Group P - Ishan Taparia, Wenbo Nan, Kyle Fathauer, Jason Hahn Progress Report 9

Instructor - Dr. Parris, GTA - Sheena Marston
04/10/2017

Week 10

Situation
Last week the team was tasked with optimizing energy usage of the AEV. It is essential to complete the task with fewer energy usage, which lowers energy-mass ratio. Not only is it energy efficient, but it's also an important part of grading criteria. Energy optimization was accomplished by making changes to the code base on the performance of the AEV and the energy usage each run. Improvements were then made to the code base to improve its efficiency. The team tried to decrease the weight of the AEV, but did not find any redundant parts to be taken off. This led the team to do improvements on coding.

Results & Analysis
As seen in code 1A in the appendix was the base code that improvements were made off of. During the run, the AEV used 320 joules and took 73 seconds. The team decided that it would trade time for speed, as going slower would allow for less energy usage.

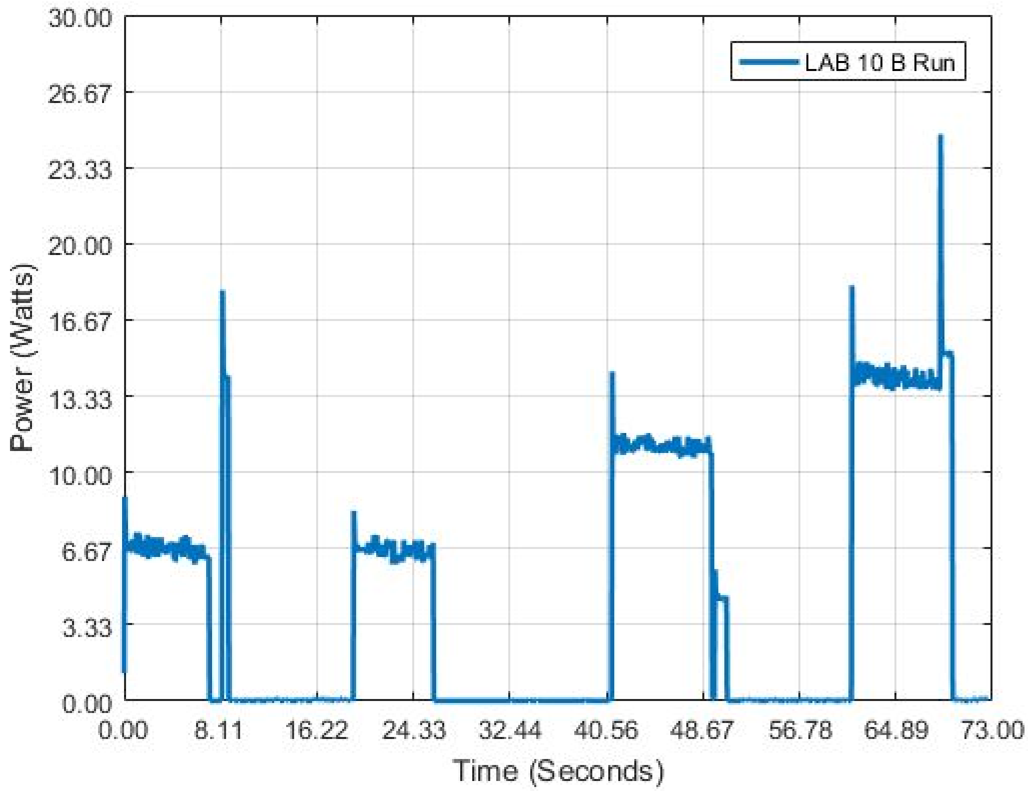

Figure 1. Plot of energy usage of Lab 10 B Run

During the first round on code improvements the team worked on decreasing unnecessary motor usage. This was done by removing the step which reversed the motor to slow down the AEV when it is stopping at both the cargo area and the drop off area, as shown in code 1B. With these improvement the team reduced the energy usage to 294 joules while keeping the time similar. As shown in the graph below.

