Week 5

Situation

This lab was focused on learning how to gather and analyze data from the AEV using the AEV data analysis tool and MATLAB. The AEV was run from the start point to the gate and data was downloaded to the computer. The team then ran the data through the AEV data analysis tool to obtain figures and created a code in MATLAB to order and analyze the data.

Results and Analysis

The plots will allow the team to find the most efficient design and code. Multiple tests will let the team compare the data to find traits that lead to a more efficient vehicle. The graphs allow for visualization of trends. This lab gave the team the opportunity to practice collecting and analyzing data before testing their own designs. The current data will act as a baseline moving forward that all future data can now be compared to see how efficient that the groups new design is. Ideally, future designs should only become more and more efficient, and if a design ever becomes less efficient than this, then the team will know to completely rethink their design.

Josh Penko: Documentation (Works with the graphs and raw data). This group members purpose is to take all of the raw data that is collected and to form it into useable graphs and tables. The tables can then be used to evaluate many aspects of the AEV project such as the efficiency of the AEV, and how the projects as a whole is performing.

Madison Hudak: Coder (Codes the AEV to do certain tasks). Is proficient in coding, namely Arduino and MATLAB. This team member's purpose is programming the AEV to complete set tasks named and to understand the software that comes along with the AEV project. The responsibilities that come with this position are debugging, writing the code, and ensuring that the AEV operates as intended.

Collin Barack: Builder (I.E. in charge of hardware, building, design, etc). Builder, in charge of AEV design and hardware associated with the project. Scribe, responsible for updating the website with all relevant information and documents.

Lizzie Rumford: General (A little bit of everything). Lizzie's role for the rest of the process is mostly general work. It is to make sure the team meets when they were stated to and that assignments get turned in on time. During labs she will make sure that the team keeps up with time management and will contact for help if the team needs it. Lizzie is in charge of making sure that everything is done appropriately, helping with codes and building when necessary.

Takeaways

1.) Analyzing data is important to optimize the AEV design and efficiency.
2.) Understanding the tools and software is just as important in design as the hardware.
3.) Each member of the team should understand the software and hardware so that tasks can be delegated to individual members in case time is short.

Week 6

Situation

In this lab, the team is asked to understand and utilize a concept screening matrix and a concept scoring matrix. These are used to compare certain design elements present in the AEV. Additionally, the team will build and program a sample AEV exhibited in Lab 4 to follow a list of commands listed in the current lab. In doing this, the team will be able to develop a set of criteria that will be used in designing the AEV.

Weekly Goals

1.) Become adept at making decisions.
2.) Program a sample AEV to perform certain tasks on the class
3.) Learn the baseline of how the AEV scoring works.
4.) Develop ideas on which to base the AEV design.

Weekly Schedule

Task	**Teammates**	**Start Date**	**Due Date**	**Time Needed**
Week 4 Progress Report	All	1/4/2017	2/8/2017	2 Hours
Accumulate data **& make graphs**	All	2/8/2017	2/13/2017	1 Hour and 20 Minutes
Week 5Progress Report	All	2/9/2017	2/15/2017	2 Hours

Appendix A

Date: 2/13/17

Time: 12:40 - 3:45

Members Present: Lizzie Rumford, Josh Penko, Collin Barack, Madison Hudak

---

Topics Discussed: Lab 5 Progress Report

Objective: The focus of today was to complete the Lab 5 Progress Report due on the 2/15/2017.

To Do:

1.) Lab 3 Progress Report.

2.) Continue brainstorming AEV design concepts.

Decisions:

1.) We decided on a team name: PBNM (Penko, Barack, Nudak, and Mumford) (Peanut Butter N Mayonaise) (Please Burn Nudist Men) (Penko Bests Normie Madison).

2.) The team will design a new arm to support the hardware of the AEV rather than using a laser cut base. This is due to the idea of conserving weight.

Reflections:

1.) Have a Gmail account.

2.) Decide where and when to meet more than an hour before the meeting may occur.

3.) Have designated tasks for each team member both in lab and out.

Appendix B

Figure 1: Excel generated graph of Supplied Power vs. Time.

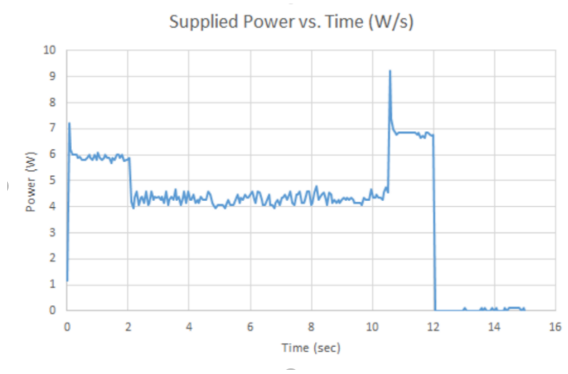

Figure 2: AEV data analysis generated graph of Supplied Power vs. Time.

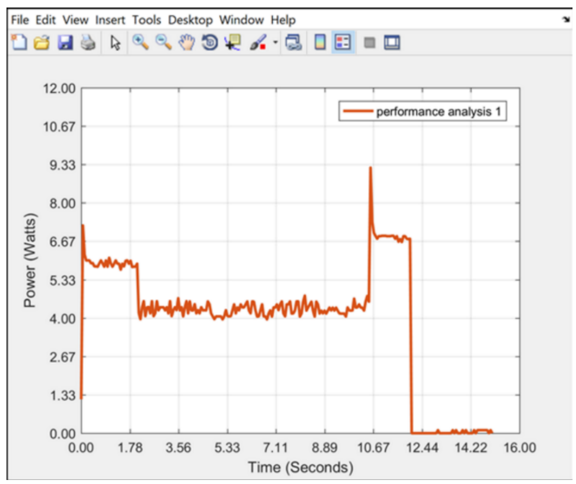

Figure 3: AEV Data Analysis generated graph of Supplied Power versus Distance.

