.8 x 157.48

Assembly of the Rover:

A. Starting up the Rover:

1) Plug in the two USB wires into the powerbank located on the underside of the rover, press the button on the powerbank to turn the LED lights on.
2) Toggle the on/off button on the battery pack through the left side panel.
3) Use the remote or your phone to control the movement of the rover.

B. Controls and Modes:

a. Line-tracking: Set up the circular line mat on the floor and place the rover on top of the line. Press number 1 on the remote, or use the phone to set the rover in line-tracking mode. The small LED light should light up green.
b. Obstacle-Avoidance: Press number 2 on the remote control, or use the phone
c. Auto-Follow: Press number 3 on the remote control, if there are obstacles in the 20CM ahead of the Ultrasonic Sensor Module, the car will automatically follow the obstacle to move; when no obstacle in front, the car will automatically rotate 90 degrees to the left, then the right, then stop.
d. Infrared Remote Control: Use the remote control to control the movement of the rover with the arrow keys, and using numbers 1-3 to differentiate between the modes.

C. Arduino Kit:

a. Rover: The software was preloaded on the UNO and ESP Camera unit.

D. Additional Information:

a. Battery Life can last up to 2 hours when using the line-tracking mode.

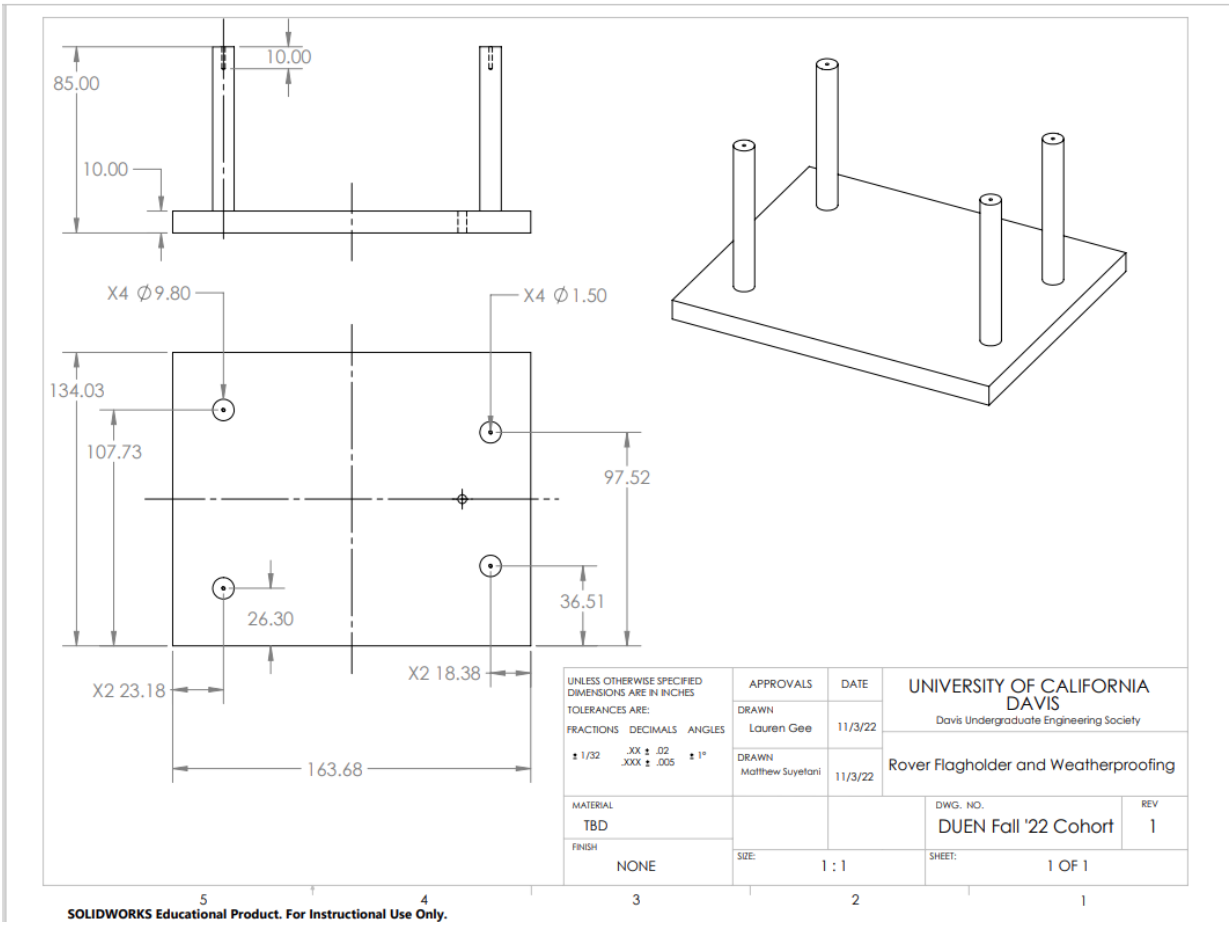
b. Before applying power the first time after assembly, ensure that the robot is on the floor with a ~two foot safe zone" cleared around it. Upon power ON, the robot will initialize its sensors, the robot will drive tracks forward and reverse for a few seconds

