Team Swervin’

Sprint Review 1

Jackie, Lilo, Sophia, Yehya, and Dianna

Before we start ...
get ready to give
feedback!

Requirements

In each sprint review you should:

1. Present progress on an integrated system. This means that your demo includes mechanical functionality as well as electrical and firmware functionality. And, it means that those functional pieces work together as a system.
2. Identify aspects of the project that represent the most risk to overall success. This could be anything from not knowing where to purchase components or stock to having a team member be out of town for a significant period of time.
3. State/review the objectives of the project and revise them according to your risk assessment from step 2.
4. Establish and state one sprint goal for the upcoming sprint.

QUESTIONS

Content

Your presentation should answer the following questions:

1. What are the overarching goals of your project?
2. What does your Minimum Viable Product (MVP) consist of?
3. What are the individual learning goals of each member of the team?
4. What was the deliverable for this sprint?
5. What is the current state of your project/product? A **demonstration of an integrated prototype** that implements functional electronics, firmware, and mechanical systems is **required**.
6. What is the biggest technical risk your team is currently facing? How will you address that risk as soon as possible?
7. Based on what you've learned so far, has your target feature set changed? If so, how?
8. What will your deliverable be for the next sprint?

Our Project: Swerve Drive Robot

- Rideable holonomic mobility platform
- Each wheel rotates while also pivoting around the vertical axis
    - Can spin while traveling along any path
    - Maximum maneuverability

Why Swerve Drive?

- Team excited about creating an interactive transportation experience
- Interesting real life applications
  - Highly maneuverable wheelchairs
  - Next *hype* transportation device
- Challenging system that satisfies our learning goals

… it’s also just crazy cool

Project Scope

MVP

- Basic teleoperated swerve drive system
- Downsized to non-rideable dimensions

Potential Expansions

- Autonomous driving w/ obstacle avoidance
- Create art
  - Large scale chalk art
  - LED light show

Our Learning Goals

Yehya:

Learn integration of mechanical design, electrical, and software.

Sophia:

Work on design and CAD Skills, make more integrative designs.

Dianna:

Improve mechanical design and integration skills, gain confidence in design & validation.

Jackie:

Engage with all parts of the system with a focus on control code and integration.

Lilo:

Focusing on control code and integration to create a working robot.

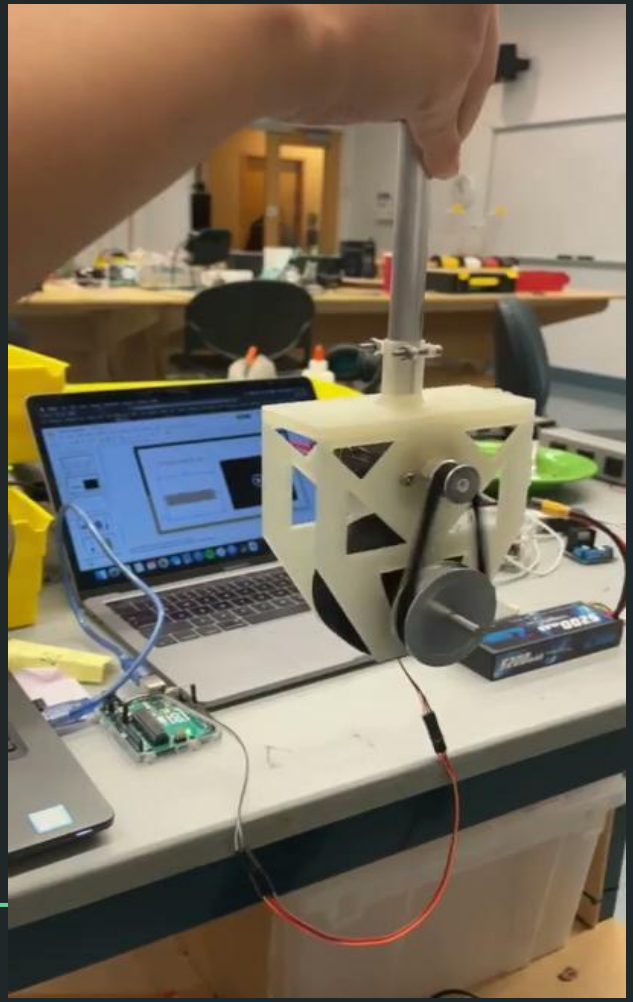
Sprint 1 Goal

Design and test a single swerve module, focusing more on mechanical.