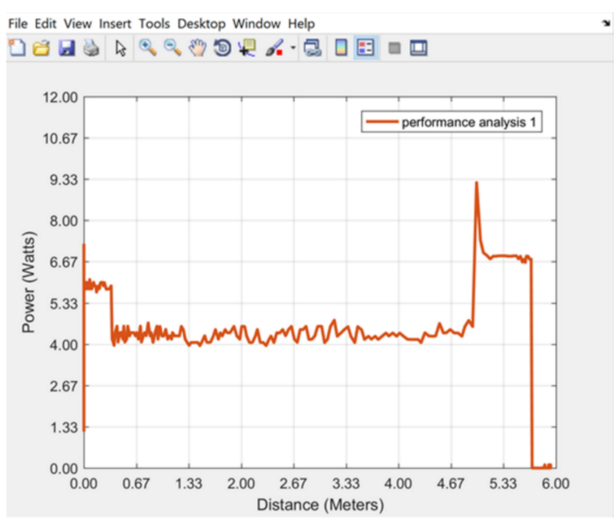

Figure 4: Phase Table for Figure 1

Phase	Arduino Code	Distance (meters)	Time (Seconds)	Total Energy (J)
1a)	motorSpeed(4,25);	0.00-0.35	0.00-2.04	12.27
1b)	goFor(2);	0.00-0.35	0.00-2.04	12.27
2a)	motorSpeed(4,20);	0.35-4.95	2.04-10.50	46.53
2b)	goToAbsolutePosition(394);	0.35-4.95	2.04-10.50	46.53
3a)	reverse(4);	4.95-5.69	10.50-12.00	58.93
3b)	motorSpeed(4,30);	4.95-5.69	10.50-12.00	58.93
3c)	goFor(1.5);	4.95-5.69	10.50-12.00	58.93
4)	break(4);	5.69-5.94	12.00-15.00	59.02

Appendix C

Madison Hudak Calculations

Time:

$$t = \frac{103}{1000} = 0.103$$

Current:

$$I = \left(\frac{0}{1024}\right) 2.46 (\frac{1\ Amp}{0.185\ Volts}) = 0$$

Voltage:

$$V = \frac{15 * 565}{1024} = 8.2764$$

Distance:

$$d = 0.0124 * 0 = 0$$

Position:

$$s = 0.0124 * 0 = 0$$

Supplied Power:

$$P = 0 * 0 = 0$$

Incremental Energy:

$$\frac{0 + 0}{2} (103 - 0) = 0$$

Lizzie Rumford Calculations

Time:

$$t = \frac{15001s}{1000} = 15.001\ s$$

Distance:

$$d = .0124 * 479 marks = 5.94\ meters$$

Position:

$$s = .0124 * 475 pos = 5.89 meters\ from\ start$$

Current:

$$I = \left(\frac{0}{1024}\right) * 2.46 volts * \left(\frac{1 Amp}{.185 Volts}\right) = 0 amps$$

Voltage:

$$V = \frac{15 * 560}{1024} = 13.125 volts$$

Supplied Power:

$$P = 13.125 volts * 0 amps = 0 watts$$

Incremental Energy:

$$E = \frac{0 watts + 0 watts}{2} * (15 sec - 16\,\mathrm{sec} \quad) = 0$$

Collin Barack Calculations

Calculations are done at T = 6301

Time: $Time = \frac{T_E}{1000}$

$Time = \frac{6301}{1000} = 6.301\ s$

Distance: $Distance = 0.0124 * Marks$

$Distance = 0.0124 * \ 165 = 2.046\ m$

Position: $Position = 0.0124 * Pos$

$Position = 0.0124 * 161 = 1.996\ m$

Current: $Current = \frac{I_E}{1024} * V_r * \frac{1}{.0185}$

$Current = \frac{44}{1024} * 2.46 * \frac{1}{.0185} = \ .5714\ A$

Voltage: $Voltage = \frac{15 * V_E}{1024}$

$Voltage = \frac{15*546}{1024} = 7.998\ V$

Supplied Power: $Power = V * I$

$Power = 7.998 * \ .5714 = 4.570\ W$

Incremental energy: $E = \frac{(P_j + P_{j+1})}{2} * \left(T_{j+1} - T_j\right)$

$E = \frac{(4.570+4.266)}{2} * (6361 - 6301) = 0.2651\ J$

Josh Penko Calculations

Sample calculations at time t = 240ms:

Time(s) =$\frac{Time(ms)}{1000}$

Time(s) = $\frac{240(ms)}{1000}$= 0.24s

Current(A) = $\frac{Current(counts)}{1024} * (2.46volts) * (\frac{1amp}{1.085volts})$

Current(A) = $\frac{58(counts)}{1024} * (2.46volts) * (\frac{1amp}{1.085volts})$ = 0.75A

Voltage(v) = $\frac{15*volts}{1024}$

Voltage(v) = $\frac{15*544volts}{1024}$ = 7.97v

Distance(m) = 0.0124 $* marks(wheel\ count)$

Distance (m) = 0.0124 * 1 = 0.0124(m)

Relative Position(m) = $0.0124 * marks(position\ wheel\ count)$

Relative Position (m) = 0.0124 * -1 = -0.0124(m)

Supplied Power(watts) = voltage*current

Supplied Power(watts) = 7.97v * 0.75A = 6.00 watts

Incremental Energy(J) = $\frac{P_j+P_{j+1}}{2} * (t_{j+1} - t_j)$

Incremental Energy(J) = $\frac{6.001+6.001}{2} * (0.30 - 0.24)$ = 0.36(J)