c. Power bank must be charged to operate LEDs

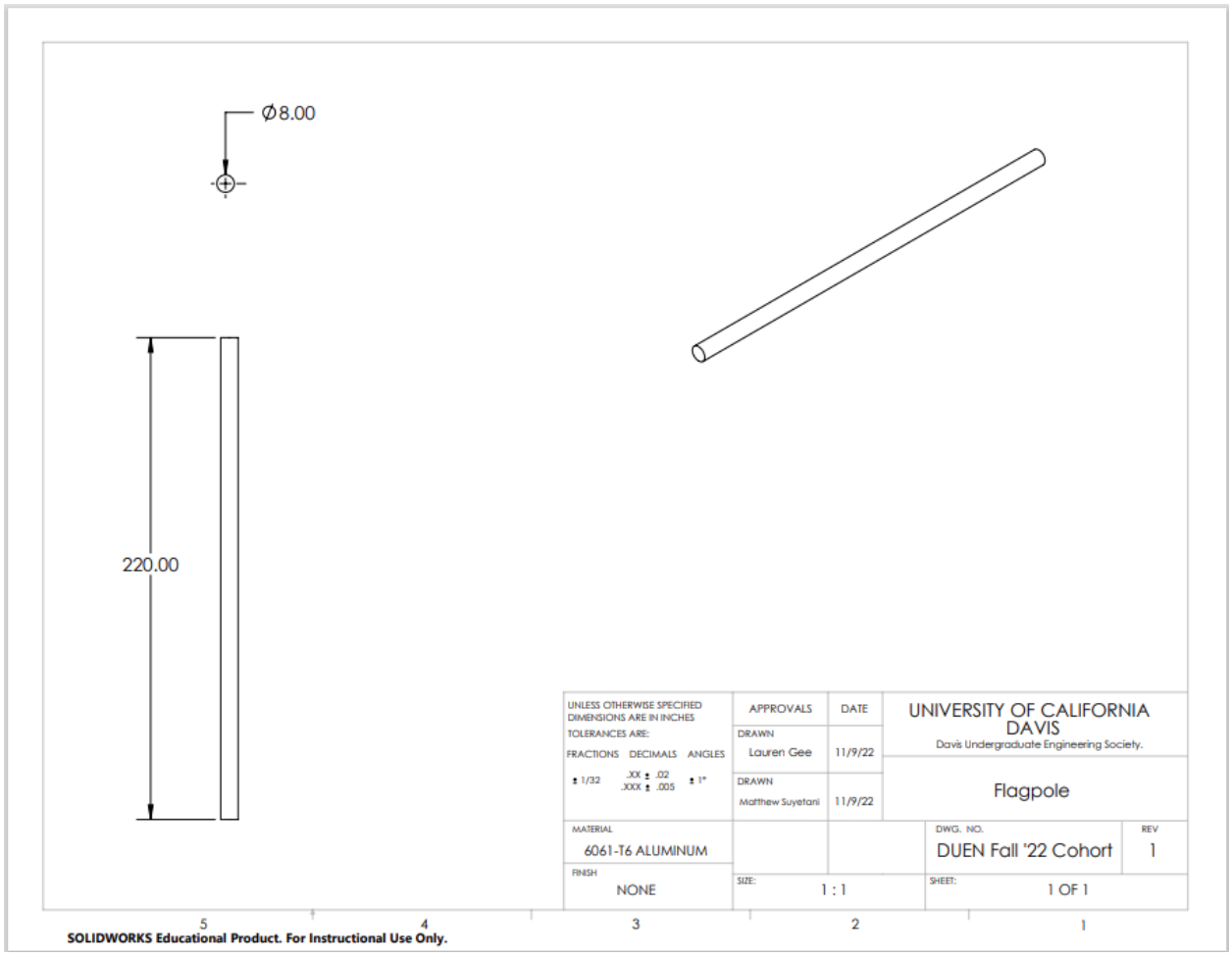
    i. Full charge takes about 6-7 hours