Where we're at:

- Completed CAD of all of necessary components
- Tested the motors and controllers
- Fabricated parts and assembled the first wheel module

See it in action!



System Breakdown

Electrical:

Our electrical system will mainly consist of 8 motors and 4 motor controllers. We'd like to add an accelerometer + gyro if we have the budget and bandwidth, to enable additional capabilities.

Mechanical:

The mechanical system will be focused on designing and fabricating the mechanical components of the drive modules, as well as the frame to mount the modules and electronics.

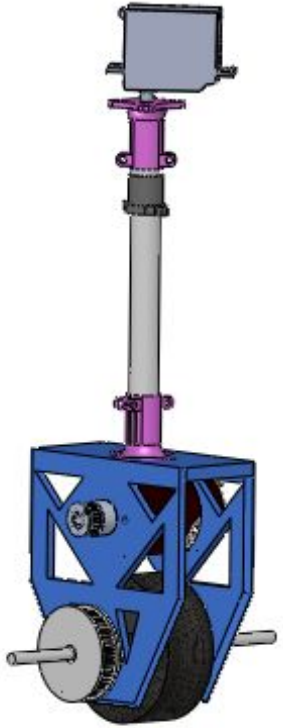
Firmware / Software:

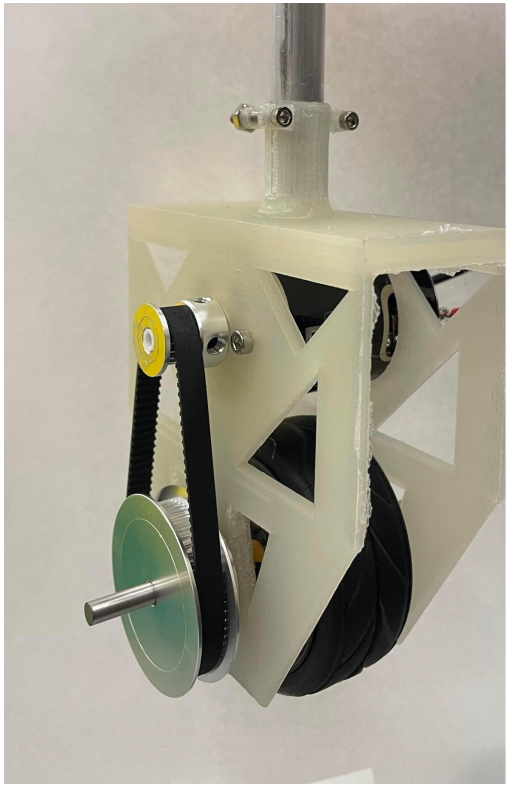
For the software, we want to use ROS on a raspberry pi to control our robot. The basic goal is to write teleoperated driving mode, stretch goal to create autonomous driving functionality.

Integration: This will all be integrated together to create our omnidirectional robotic platform