Figure 2. Plot of energy usage of Lab 10 C Run 2

During the third iteration of the code base the team was able to accomplish another around 10 joules of energy loss due to code base changes. These changes changed how fast the AEV entered the loading and unloading area by controlling the motor speed. These changes can be seen in code 1C. The team was able to reduce energy usage by 269 joules.

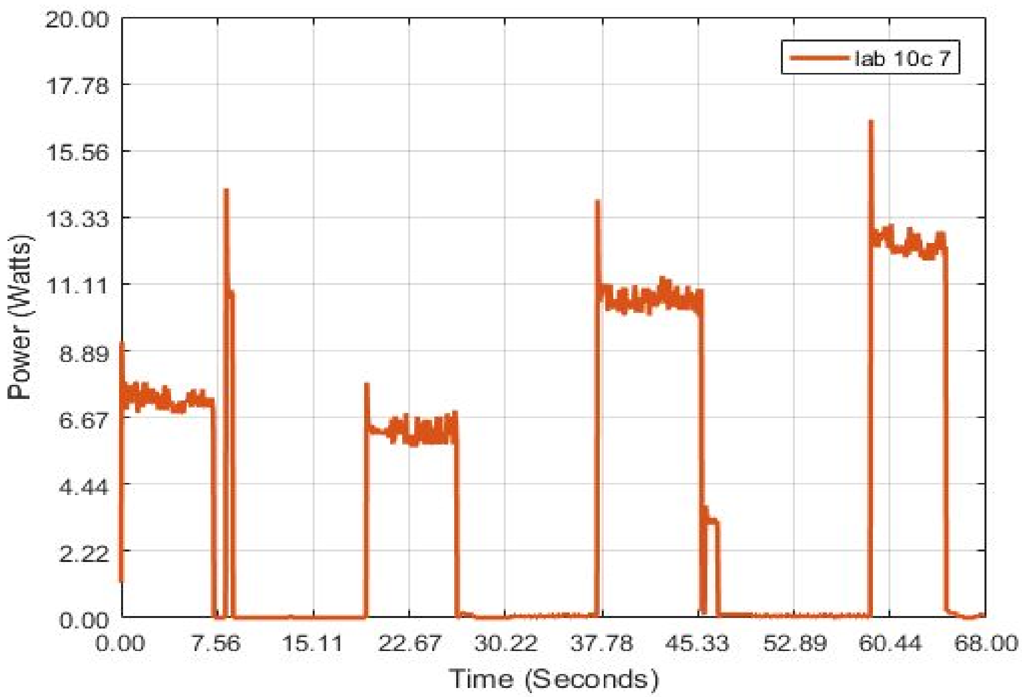

Figure 3. Plot of energy usage of Lab 10 C Run 7

When the team was testing solutions to lower the energy consumptions, they faced many problems. The first of which being that during testing the AEV is inconsistent on where it stops at the first gate, sometimes the AEV overshot and sometimes it undershot. The team overcame this problem by repeatedly testing the AEV so that the team could get one to two good sets of data to compare. The other problem the team faced was that the batteries that were used had issues if they were not fully charged. To diagnose this problem the team had to keep an eye on where the AEV was stopping and how the motors were running to see if they were similar each time. The team solved this problem by getting new batteries.

The team will complete the mission concept review while have the most energy efficient vehicle by two factors. The first being that the team has fined turn the code so that it is efficient. Since the team has started testing, they have sucessfully remove around 50 joules of energy usage since the start of energy test. The second way the team will have the most efficient vehicle is they have removed all unnecessary components so that it weighs less and costs less.

Takeaways

1) AEV -- The battery loses power quickly, causing inconsistency in results
2) AEV -- Fine tuning of the code is essential to getting the AEV to stop at the correct position at each gate
3) General -- Cooperation between team members is essential to making progress

Week 11

<u>Situation</u>

This week the team's goal is to do final testing for the AEV program. The final testing of the AEV is a two run test to see if it can accomplish the required tasks of the program. These tasks are stopping at the gate, picking up a cargo sled, stopping at the gate again with the cargo sled, and then stopping at the starting point with the cargo sled. If the AEV need help in completion of the tasks, then point will be deducted from the final score of the test.