Computer-Aided Design:

Version 1 (Shell Component):

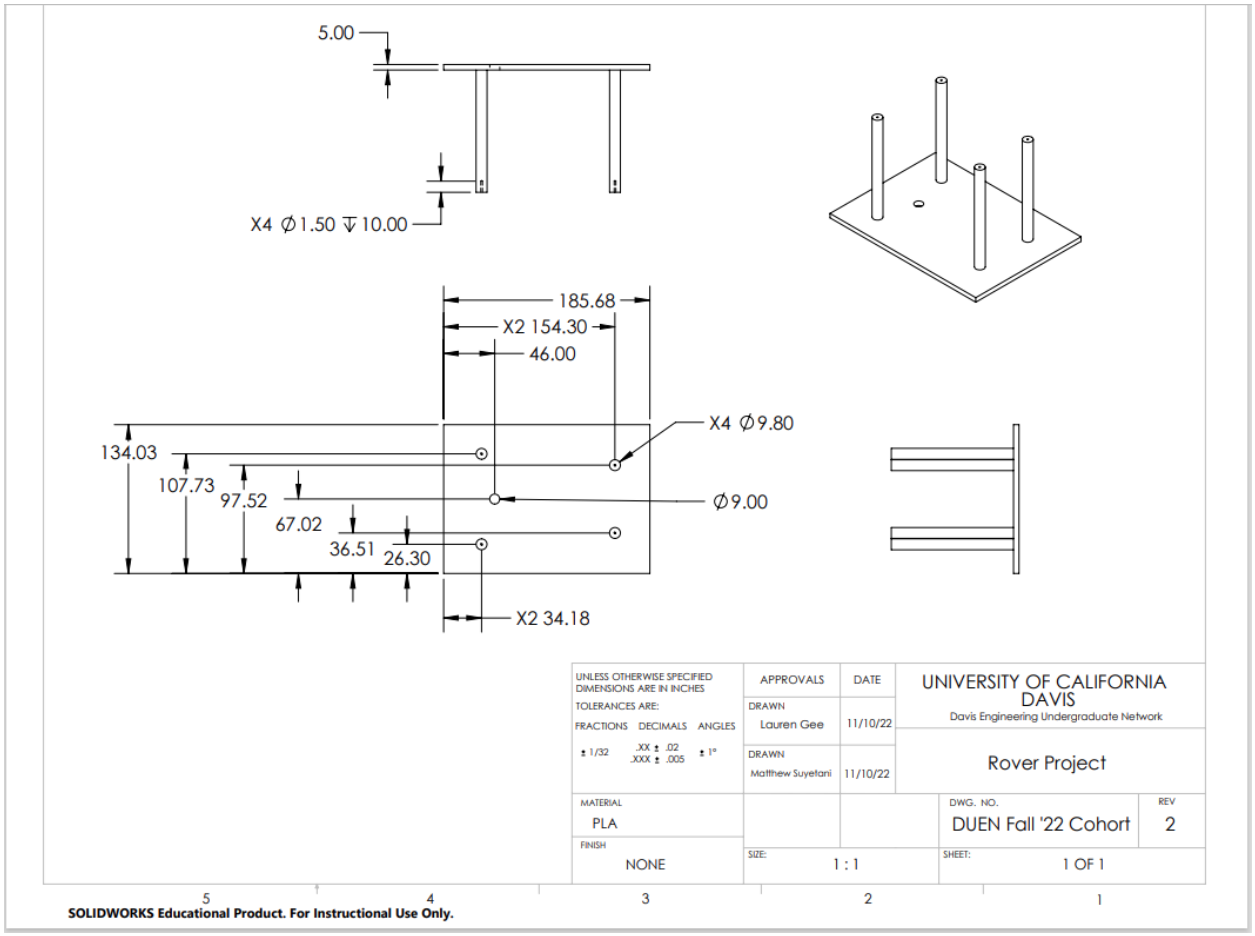


Version 1 (Flagpole):



Version 2:

-note: hole placement was fixed, the roofing was enlarged, and 3-D printed flagpole was scrapped for a wooden one instead



Frequently Asked Questions (FAQ's):

1. Q: What happens if water gets inside the rover?
    - A: Disconnect rover from power,
2. Q: What happens if one of the wires gets disconnected?
    - A: Disconnect the exposed wire from any electrical source. Consult the rover pre-build instruction manual to identify which pair needs to be connected again.
3. Q: What if the rover fails to complete its function?
    - A: Reposition the rover to its intended starting location and attempt the function again.
    - A: If nothing changes, turn the rover off and troubleshoot**
4. Q: How do you switch between the different modes?
    - A: Using the mobile app in Control Mode, there are five icons on the right of screen; Obstacle-avoidance, line-tracking, auto-follow, standby, and FPV modes. On the left side of the screen, there is the Rocker control which uses your finger to control motion using a virtual joystick. the remote/phone or pressing and holding the side button to toggle through the modes.
5. Q: How do I charge the rover?
    - A: The power bank is attached to the bottom of the rover. Connect the powerbank to a micro-usb output connector. It will illuminate a GREEN LED on the battery while charging and the LED will turn OFF when charging is complete.

Handling With Safety

Warnings and Safety Precautions:

- Assembly and disassembly process:
    - Ensure that when dealing with any electrical components that no power is plugged in
    - Handle the rover with ease as it is fragile.
        - Keep the rover off of high surfaces
    - Avoid utilizing electronics around close proximity of liquids

Timeline:

November 3rd:

