

Project Overview

The Robotic Palm Tree Trimmer End Effector is a remote-controlled attachment for last year's Palm Tree Elevator Project, designed to safely trim California Fan Palm fronds. The goal is to enhance safety for palm trimmers, lower labor costs, and support wildfire prevention in Southern California.

The system was designed to allow a chainsaw to move circumferentially around the tree and radially adjust for trunk size. It integrates mechanically and electrically with the Palm Tree Elevator and uses a chain drive powered by a DC motor for rotation and a stepper motor for radial movement. All components run on a 115 VAC power source.

Meet the Sponsor

Max Marek Winiarz is a retired engineer and founder of Max Engineering, an entity dedicated to pursuing innovative engineering projects driven by passion and purpose. One of his key initiatives is the development of a robotic palm trimmer with the vision of saving lives by enhancing the safety and efficiency of palm tree maintenance, also helping towards the prevention of wildfires.



Meet the Team



ME Lead:
Brayden Chau



ECE Lead: Gianluca
Capirossi Donoso



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(ME)



Brandon Cooper
(ME)



Lauren Miracle
(ME)



Madison White
(ME)



Erianna Dayrit
(EE)



Jackson Rayner
(EE)

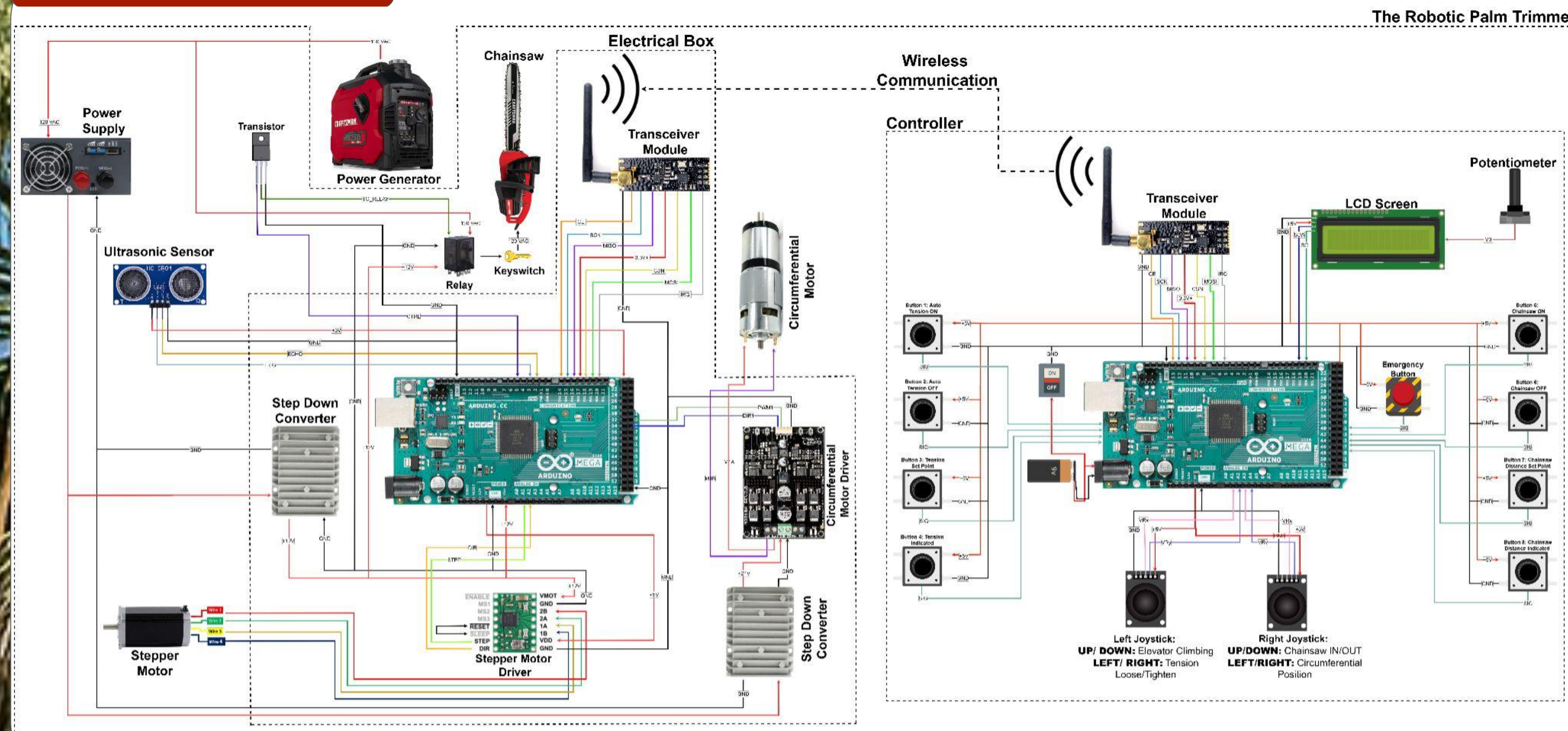


Abdul Karim
Tamim (COMPE)

