Introduction & Motivation

Troubles Finding the Rocket

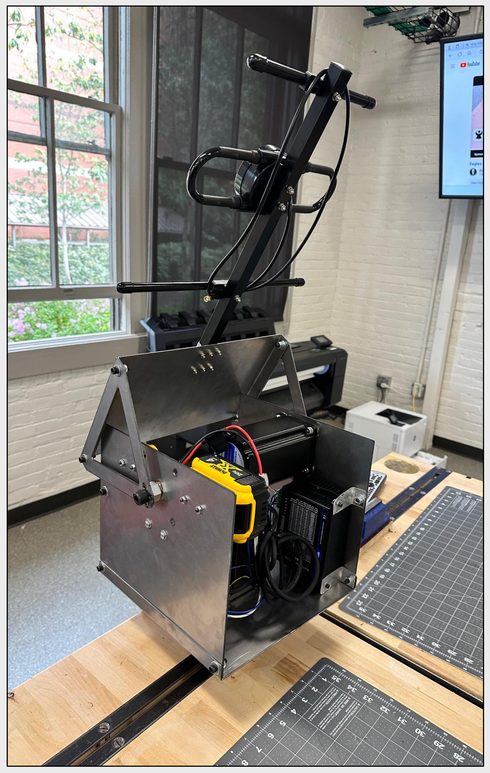
- 2023 HART spent 8 hours alone trying to recover their rocket in the California desert.
- Computers on board tend to malfunction which leads to loss of tracking capabilities.
- Cut down on recovery time by creating automatic antenna tracker.
- Creating new data reception.

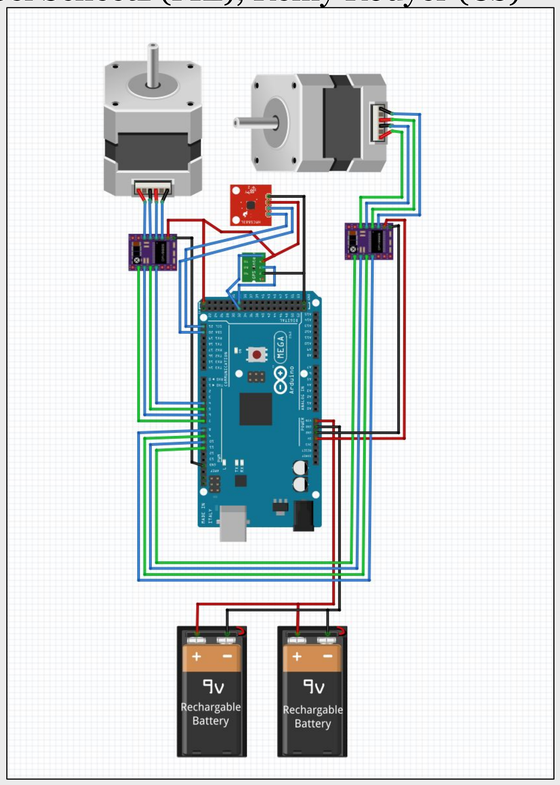
AUTOMATIC ANTENNA TRACKER (HART)

High Altitude Rocket Team

Advisors: Dr. Greeven

Team Members: Bryan Trapala (MFGE + ME), Carson Craig (MFGE + ME), Ian Spehar (ME), James Cross (ME), Joel Scheetz (ME), Rémy Rouyer (CS)





Mechanical & Manufacturing Sub-Team

Our team started this term by taking an alternative approach to our meeting times and activities. While continuing to have our full team meetings, we now have additional sub-team meetings. We have our manufacturing and mechanical team as well as our coding and electronics team. Our manufacturing team this term has prioritized staying ahead of the overall game plan, and wanted to ensure we would not be a bottleneck to the team. This included getting our sheet metal manufactured as soon as we could, based off of the CAD work that our team has been working on diligently for the past two terms. We only made sure to order the necessary consumer off-the-shelf components that were required by both sub-teams. Finally, we wanted to make sure that our automatic antenna tracker would be able to support various applications in the future, such as swapping antennas. We made sure we could fit this criteria of modularity and flexibility through our extensive prototyping process, from both sub-teams.

Computer Science & Electronics Sub-Team

The computer science and electronics subteam was created to divide the work in order to maximize team efficiency. This sub team's focus is on the coding and electronics side of the project. Its main responsibilities include figuring out how to receive GPS coordinates from the Telemega flight computer, developing the Arduino tracking code to align the antenna using those GPS inputs, and putting together the dual-stepper motor setup that will be used to keep the antenna pointed at the rocket. There have been some changes in methodology over the course of the project. The initial plan was to gather the flight computer GPS data directly through the code of the flight computer's companion software, AltOS. This was not working due to issues with the code provided by the flight computer manufacturer. The updated plan is to use AI to read the coordinates from the user side of AltOS. This will allow us to acquire the live data needed for a successful prototype.

Challenges & Learnings

Coding Issues

- Compiling the Open Source AltOS UI from Altus Metrum to be able to make a custom fork to serve real time positional data to feed into the arduino code was a large challenge. We never got the original nor fork to compile correctly so we ended up doing screen capture and optical character recognition to get real time data output from AltOS UI.
  Learnings: *Sometimes you have to change plans when things aren't working regardless of how much time and effort you put into your original plan. You also have to think out of the box and a realized non-optimal solution is better than a unrealized optimal solution that won't be delivered on time.*
- The Arduino code for adjusting the antenna based on GPS coordinates is complex, involving intricate mathematical and logical calculations. Adding new features, like integrating a GPS module into the antenna for automatic positioning, requires thorough testing. Challenges with receiving coordinates from the flight computer have also hampered realistic testing of the code.

Attaining Materials

Our team experienced issues with ordering parts, leading to parts not arriving until the end of the first term of this project. Our team had to work through leadership within the AIAA club, and there was a slow response time. We worked through this issue by reaching out to other supervisors and asking for status updates every day.
Learnings: always allow for an immense amount of time when it comes to part ordering.

Testing

Our project has relied heavily on receiving real time data from the on-board GPS computer. Without real time data, our arduino code that is loaded onto our prototype could not be tested thoroughly. Due to the GPS computer's OS being open sourced but not compiling correctly, our team could not do any live testing. Our team relied heavily on passive data testing, which led to only a little time at the end of the second term to filter out all of the live data testing bugs.
Learnings: one cannot always rely on their initial plan. Always have back up plans even if the path seems simple.

Oregon State University