System Breakdown

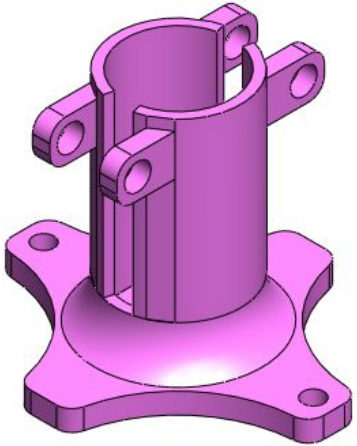
Mechanical: Swerve Drive Module Design



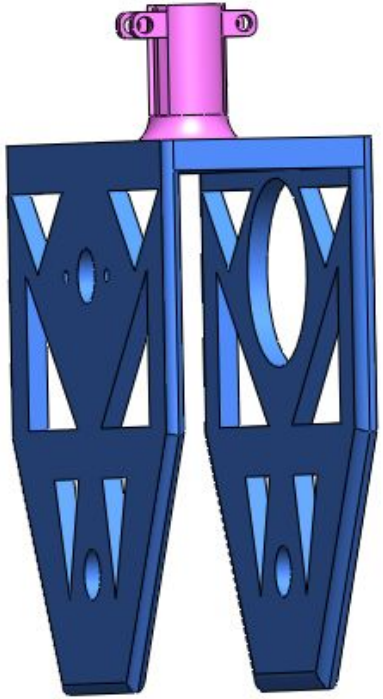


Mechanical: Swerve Drive Module Design

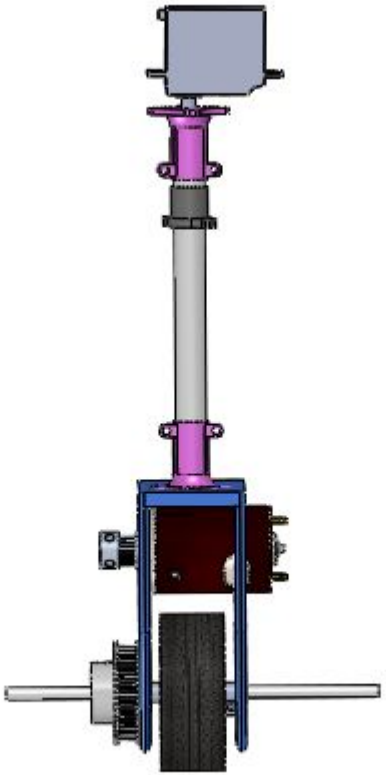
bushing



clamp/mount

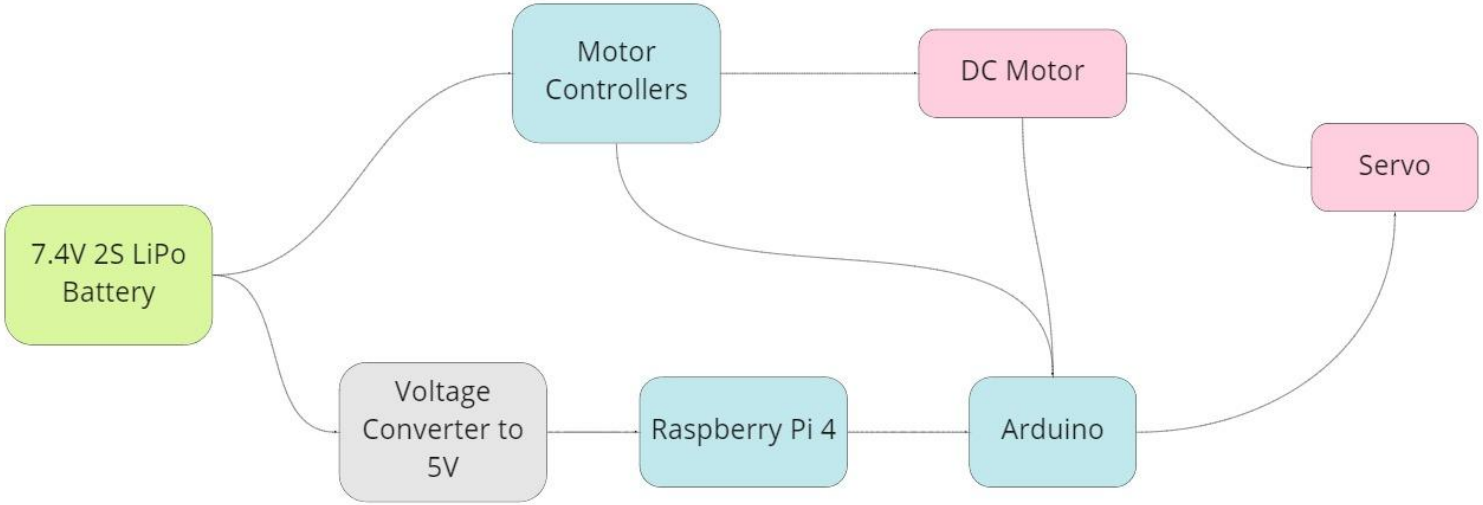


Wheel housing

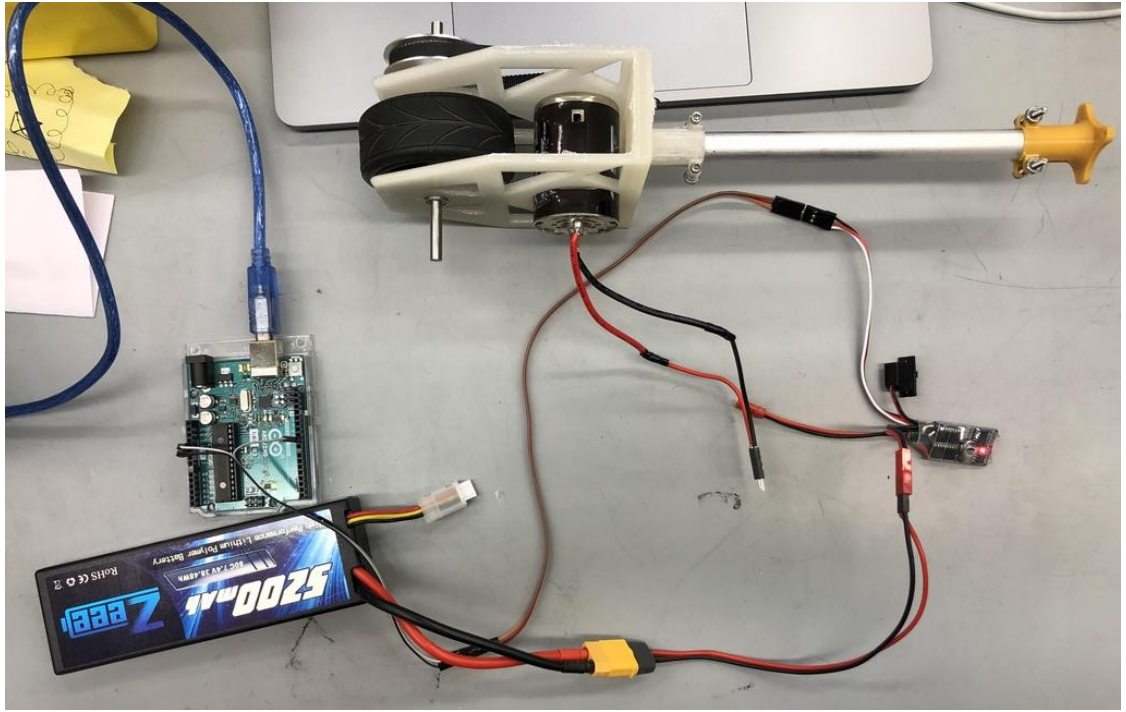


Full single module assembly

Electrical: Block Diagram



Electrical: Current Setup



Software

- Experimented with ROS and achieved minor success
  - Publish joystick input to a rostopic
- Pivot to controlling our motors with PWM on Arduino for simplicity
  - Bit behind on code due to time spent learning ROS
- **Next step:** motor and servo control
- **Stretch goal:** take input from gyro, accelerometer, encoders and use to program autonomous driving

Our Concerns ...

Mechanical

- Is the servo motor powerful enough for single module (everything needed for one wheel)?
  - Can it provide enough torque?
- Will our wheel work?
  - Module might be heavy... do we have to worry about the contact patch/ friction?