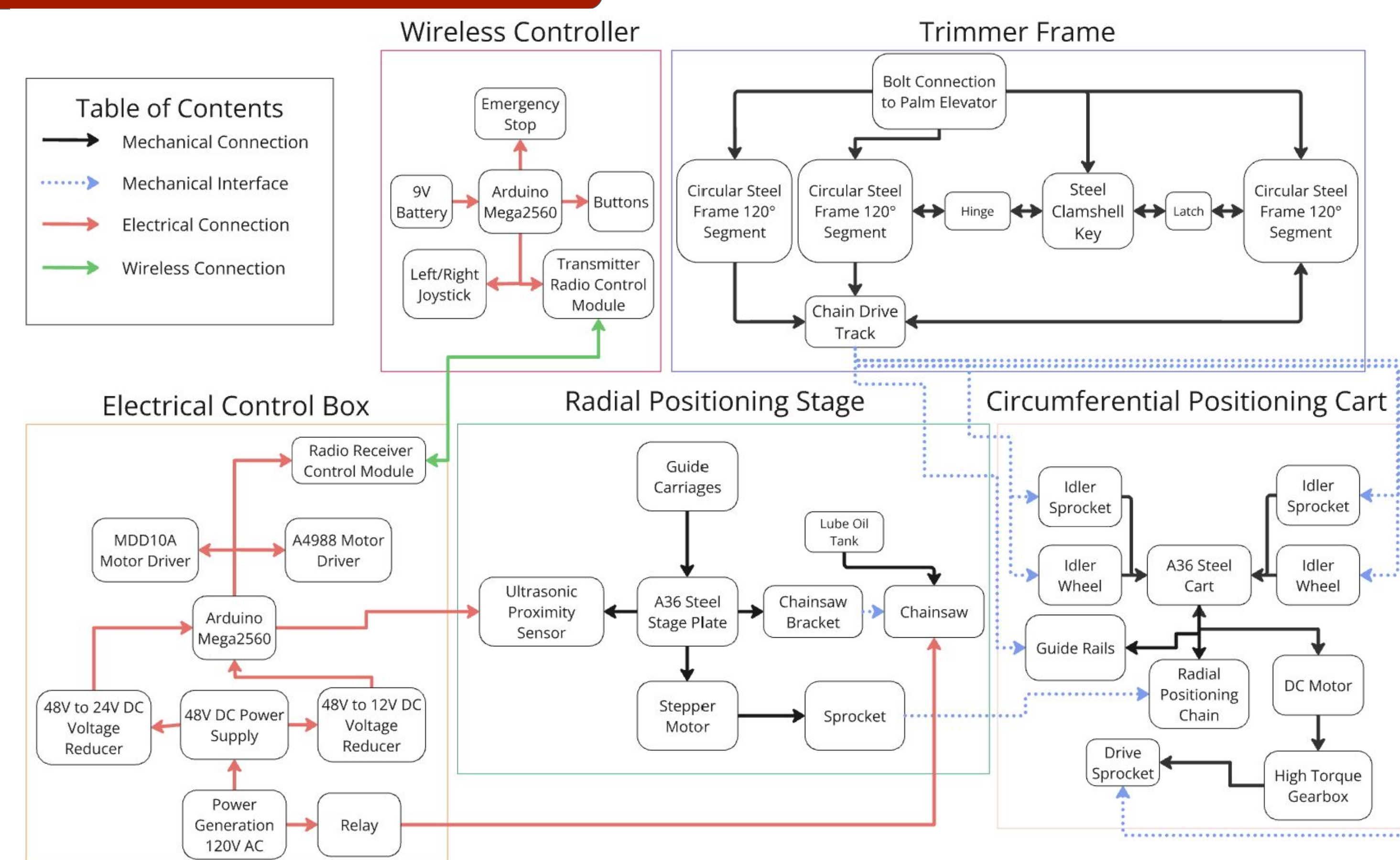


Leonardo Martinez
(EE)

Block Diagram



System Level Diagram



Key Components

Circumferential Trimmer

Frame: Three 120° steel sections form a 360° frame with a welded on 10-speed chain drive track. A key, hinge, and latch mechanism allows the frame to open 120° for easy tree mounting.

