

Labs 01-07

Up to this point, the team has gained much experience working with the AEV and its components as well as a greater familiarity with the goals set out by the Mission Concept Review. Through the course of 7 weeks of labs, the team has worked with a myriad of new tools and pieces of equipment not only to build the AEV, but also to evaluate its performance. Through working together to complete the lab tasks, the team has also learned valuable new teamwork and collaboration skills necessary for success in the engineering environment.

One of the most important takeaways the team has observed from working so far on the lab was problem-solving skills. At numerous points, the team has encountered some issue with completing the task set out where it was not immediately clear how to solve it. An example of this was when our wheel count sensor failed and would not report accurate values. The team worked together to try out different ideas of how to fix it, such as re-attaching cables in different configurations and verifying that everything was correct on the software side. By collaborating and trying different methods as well as involving the instructional staff, the team was able to rule out all other possible options and determine that it was a defective sensor causing the issue, which needed replaced.

Several labs have also demonstrated various methods of decision making. Throughout the past labs, the group has had to make several decisions regarding the AEV's design. Decision making, in the overall design process, will be very important. In the testing cycle, the group will be in a constant loop of recording data, analyzing data and making design decisions based off said data. The group will need to make smart decisions in order to maximize the potential of the AEV. The group learned of concept screening and concept scoring in Lab 05. These methods involved analyzing designs based off certain criteria. This analysis was done in comparison to another reference design. The concept screening and scoring exhibited to the group an effective way to make informed decisions.

In the design cycle, the group will be required to effectively analyze the AEV's data. Data analysis will be a crucial part of decision making, as data is one of the primary forces affecting design decisions. Lab 04 had the group record EEPROM data, and then perform conversions and calculations on the recorded data. The final data included parameters such as distance, time, power and more. In the second half of Lab 04, a MATLAB analysis tool was introduced. This

tool performed all conversions, calculations and graphing of data. The MATLAB analysis tool was then used from that point forward in all data analysis. Whenever the group had to analyze data, the analysis tool was used to adequately analyze all aspects of the data.

Lab 8

Situation

The next lab will begin a new format for the AEV labs which will carry over through the end of the year. The team will now meet three times weekly with the goal of completing some objective, and the responsibility will be on the team to decide how to complete this task within the time given. The team will also have to continue writing technical reviews including the weekly progress report as well as the Preliminary Design Review and the Critical Design Review.

The first weekly challenge presented to the team will require a design performance test. The team is to begin with two different AEV concept designs, with the ideal of testing these to determine which will be superior at completing the Mission Concept Review and do so efficiently. This lab will focus on comparing these two designs directly, and will thus require testing each design in a consistent manner to observe their differences.

For the purpose of this performance test, the team will be required to develop Arduino code for the AEV to properly complete the task of arriving at, but stopping before, the first gate on the full track. This code will be tested with both of the team's potential designs on the track, and the runs will be observed in order to determine which design is more suited to go forward as the team's AEV. The team will use visual observations of performance as well as EEPROM data in order to come to these conclusions.

Two design concepts have been predetermined for the purpose of this lab. The first design is the one the team has been working with over the past few labs. It utilizes a T-shaped base with propellers mounted on each side of the bottom end. The L-shaped arm is attached at the back, providing a degree of weight balance with the front-mounted Arduino. This design was chosen as it has proven to perform successfully in the past. It has gone rather quickly given the input power to propellers, and showed admirable performance compared to class average values in the previous lab.

The second design concept was conceived more recently by the team. It will take the previous design's objectives of minimal footprint to the next level by compacting the vehicle onto a much smaller, trapezoidal base. The design will continue to use the L-shaped arm and bottom mounted propellers, as these have proven to work well in past tests. The Arduino, however, will be

mounted vertically up against the control arm to truly take maximum advantage of the space given. This resulting AEV will have a lower mass than previous designs. This will allow it to perform faster and more efficiently with a given amount of power. The minimal size may also make it a particularly good performer when it comes to turning corners; a task that must be completed twice to complete the Mission Concept Review.

Weekly Goals

- 1) Complete the Progress Report for LAB 08A by the deadline of Friday, March 10th and submit it on Carmen.
- 2) Prepare for the Lab Proficiency Quiz by studying the AEV lab manual on Carmen.
- 3) Add the Executive Summary from the new lab 7 and the Progress Report for Lab 08A to the project portfolio on U.osu.edu.
- 4) Organize the project portfolio on U.osu.edu after the addition of the Executive Summary from the new lab 7 and the Progress Report for Lab 08A.

Weekly Schedule

Task	Teammate(s)	Start Date	Due Date	Time Needed
Progress Report for Lab 8	All	3/7/17	3/10/17	3 Hours
Preparation for Lab Proficiency Quiz	All	3/9/17	3/10/17	1 Hour
Add the Progress Report for Lab 8 to the Project Portfolio	All	3/9/17	3/10/17	10 Minutes
Add the Executive Summary to the Project Portfolio	All	3/6/17	3/7/17	10 Minutes
Organize the Project Portfolio on U.osu.edu	All	3/9/10	3/10/17	10 Minutes

Appendix A

Date: 3/09/17

Time: N/A.

Members Present: Tarun Pilli, Matthew Caldwell, Jacob Phillips & John Kim

Topic(s) Discussed: Progress Report for Lab 08A

Objective:

Throughout the course of Thursday, March 9th, the members, on their own time, worked on the progress report online. Due to various complications, the team was unable to gather in person to finish the task. Thus, the task was completed online.

Tasks:

-Progress Report for Lab 08A

Even though the group did not meet in person for this progress report, everyone still contributed to several different sections of this progress report. Through online communication, the group was able to distribute tasks to all members in order to complete the report.

-Organize the Project Portfolio

The group updated the Project Portfolio with the latest progress reports created.

To Do/Action Items:

-Prepare for Lab 08A understanding the unique AEV design before coming to class(All Members)

-Prepare for the Lab Proficiency Quiz by reviewing the provided study guide(All Members)

Reflection:

This was the first week in which Team J did not meet in person in order to finish the paper. This week, there were two reports to be done, and the group had to meet on a day that was usually not slated for lab work. However, several members had prior engagements, and so the group could not meet. Still, the group effectively worked together in order to complete this lab progress report. Group J has proved that they can work fine even if they cannot meet in person, as they effectively communicate information through whatever means are necessary.

Appendix B

Design Concept Screening

Success Criteria	Reference	Design A	Design B
Weight	0	+	+
Cost	0	0	0
Energy Efficiency	0	+	+
Durability	0	+	0
Center of Gravity	0	0	+
Turning	0	0	+
Blockage	0	0	0
Sum +'s	0	3	4
Sum 0's	7	4	3
Sum -'s	0	0	0
Net Score	0	3	4
Continue?	No	Yes	Yes

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Design Concept Scoring

Success Criteria	Weight	Reference		Design A		Design B	
		Rating	Weighted Score	Rating	Weighted Score	Rating	Weighted Score
Weight	20%	3	0.6	4	0.8	5	1
Cost	5%	3	0.15	3	0.15	3	0.15
Energy Efficiency	20%	3	0.6	4	0.8	4	0.8
Durability	10%	3	0.3	5	0.5	3	0.3
Center of Gravity	20%	3	0.6	4	0.8	5	1
Turning	15%	3	0.45	4	0.6	5	0.75
Blockage	10%	3	0.3	4	0.4	4	0.4
Total Score			3		4.05		4.4
Continue?		No		Yes		Yes	