<u>Weekly Goals</u>

1. Fix any final bugs
2. Implement any last minute solutions
3. Complete scored runs

<u>Weekly Schedule</u>

Table 1

Task	Teammate(s)	Start Date	Due Date	Time Need
Progress Report 9	ALL	03/25/17	03/31/17	2hrs
CDR	ALL	03/27/17	04/21/17	4hrs
Develop Code	ALL	03/27/17	03/31/17	8hrs
CDR Draft	ALL	03/27/17	04/7/17	2hrs

Appendix

Meeting Notes

Date: 6 - April - 2017
Time: 5:00 (In-Person)
Members Present: Wenbo Nan, Kyle Fathauer, Jason Hahn, Ishan Taparia

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Objective: Complete progress report, update portfolio, finish CDR presentation draft

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To do:
- Write Progress Report
- Update Portfolio
- Finish CDR Presentation draft

Decisions:
- Ishan will work on recording the team notes
- Wenbo and Jason are in charge of handling the looking back section of the progress report
- Kyle is in charge of editing the looking forward section of the progress report

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Reflections:
- The battery causes a large amount of inconsistency so making sure we have a full charge is important for consistent results

Code 1A

```
// Initial Reverse to get motors to go forward
reverse(4);

// Move forward at 25% power
motorSpeed(4, 25);

// Stops moving after going around curve
goToAbsolutePosition(344);

// Stop the motors
brake(4);

// Coast until near first sensors
goToAbsolutePosition(425);

// Run motors backwards
reverse(4);

// Run the motors at 55% power backwards to stop the AEV
motorSpeed(4, 50);

// Run the motors for 1.5 seconds
goFor(0.5);

// Stop the motors
brake(4);

// Wait for the gate to raise
goFor(10.5);

// Motors back to forward
reverse(4);

// Motors at 25% power
motorSpeed(4, 25);

// Temporary goFor to test the gate stop portion
goFor(1);

// Go to 5ft before the cargo
goToAbsolutePosition(830);

// Stop motors
brake(4);

goFor(15);

reverse(4);
```

```
// Run the motors at 40% to get back to gate
motorSpeed(4,40);

// Run until near first sensor
goToAbsolutePosition(670);

// Reverse the motors for stopping procedure
brake(4);

goFor(0.25);

reverse(4);

//Short burst of motor power to stop AEV at gate sensor
motorSpeed(4, 20);

// Run the motors for 2 seconds as there is more weight with the cargo
goFor(1);

// Stop motors
brake(4);

// Wait for gate to go up
goFor(10.5);

// Gets motors back in the right direction
reverse(4);

// Set power to 45%
motorSpeed(4, 50);

//Go to right before drop off area
goToAbsolutePosition(100);

//Stop procedure
reverse(4);

motorSpeed(4,50);

goFor(1);

brake(4);
```

Code 1B

```
// Initial Reverese to get motors to go forward
reverse(4);

// Move forward at 25% power
motorSpeed(4, 25);

// Stops moving after going around curve
goToAbsolutePosition(344);

// Stop the motors
brake(4);

// Coast until near first sensors
goToAbsolutePosition(425);

// Run motors backwards
reverse(4);

// Run the motors at 55% power backwards to stop the AEV
motorSpeed(4, 50);

// Run the motors for 1.5 seconds
goFor(0.5);

// Stop the motors
brake(4);

// Wait for the gate to raise
goFor(10.5);

// Motors back to forward
reverse(4);

// Motors at 25% power
motorSpeed(4, 25);

// Temporary goFor to test the gate stop portion
goFor(1);

// Go to 5ft before the cargo
goToAbsolutePosition(805);

// Stop motors
brake(4);

goFor(11);

reverse(4);
```

```
// Run the motors at 40% to get back to gate
motorSpeed(4,40);

// Run until near first sensor
goToAbsolutePosition(670);

// Reverse the motors for stopping procedure
brake(4);

goFor(0.25);

reverse(4);

//Short burst of motor power to stop AEV at gate sensor
motorSpeed(4, 31);

// Run the motors for 2 seconds as there is more weight with the cargo
goFor(1);

// Stop motors
brake(4);

// Wait for gate to go up
goFor(12);

// Gets motors back in the right direction
reverse(4);

// Set power to 45%
motorSpeed(4, 50);

//Go to right before drop off area
goToAbsolutePosition(175);

//Stop procedure
reverse(4);

motorSpeed(4,50);

goFor(1);

brake(4);
```