Circumferential Positioning Cart: A steel cart moves on the frame using a DC motor-driven sprocket, supported by four idler wheels for stability. Guide rails adjust for the chainsaw's radial position.

Radial Positioning Stage: Guide carriages slide on the rails and are moved by a stepper motor and 10-speed chain drive. A chainsaw stand is attached to secure the chainsaw's position.

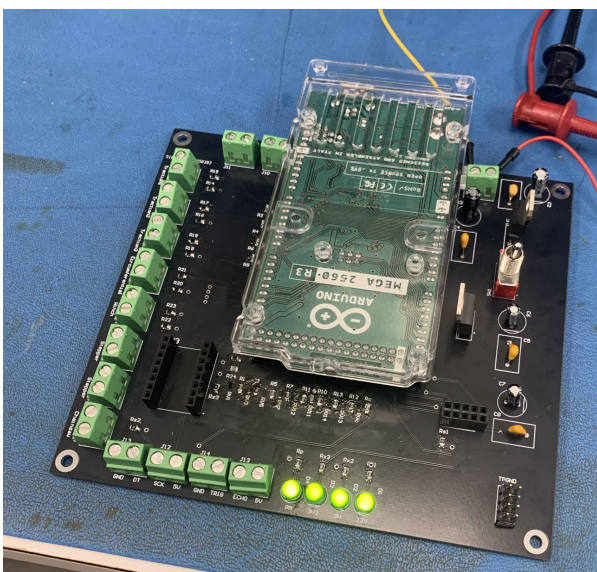
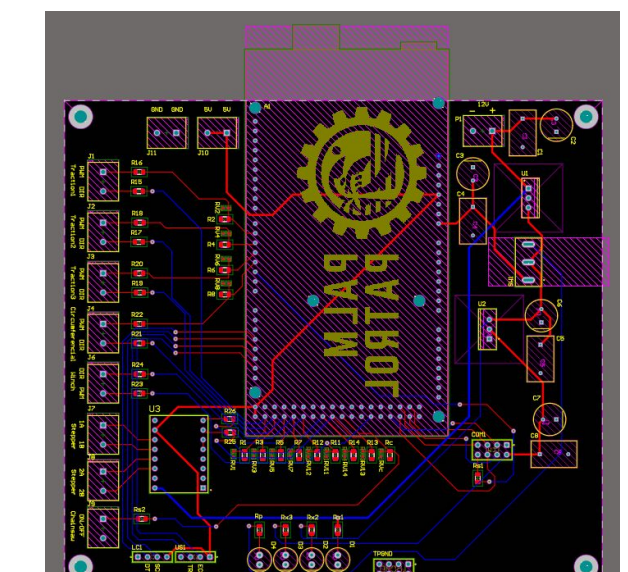
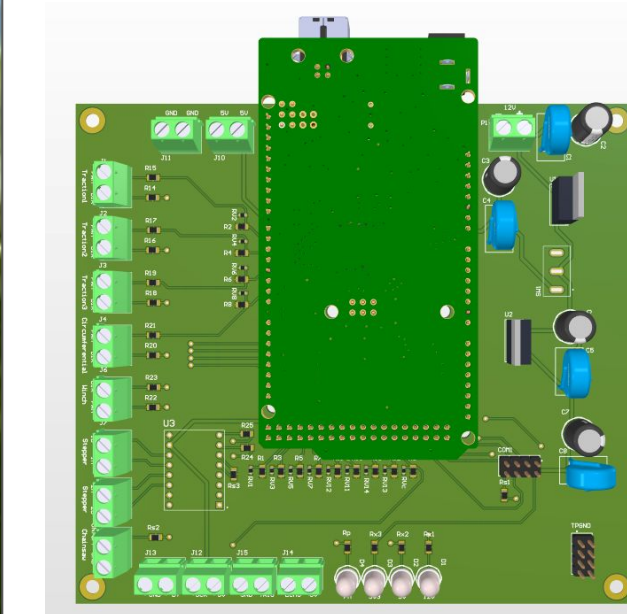


Chainsaw: A 16-inch corded chainsaw is secured with straps and is controlled by an Arduino Mega, sending a 5V digital signal to a gate driver circuit, which activates a relay to power the chainsaw with AC.

