Week 9

Situation

This week, the team worked on completing Performance Test 2. This set out the objective of testing the team's chosen AEV design with two differing Arduino code sequences controlling its runs. The team, keeping in mind the considerations laid out in the Mission Concept Review, observed the differences between the two runs to determine which code solution would result in the most optimal performance. As the team operated in two different labs with two different tracks, a key necessity was to make code resilient enough to provide consistent operation on both tracks. Energy efficiency of the code was also a consideration.

Results & Analysis

Continuing from the previous lab, the team had issues getting the code to work correctly. Somewhat behind, the team was still working on getting the AEV to consistently stop at the first gate. Reversing the motors' directions and applying power to force the AEV in the opposite direction of its travel was the chosen method of the team for "braking" the AEV in a consistent spot every time. However, consistent failure was experienced in getting the AEV to stop quick enough. Numerous test runs were conducted, with code being adjusted between each run in order to pin down the problem area. Eventually it was determined that the motors were not running at a high enough speed to perform the braking. By increasing the speed of the motors in this stage to 40%, the team had consistent success with stopping the AEV in the correct position.

The team then moved on to extending this code to complete the full mission. After having the AEV wait for 7 seconds for the gate to go down after stopping, the team moved on to sending the AEV down the rest of the track to pick up its cargo at the end. This was seen as an easier task, as the AEV did not have to stop perfectly as long as it hit the magnet on the cart. After several attempts, somewhat hindered due to one of the propellers flying off, the team were able to pick up the cargo. Moving on to the code to bring the cargo back, the motors were reversed and power was applied. Here, more power was required for the motors as significantly more weight had to be pulled. A process of trial and error was used to get the speed right. The team had to program this part of the code to bring the cargo back to the gate and once again, stop in the proper spot before the gate to activate the first sensor without activating the second.

While working toward accomplishing this goal, the team had two incidences of the propeller once again flying off of the motor during its run. An initial consideration was that the motors might be spinning too fast for the propeller, but this was determined to not be the issue as it was clear that other groups were able to move their AEVs at such speeds without a problem. With the assistance of a TA, the group determined that a replacement propeller would be needed to do the job. The new part was obtained and some tests were run with it, showing success as the new propeller did not pop off. This incident, however, consumed a lot of the group's time.

Due to these constraints, the group did not have a lot of time to test two different kinds of control code for the Arduino. The team was able, however, to test a different code sequence utilizing relative position rather than absolute. For the team's first sequence of code, the commands telling the AEV which positions to navigate to were denoted in absolute position. This meant that each command would specify the total number of marks from the point the AEV started at. The team's second sequence of code replaced these with relative position commands, of which each causes the AEV to travel a distance relative to the last position it was at. This made things somewhat easier in terms of the actual writing and understanding of the code; for instances in which the AEV was to travel the same distance, the same exact command could be used rather than needing to account for the relative position that each desired ending was at. Additionally, clarity was added due to the fact that negative position commands corresponded to movement in one direction, while positive corresponded to movement in the other direction. Apart from this difference, no change was noticed in the performance of the code itself. However, the increase in code readability may make it more preferable for future labs.

While the group may not have an exact idea of what the final code will end up looking like, some basics will be consistent throughout all programs. For instance, the group determined the distances between the critical points of the track, as well as any pertinent wait times for the gates to open. The table below shows the breakdown of this data.

Table 1: Phase Breakdown of AEV Mission

Phase	Distance (ft)	Wait Time
1(To Gate)	17.28 ft	
2(Wait For Gate)	0 ft	7 seconds
3(To Cargo)	17.28 ft	
4(Back to Gate)	17.28 ft	
5(Wait For Gate)	0 ft	7 seconds
6(To Beginning)	17.28 ft	

Week 10

Situation

In the coming week, the lab will follow the previous format of Labs 8 and 9. This lab will be dedicated to the energy optimization of the group's AEV. Using the finalized AEV design, the group will test many variations to the code, adjusting very minute things. Through data analysis, the group will observe how each variation to the code decreases the energy that the AEV uses. Alongside adjustments to the code, the group will also attempt to adjust physical aspects of the AEV design.