Code 1C

```
reverse(4);

// Move forward at 25% power
motorSpeed(4, 27);

// Stops moving after going around curve
goToAbsolutePosition(344);

// Stop the motors
brake(4);

// Coast until near first sensors
goToAbsolutePosition(425);

// Run motors backwards
reverse(4);

// Run the motors at 55% power backwards to stop the AEV
motorSpeed(4, 41);

// Run the motors for 1.5 seconds
goFor(0.5);

// Stop the motors
brake(4);

// Wait for the gate to raise
goFor(10.5);

// Motors back to forward
reverse(4);

// Motors at 25% power
motorSpeed(4, 25);

// Temporary goFor to test the gate stop portion
goFor(1);

// Go to 5ft before the cargo
goToAbsolutePosition(790);

// Stop motors
brake(4);

goFor(11);

reverse(4);
```

```
// Run the motors at 40% to get back to gate
motorSpeed(4,40);

// Run until near first sensor
goToAbsolutePosition(680);

// Reverse the motors for stopping procedure
brake(4);

goFor(0.25);

reverse(4);

//Short burst of motor power to stop AEV at gate sensor
motorSpeed(4, 15);

// Run the motors for 2 seconds as there is more weight with the cargo
goFor(1);

// Stop motors
brake(4);

// Wait for gate to go up
goFor(12);

// Gets motors back in the right direction
reverse(4);

// Set power to 45%
motorSpeed(4, 47);

//Go to right before drop off area
goToAbsolutePosition(255);

brake(4);
```