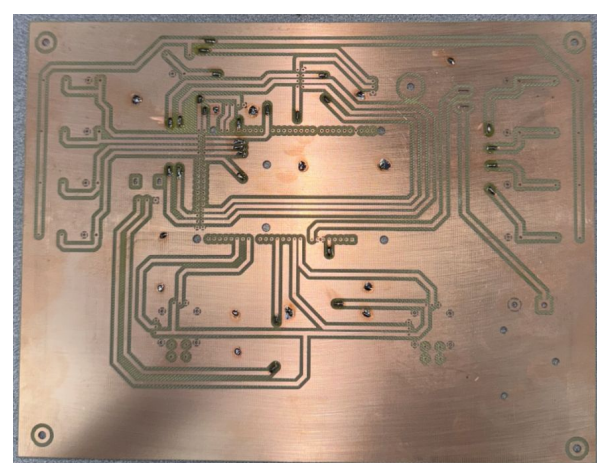
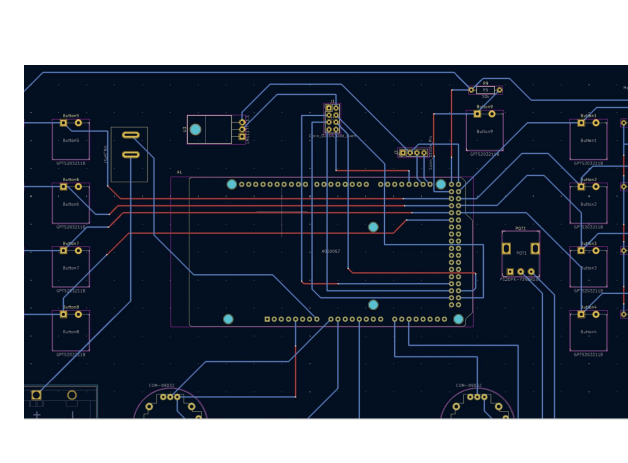
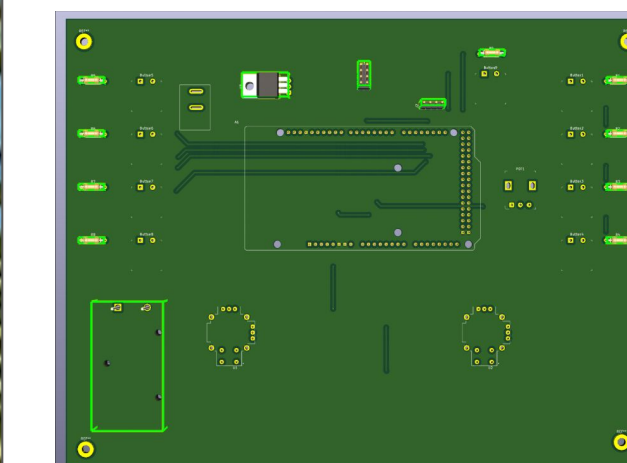


