Memo

Date: April 6,2016
To: Inst. Schrock and GTA Patankar
From: Group L: Nina Tavernier, Abrahm Williams, Aziz Bokari, Dj Greathouse
Subject: Lab 9

The purpose of this lab was to improve upon the components accessed in the final run of the AEV and completion of the R2D2 mission. Such components that were accessed by the group included energy efficiency, consistency, battery power and successful completion of all aspects of the R2D2 mission. However, this lab in specific focused on a decrease in the amount of energy used by the AEV in completion of the task. This memo contains the group's process of decreasing the amount of energy, as well as the team's results of the specific method chosen.

The main focus of this lab was to decrease the amount of energy used for the AEV to complete the MCR. To do this, the team edited the code by decreasing the amount of marks the AEV travels, thus decreasing the amount of time the motors run. Doing this also allows for more coasting, meaning the use of the code running the motors in reverse to stop the AEV is minimized. Unfortunately, this means the team is experiencing a lot of trial and error. This strategy may require multiple runs to get right, but much progress has been made. The only thing that still needs to be adjusted in the code is the amount of marks the AEV travels. Once the team gets the numbers perfected, the R2 unit will be retrieved as efficiently as possible with our current design.

In the preceding labs, the team took a direct approach in programming using marks. When the appropriate amount of marks were reached for the certain task, be it stopping at the gate or picking up/ dropping off the R2 unit, the AEV would reverse the motors and apply a force for a couple seconds in order for a precise stop. As given by Figure 1, this programming approach used up a lot of energy when the propulsion was reversed to make the AEV stop on a moments notice and accounted for a significant amount of the energy used by the AEV. The team's priority became minimizing this reverse propulsion application while also looking for alternative methods to stop the AEV that use less energy.

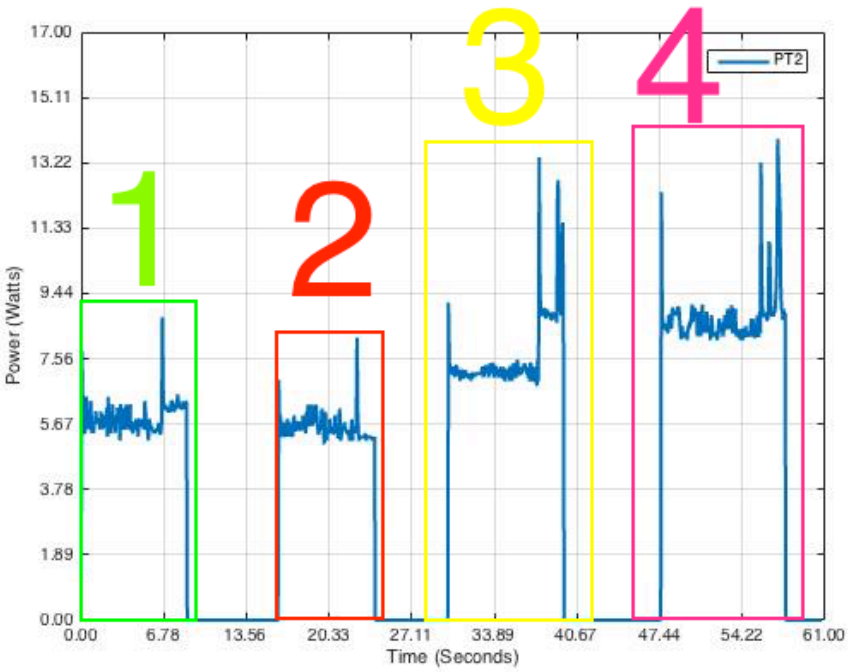

Figure 1: Plot of Power (watts) vs. Time (s)

The alternative of coasting was implemented into the program to lessen the energy usage. The main difference in this method of coding compared to the original is that the reverse propulsion is taken out. In figure 2, when comparing phases 2 and 4 to the same phases in figure 1, the amount of time the motors are running is reduced because of this coasting. This, accompanied from the reduced energy usage from the reverse propulsion being taken out, reduced the energy output by around 30 J to 226 from the previous 257 J.

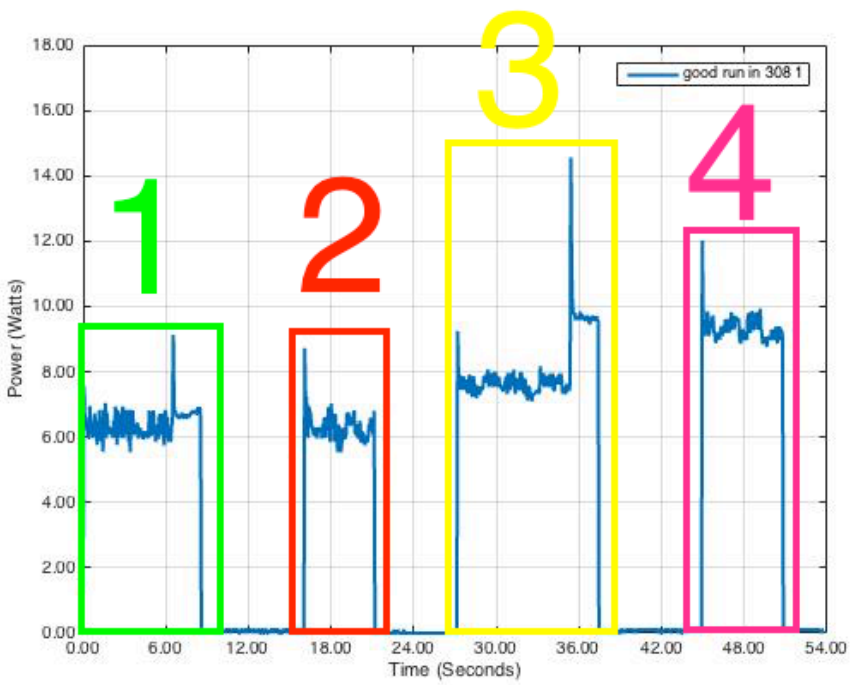

Figure 2: Plot of Power (watts) vs Time(s) for the coasting method

The focus of this lab was to decrease the amount of energy the AEV uses. For instance, the team modified the code to cancel the approach of using a reverse function call in the Arduino code that helped the AEV to stop at specific spots. Therefore, the energy that was consumed by the motors on account of the reverse function call was reduced from 257 J to 226 J.

Errors were present in the lab the hampered the team's progress. One such error was anomalies on the track that sometimes prevented the AEV from moving. The obscurities were tape that was lifted up making it hard for the wheels to move over the track, so to solve the problem the tape was smoothed down. Another error is the testing of multiple rooms where the AEV acts different in one room than the other. To fix this, 2 similar codes were made, one for each room, in order to test the AEV in both rooms while still giving similar results.

After the team finishes the final code, the objective will be to reduce the amount of time the AEV takes to finish the run. In order to accomplish this, the team will risk the consistency and accuracy of the code. Higher speed will be required and less coasting to finish the run in a less time. The higher speed might increase the AEV losing balance before reaching the R2.

Appendix

Table 1: phase table of Efficient code

Phase #	Energy used (J)
1	51.30
2	36.00
3	82.7
4	56.11
Total	226.11

Table 2: phase table of original code

Phase #	Energy used (J)
1	50.54
2	44.32
3	72.53
4	89.67
Total	257.06