Figures

Figure 1. Plot of energy usage of Lab 10 B Run

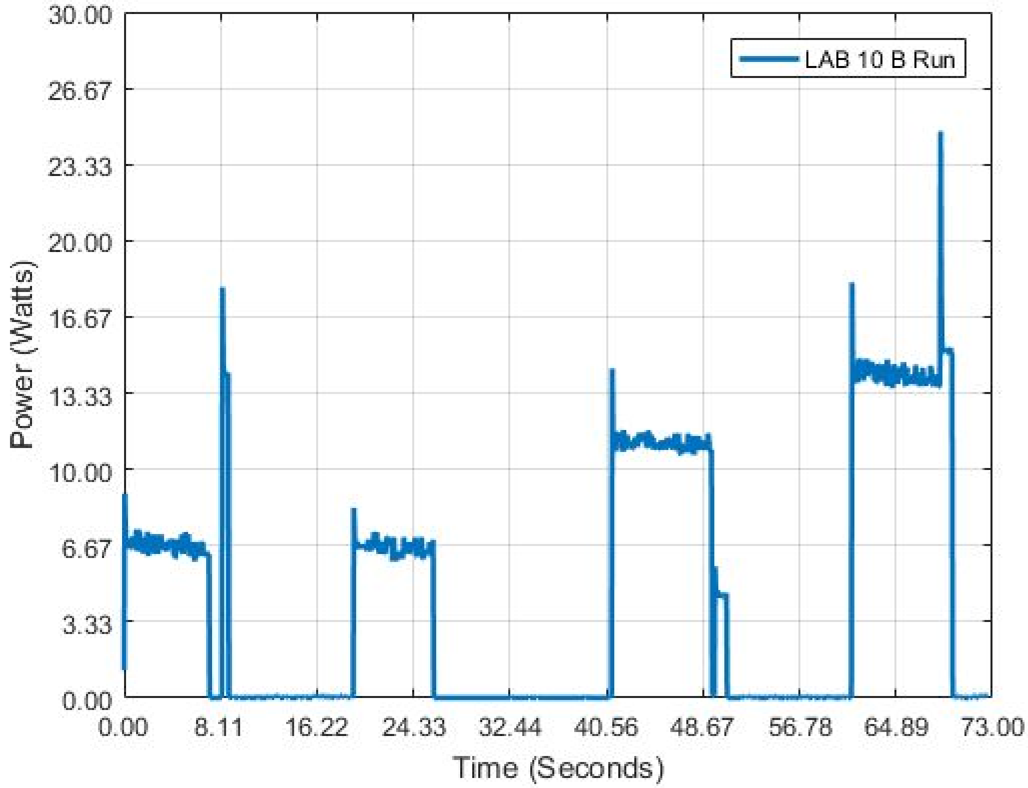

Figure 2. Plot of energy usage of Lab 10 C Run 2

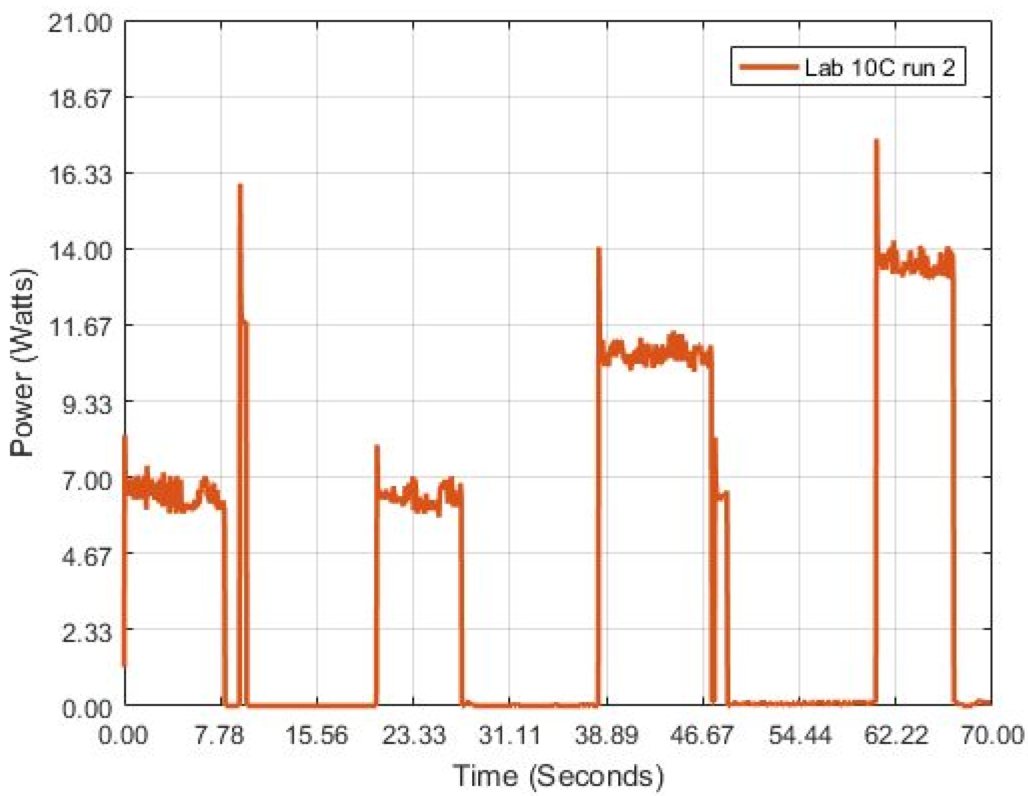

Figure 3. Plot of energy usage of Lab 10 C Run 7