PCB Models

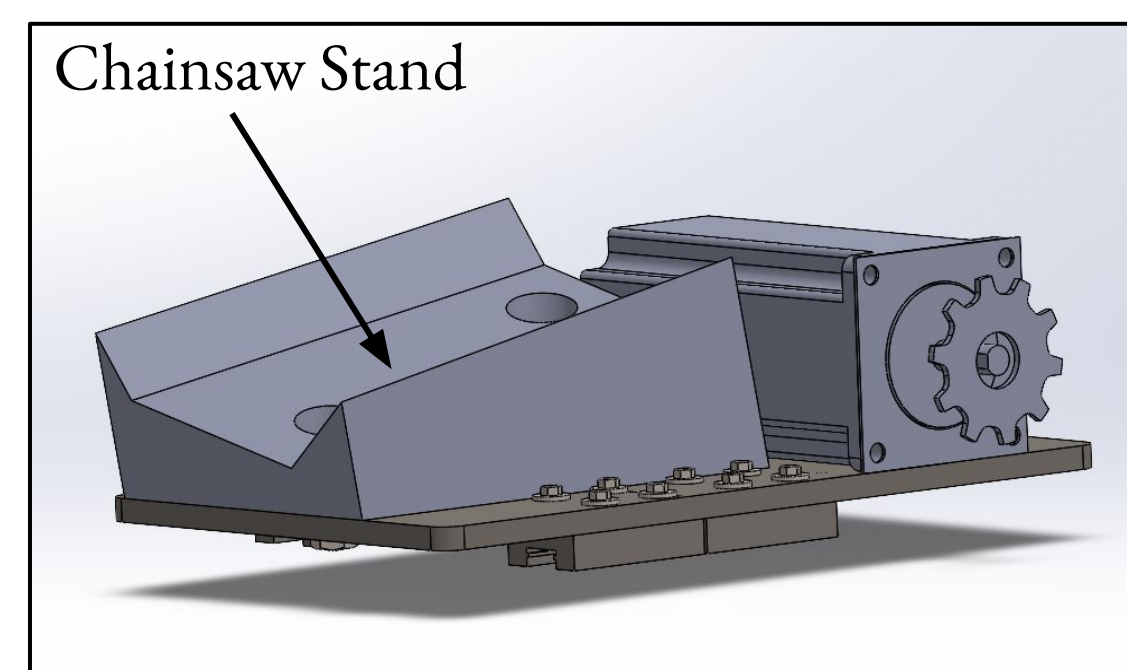
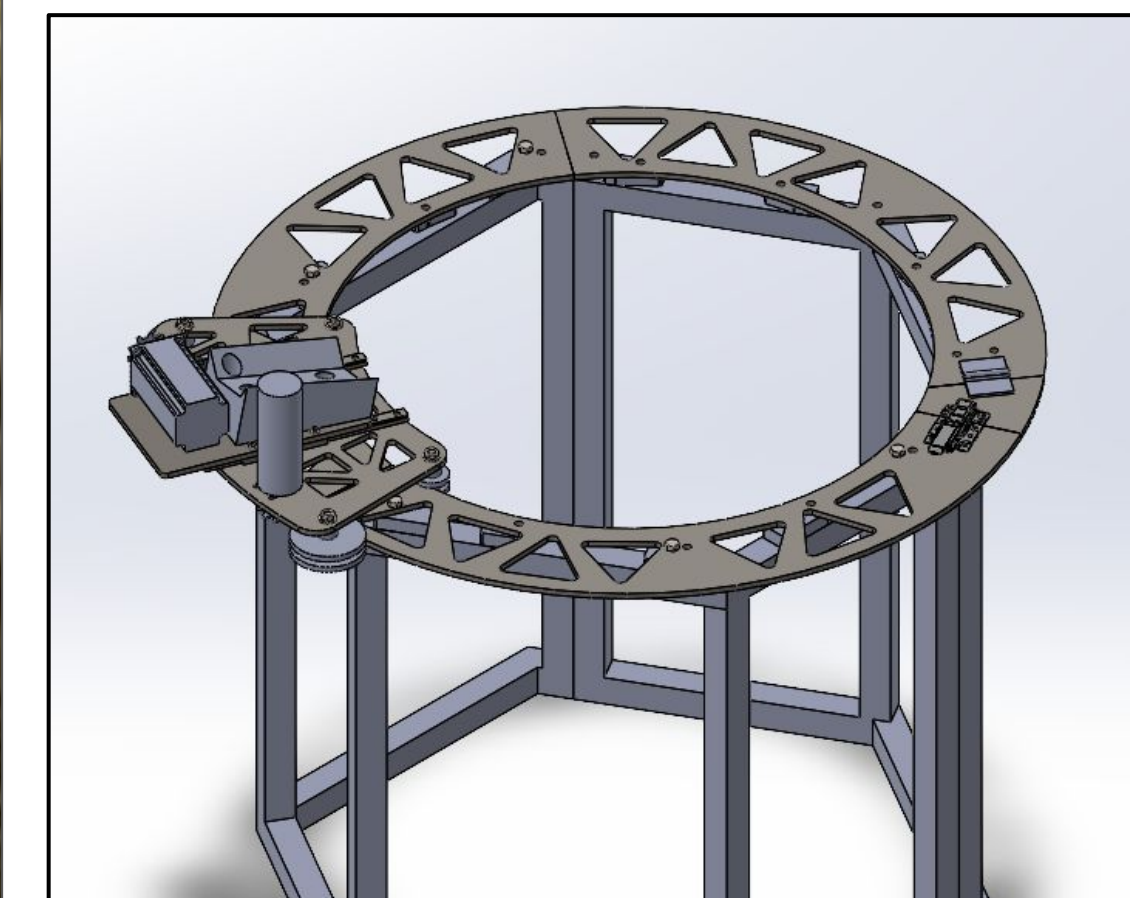
Electrical Box:



