

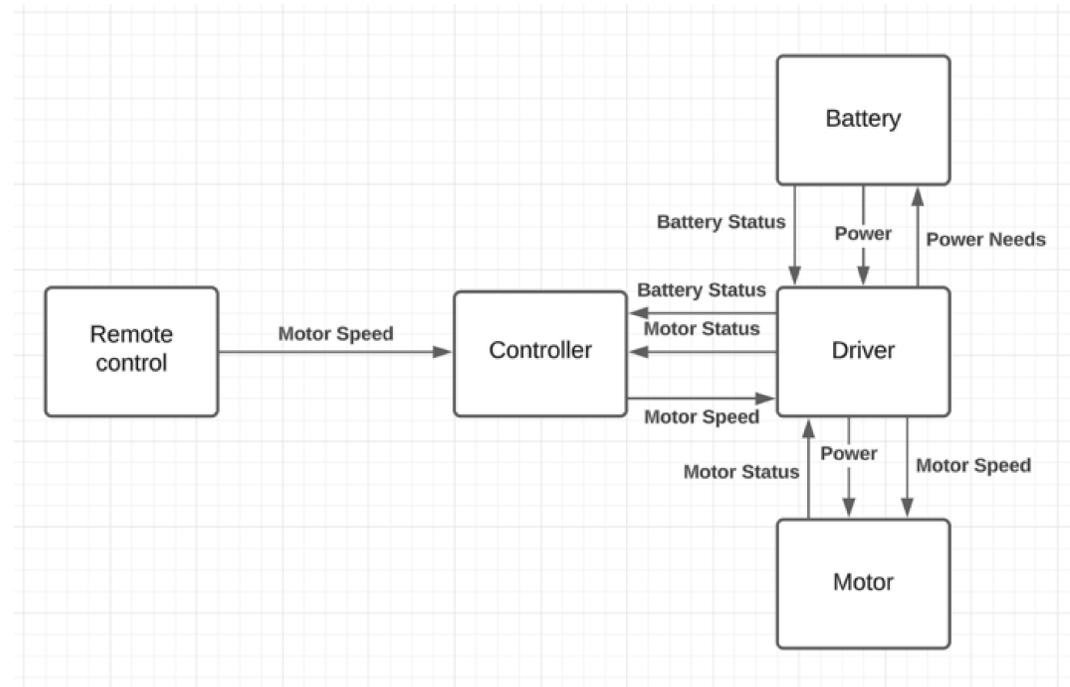
Electric Longboard

Project Goals

- Build an electric longboard from the ground up.
- Create a custom torque control feedback loop for smooth acceleration and braking.
- Integrate a wireless remote to control acceleration and braking.
- Achieve a top speed suitable for commuting (roughly 15 mph).
- Design and implement all electronics and software without using commercial ESCs or VESCs.
- Ensure safe and reliable power delivery using a custom battery and driver board setup.



System



Methods

- Planned hardware and developed system requirements.
- Acquired all hardware for the project.
- Assembled Microcontroller, remote receiver, driver board, brushless motor, 2 LiPo battery packs, Longboard, and gearing.
- Programmed the STM32 microcontroller in C which included:
 - Translate remote PWM signals into throttle commands.
 - A torque control feedback loop was designed to ensure the motor followed the desired torque command smoothly and accurately.
 - Implemented current control to avoid damaging the motor.
 - Implemented control of the gate driver on the driver board to open and close the 6 MOSFETs for proper motor control.
- Tested the finished board to verify that it met all system requirements.

Conclusion

- The system successfully controlled the motor using custom torque feedback and current control, meeting the original goal of smooth and safe acceleration and braking.
- The microcontroller, driver board, and power system functioned reliably under load.
- The project highlighted the importance of precision in embedded programming and power electronics design.
- Further improvements could include implementing regenerative braking which would make heat dissipation in the power resistor more efficient.
- In the future, I'd like to refine the controller for higher speeds, add more safety features, and explore adding another motor for improved acceleration.