During this meeting, Lauren, Matthew, and Richmond, worked on the preliminary construction of the rover. The main goal was to get as many components together as possible within a three-hour period.

November 4th:

During this meeting, Lauren and Matthew met to fully dimension the top outer covering of the Rover by using a micrometer and fully completed the CAD design and Drawing for the weather protection and flag holder through Solidworks.

November 5th:

During this meeting all members were present after the product presentation and reveal, Abubakr and Sherri worked on some of the final rover parts and the group finalized and started testing the rover movement paths and modes.

November 8th:

During this meeting, Sherri and Richmond worked on gathering the necessary components for powering the rover (breadboard, LEDs, Resistors, and power bank), and took the necessary dimensions needed to make sure all of these components fit together.

November 9th:

During this meeting, all group members were present at different times to work on different areas of the project. Richmond worked on the coding component of our rover, Matthew & Abubakr worked on the user manual, Sherri worked on the flag component, and Lauren & Matthew worked on the drawings/diagrams for the final CAD components. fixed a few parts of the camera biaxial bracket.

November 10th:

During this meeting, we all met up as a group and worked on attaching the weather protector/flag holder by taking apart the rover, allowing us to also realign the connections after strengthening the frame. We also collectively worked on the instruction manual and our presentation slides.

November 11th:

During this meeting, we all met up and debugged the code for the LED strips and fully mounted the table to the top of the rover, completing our construction.

We also met a second time later this day and finalized our presentation, slides, and user manual.