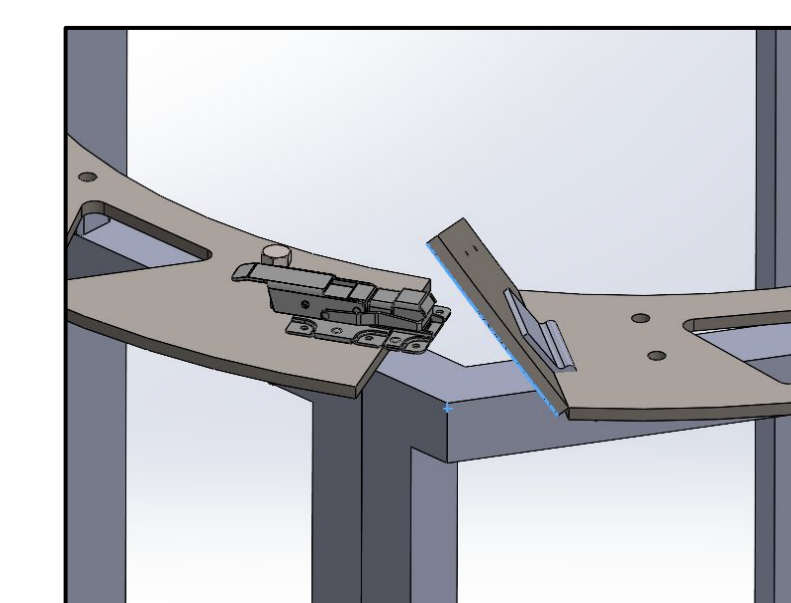
Wireless Controller:



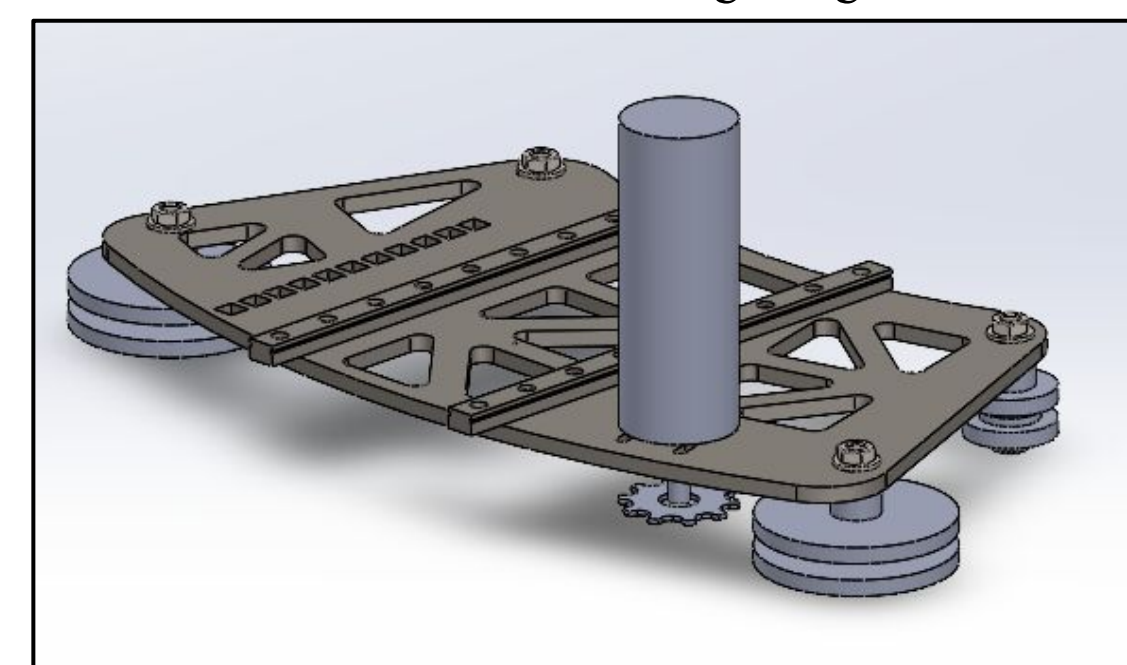
Assembly



Radial Positioning Stage



Key, Latch and Hinge



Circumferential Positioning
Cart

Acknowledgments

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Dr. Scott Shaffar, Professor Barry Dorr, Mr. Max Marek Winiarz, Mr. Michael Lester, Mrs. Louisa Burrus, Ms. Selena Jarin