AIMM Sensor-Side

Students: Nathaniel Acres, Shelby Altman, Mason Bledsoe, Mason Custer, Mitchell Dickman, Roger Ellyson, Cole Goodman, Coltin Haylett, Brogan Jones, Kyle Kirtley, Asher Markitan, Alexander Menelli, Daniel Siebeneck, Trenton Vanderkuyl
Advisors: Dr. Andrea Mitofsky, Dr. Kendall Teichert, Dr. Rizacan Sarikaya, Joseph Thompson

Introduction

Naval Surface Warfare Center Crane Division (NSWC Crane) with the support of the Office of Naval Research (ONR) will host the AIMM ICC April 26-28, 2024, at Pokagon State Park, Indiana. This event was created after Congressman Jim Banks (IN-3) led a congressional funding addition for a partnership between Trine University and NSWC. The unique partnership, funded by ONR, focuses on providing a low-cost, easy-to-build, low profile vessel (LPV) that can be made fully autonomous for a variety of mission sets; supply delivery system, stealth missions, locator purposes, etc. Crane focused on advancing the AIMM effort. The grant allowed Trine University to purchase state-of-the-art equipment used to aid in the design and construction of LPVs that will be distributed to each university participating in the challenge. Each university will not only receive a built LPV and sensor package but will also receive financial stipends to offset materials. Purpose of the challenge: To demonstrate the ability to make a fully autonomous LPV and develop solutions for a mixed set of objectives.

Methods and Testing

- The boat must be fully autonomous
- During assembly of the boat electrical system, push-pull and continuity checks were conducted on all connectors and wires to ensure a reliable system.
- All Wires and components will be waterproof or have a waterproof enclosure for dependable performance in an aquatic environment.
- Push data from OAK cameras through a neural network to train for detection of course objects and colors.
- Simulate the vessel and its propulsion system in Unity.
- Using the simulation, train the artificial intelligence that will drive the boat.
- Submerge the boat and verify that the AI can operate the boat in a real-world environment.
- Create a functioning crane that will sit atop the boat.
- The Jetson and crane controller will communicate with an onshore laptop for live feedback
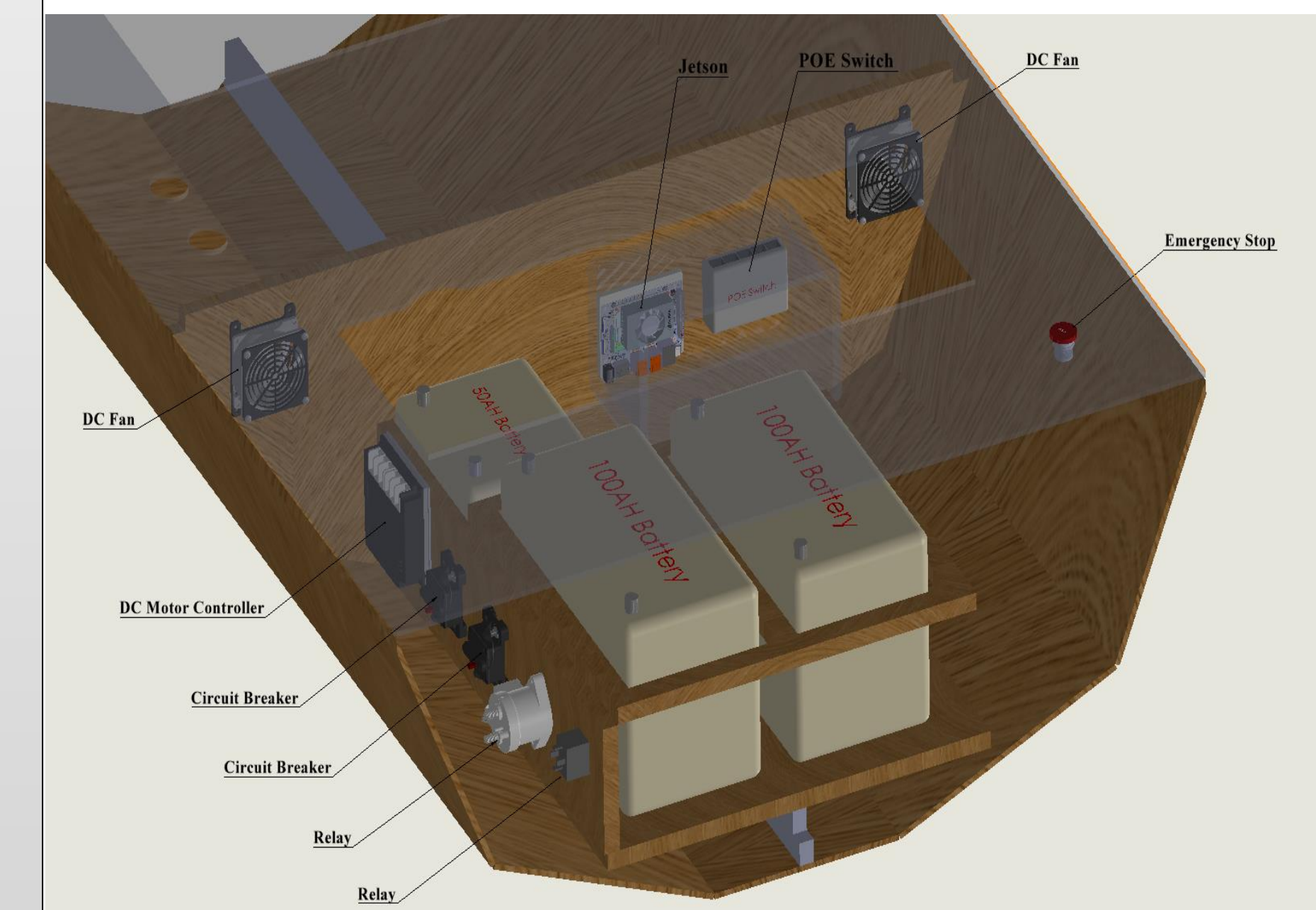