There are several possibilities that the group will pursue. Up to this point, the program had employed a reverse command to assist with the braking of the AEV. This is because the brake function only cut power to the motors in past runs. The AEV still moved forward, as inertia carried the vehicle forward, thus leading the group to use the reverse command. The reverse command, however, used a notable amount of energy. In the coming lab, the group will look for alternatives to the usage of the reverse command in order to alleviate the energy use. Another possible adjustment could be the usage of a different support arm. Until this point, the group had used the L-support arm on the AEV design, but never considered the T-support arm. If time permits, then the group will test the T-support arm and observe any changes in energy consumption.

Weekly Goals

1.) Complete the Progress Report for Lab 10A by the deadline of Monday, April 3rd and submit it on Carmen.
2.) Brainstorm solutions to reducing the AEV's energy consumption.
3.) Add the Progress Report from Lab 09 to the project portfolio on u.osu.edu.
4.) Organize the project portfolio on u.osu.edu after the addition of this progress report.

Weekly Schedule

Task	**Teammate(s)**	**Start Date**	**Due Date**	**Time Needed**
Complete Progress Report for Lab 10	All	3/31/17	4/3/17	3 Hours
Add all needed Lab Documentation up to Lab 10 to the Project Portfolio	All	4/2/17	4/21/17	30 Minutes
Organize the Project Portfolio on U.osu.edu	All	4/2/17	4/21/17	30 Minutes

Appendix A

Date: 4/2/17
Time: 5:00 P.M.
Members Present: Tarun Pilli, Matthew Caldwell, Jacob Phillips & John Kim
Topics Discussed: The Progress Report for Lab 10 and the Project Portfolio on U.osu.edu.

Objective:
Team J met in order to complete the Progress for Lab 10, as well as to update and organize the Project Portfolio on U.osu.edu.

Tasks:
-Progress Report for Lab 10
Part of the Progress Report for Lab 10 was completed before Team J held a meeting, but during the meeting the team worked together in order to complete the report before the deadline it was due.

To Do/Action Items:
-Add all laboratory documentation through lab 10 to the Project Portfolio on U.osu.edu (All Members)
-Organize all laboratory documentation that has been added to the Project Portfolio on U.osu.edu (All Members)

Reflections:
Team J continued to work well together and was able to complete the Progress Report for Lab 10 before the deadline, as well as properly organizing the Project Portfolio with all laboratory documentation through lab 10 being added to it. Thus far Group J has not had any complications working as a team as a system that has been in place the entire AEV project was again used in order to complete all the tasks for the week on time.

Appendix B

Arduino Code - Sequence 1

```
//get to first gate
reverse(4);
motorSpeed(4, 20);
goToAbsolutePosition(-317);
//slow down and stop
reverse(4);
motorSpeed(4, 40);
goFor(1.7);
brake(4);
//wait for the gate
motorSpeed(4, 0);
goFor(7);
//go to the end gate
reverse(4);
motorSpeed(4, 20);
goToAbsolutePosition(740);
//slow down and stop
reverse(4);
motorSpeed(4, 35);
goFor(1.7);
brake(4);
//go back to gate
motorSpeed(4, 40);
goToAbsolutePosition(-390);
//slow down to stop
reverse(4);
motorSpeed(4, 60);
goFor(1);
brake(4);
```

Arduino Code - Sequence 2

```
//get to first gate
reverse(4);
motorSpeed(4, 20);
goToRelativePosition(-317);
//slow down and stop
```

```
reverse(4);
motorSpeed(4, 40);
goFor(1.7);
brake(4);
//wait for the gate
motorSpeed(4, 0);
goFor(7);
//go to the end gate
reverse(4);
motorSpeed(4, 20);
goToRelativePosition(-423);
//slow down and stop
reverse(4);
motorSpeed(4, 35);
goFor(1.7);
brake(4);
//go back to gate
motorSpeed(4, 40);
goToRelativePosition(350);
//slow down to stop
reverse(4);
motorSpeed(4, 60);
goFor(1);
brake(4);
```