- Do we have to worry about highest loaded points?
  - Added bushings and bearings to help distribute the load but are concerned about servo, wheel, and gear shafts
- We decided to build a full module and test a fully integrated version... it seems like this currently is not an issue

We believe mechanical poses greatest threat to overall success due to its complexity

More Concerns...

Electrical

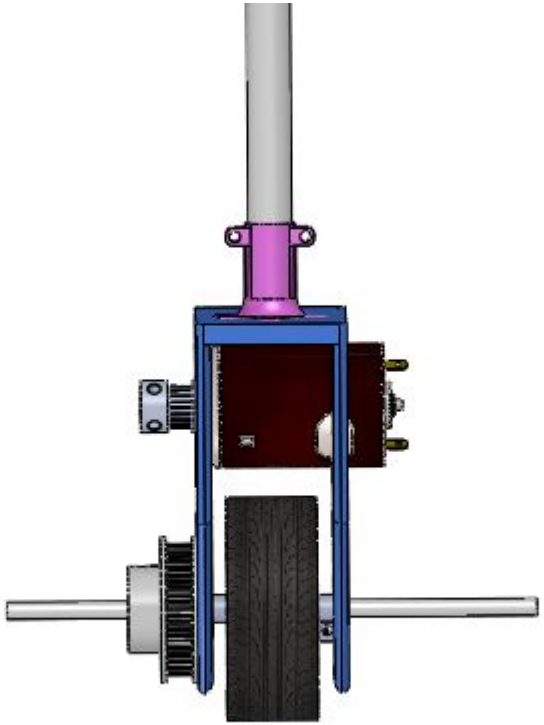
- Is it normal for our motor controller to get warm?
- Should we switch the type of motor controller we are using?

Software

- Should we write code for our motor controllers on arduino or pi? If pi, what library?
- How should we control PWM?

Next Steps

- Assemble the full four--module system
  - Build frame/platform to connect individual swerve modules
  - Mount all electronics onto robot
- Start driving code.
  - Experiment with all four swerve modules working together
  - Be able to control the robot motion using a joystick



Questions?
Feedback?
Advice?