Figure 1: Action Photo of boat in the water
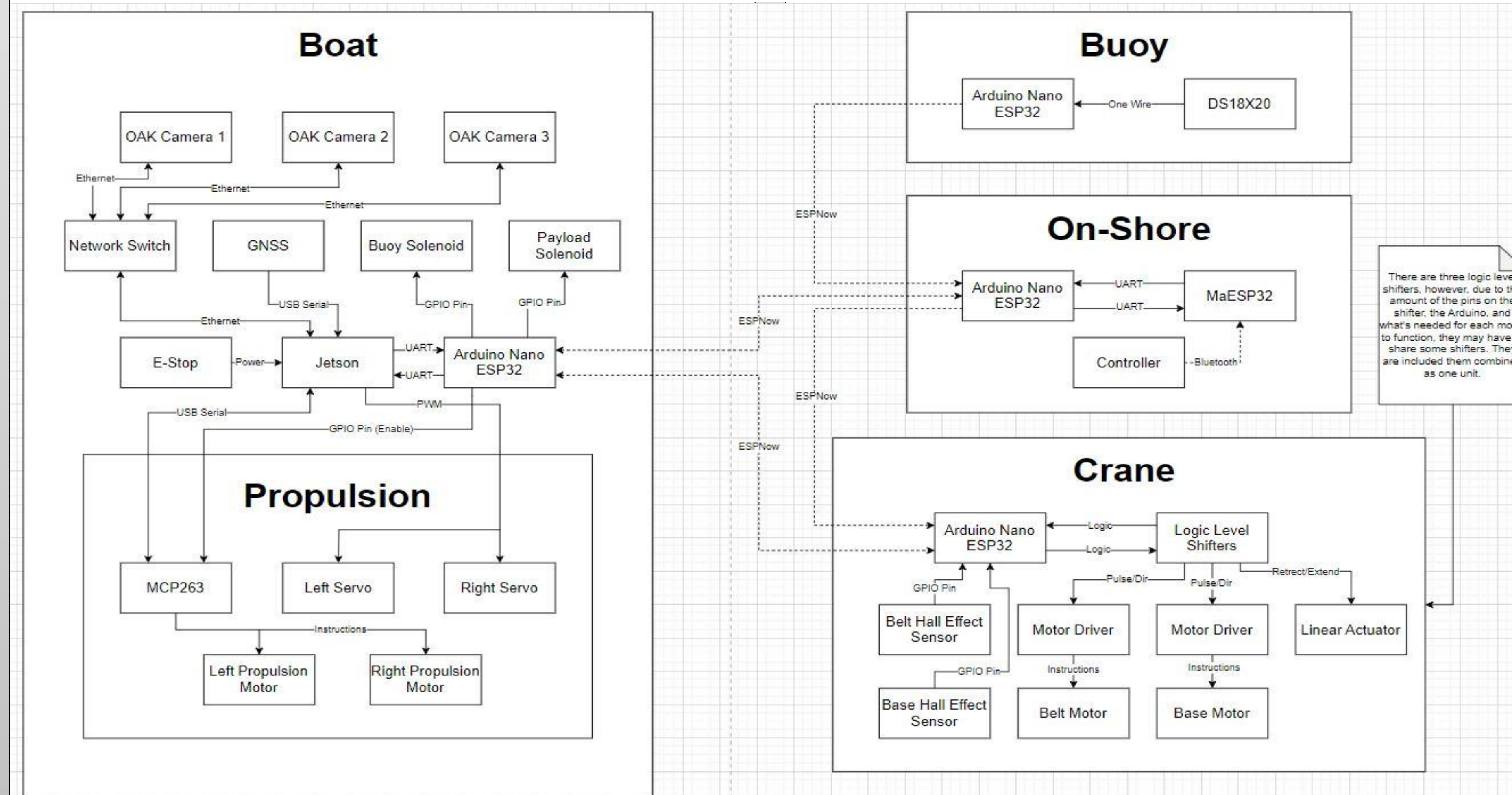
Figure 2: Component Communication
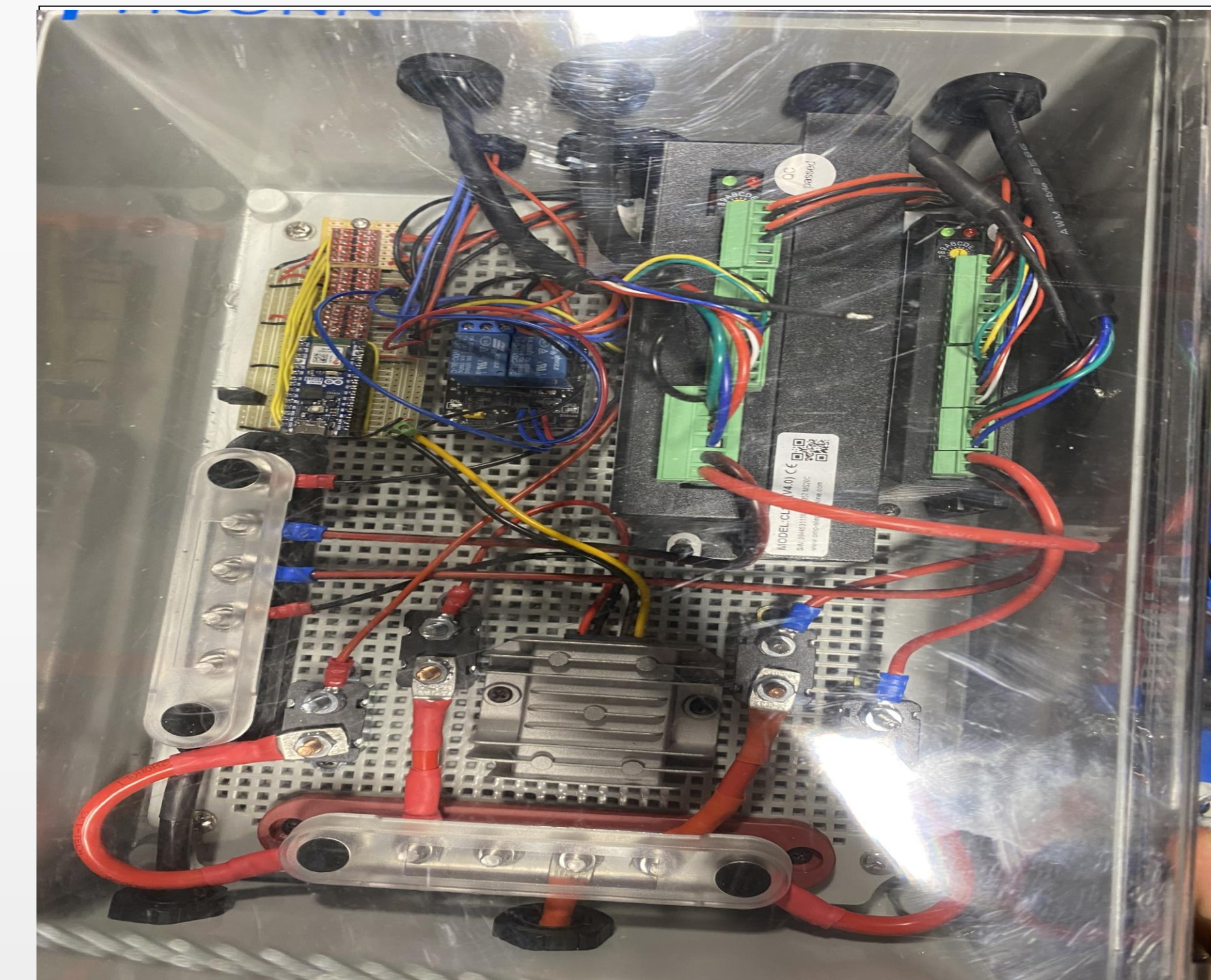
Figure 3 : Crane Electrical Box

Figure 4 : Propulsion and Vision Power Bank

Acknowledgements

As the Trine team worked on the project, there were a few organizations and people that helped to reach a fully developed design. A special thanks goes out to the Trine faculty and staff that advised the team during the design and manufacturing phase. Another thanks goes out to the Crane advisors that gave the team the project to work on and helped with many decisions, competition or creative-wise, giving the team many opportunities to ask questions for clarity. One last thanks goes out to the Steuben County YMCA, in particular the aquatics director Steve Lake. Steve allowed the team to run crucial tests in the YMCA pool, when weather prevented the team to test in local bodies of water.