Week 10

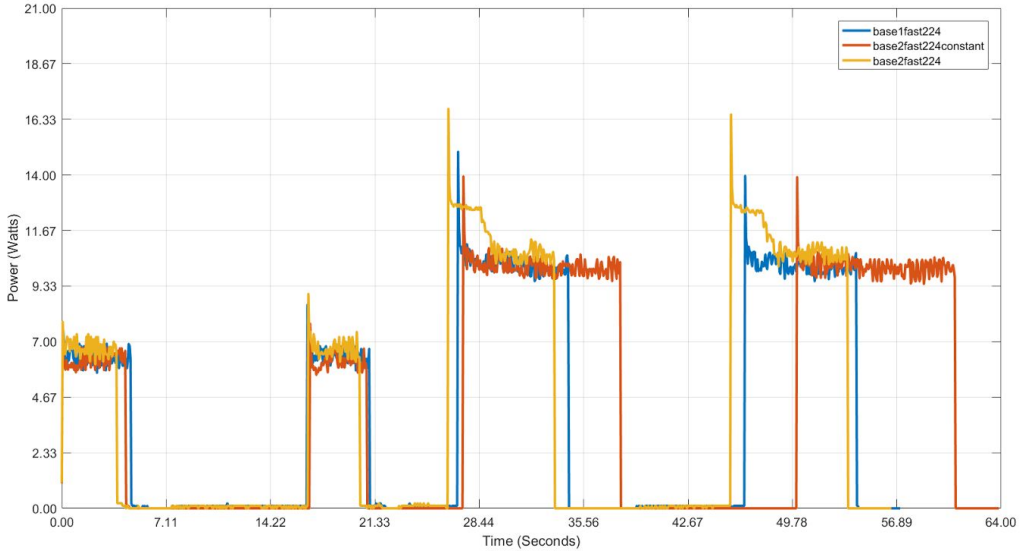
Situation

This week the group tested the new base against the old base with the same code to try and reduce the amount of energy used by the AEV. By running the AEV on the track and analyzing the EEPROM data, it was discovered that the lighter custom base required more energy to complete the scenario code, contradicting our hypothesis. The group is still unsure as to why the custom base required substantially more energy than the supplied base. When the custom base was used with a different set of code utilizing a higher powered boost for the return trip, the energy used was reduced despite running on a higher power setting.

Results and Analysis

Following the test runs conducted this week, the group determined that the lighter, custom AEV base used 270.19 J to complete the run. Despite the new base being almost 49% lighter than the custom base, the energy used for the run is 25.5% higher than the 215.51 J that the heavier, supplied base used with the same code structure. The team also ran the new base with a set of code that had a boost on the return trip to allow for faster acceleration. Despite the higher power setting, this run used just 224.01 J. Although this is still higher than the 215.51 J used by the heavier base, it is significantly less than the run where we kept the code the same. The graph of power vs time for each of the three runs can be seen below:

Figure 1: Power vs Time of Each of the Three Successful AEV Runs



As can be seen on the figure, the blue graph is the original run on the old base and the orange graph is the run on the new base with the same code. For the orange graph, the return trip with the cargo, the AEV ran for a substantially longer time than the other two runs. The group is still unsure as to the cause of this and is still trying to identify solutions to this problem.

Takeaways

Despite seemingly going against logic, the heavier base used the least amount of energy to complete a run, suggesting there is another variable the group is overlooking that can significantly impact run efficiency. Instability caused by a change in weight distribution and a shift in center of gravity also contributes to run inconsistencies and the group will try to remedy this issue.

Week 11

Situation

The upcoming lab 11 will be the final performance test of the AEV. Consistency is now the primary concern for the group as having repeatable, successful runs is the main goal of the AEV, although energy efficiency is still a close second. To optimize the run to use the least amount of energy and try to make runs more consistent, the group is writing a new set of code that utilizes a while loop to check the amount of marks travelled. This will allow the AEV to adapt to differences between each track or run, increasing consistency. This code will also feature bursts of power and coasting rather than running constantly, hopefully reducing the total amount of energy used.

Goals for Week 11:

- Have a successful run with AEV use less than 200 J
- Develop code that allows the AEV to make three consecutive successful runs
- Bring project portfolio up to date and improve graphical presentation

Weekly Schedule

To Do	**Team Members**	**Start Date**	**End Date**
Optimize/redevelop AEV code	Albert, Carlos	3/31/2017	Ongoing
Test code with final design	Albert, Carlos, Tyler	4/5/17	4/7/2017
Process data	Albert	4/7/2017	4/7/2017
Work on progress report	All members	4/5/17	4/7/2017
Add to project portfolio	James, Tyler	4/7/2017	Ongoing
Finalize Draft for Presentation	All members	4/4/17	4/5/17

Appendix

Team Meeting Notes

Date: 4-April-2017
Time: 1:50 pm (Face to Face)
Members Present: James Pfeifer, Albert Hsu, Tyler Wang, Carlos Perez-Oviedo,
Topics Discussed: AEV Design, Efficiency Problems

Objective:
Determine a plan going forward since the anticipated higher performing design underperformed below expectations and now the final design choice remains uncertain.
To do/ Action Items:

- Review energy used data between the streamlined design and the original design
- Determine the best code out of the few developed for the assignment
- Determine if it was the code or the vehicle responsible for the less efficient trial
- Determine the final design for final testing

Decisions:

- “Streamlined” alternative design is less efficient than originally assumed and less efficient than the other design chosen from a previous lab
- Original design will serve as the final design

Reflections:

- Balance of the vehicle is essential to the performance of the vehicle

Arduino Code

```
// Original base
  reverse(4);
  motorSpeed(4,25);
  goToRelativePosition(187);
  brake(4);
  goFor(12);
  motorSpeed(4,25);
  goToRelativePosition(193);
  brake(4);
  goFor(6);
  reverse(4);
  motorSpeed(4,40);
  goToRelativePosition(-234);
  brake(4);
  goFor(12);
  motorSpeed(4,40);
  goToRelativePosition(-247);
  brake(4);

// Custom base, constant power
  reverse(4);
  motorSpeed(4,25);
  goToRelativePosition(174);
  brake(4);
  goFor(12.5);
  motorSpeed(4,25);
  goToRelativePosition(172);
  brake(4);
  goFor(6.5);
  reverse(4);
  motorSpeed(4,40);
  goToRelativePosition(-270);
  brake(4);
  goFor(12);
  motorSpeed(4,40);
  goToRelativePosition(-290);
  brake(4);
```

```
// Custom base, boosted return
  reverse(4);
  motorSpeed(4,25);
  goToRelativePosition(154);
  brake(4);
  goFor(13);
  motorSpeed(4,25);
  goToRelativePosition(162);
  brake(4);
  goFor(6);
  reverse(4);
  motorSpeed(4,45);
  goFor(2);
  celerate(4,45,40,1);
  goToRelativePosition(-200);
  brake(4);
  goFor(12);
  motorSpeed(4,45);
  goFor(2);
  celerate(4,45,40,1);
  goToRelativePosition(-210);
  brake(4);
```