To: Dr Janiszewska

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Introduction:

Once the AEV was designed and ready to go, properly balanced and everything secured correctly, it was time to get to coding the arduino. Some difficulties that were dealt with was braking and lack of power, but once the power percentage was raised on the motors in the code, braking became a lot easier. Of the two propellers, the smaller, two bladed one was chosen opposed to the larger, three bladed one. This was mostly a design decision, it better fit the vessel. This may have caused difficulty with speed and power, but raising the power percentage on the motors allowed to compensate for that. Other than those issues, the design runs as planned and will continue to improve over the course of more trials and errors that are encountered.

Executive Summary:

At first, there was a delay when starting up the code for the first time on the arduino, but the motors functioned as expected for the code provided to run at. However, since we were utilizing the two-bladed design, the propellers did not run nearly as fast as expected for carrying the weight of the entirety of the AEV. However, there were noticeable changes in the rotation speed when the code began to run the deceleration and acceleration procedures as requested in the lab guidelines.

For the selection of blades, group Jasper decided to install the double-bladed flat propeller. The decision was made to accommodate the design limitations and spacing of the wings for the motors. However, it is feasible that a change may occur later on along the design planning to incorporate the tri-bladed propeller design, as they are much more efficient and have a much higher performance than the twin-blade design. This could help benefit the overall AEV vehicle, as the size of the AEV is much larger than the propeller is, causing a requirement for a much higher output of revolutions to propel the AEV forward.

The AEV commands that are currently being used in the programming have several flaws within its function. However on a simpler level, the commands can function easily and get what is required done. However, in more complicated situations the code may underperform to the standards required for the guidelines. This can include situations such as changing the motor speed without a steady acceleration or deceleration. The motors cannot automatically adjust to a new rotation speed immediately, and require for the motors to not only brake, but to reset the speed and restart the motors back up. Another issue is that although there is a brake function, it does not fully stop the AEV as the brake only affects the motors, and not the AEV wheel. Another issue is that the motors reverse function requires that the brakes be applied before the direction of the propeller is shifted, creating even more down time on the transport of the AEV on the track.

The AEV overall remained fairly balanced upon the monorail, only falling off once when improperly placed upon the track. The design was created so that the center of the gravity of the AEV would be in the middle of

the AEV, creating an equal distribution of weight across the entirety of the chassis. This would allow there to be a much more safer and consistent transportation along the monorail. However, upon the first test the AEV did not travel far enough along the track and slowed down and stopped often when approaching inclines and rough terrain. The propellers struggled on low efficiencies to successfully transport the AEV along the track successfully, as a two blade propeller design is not as strong or effective as a tri-blade design.

Some difficulties which occurred while the test was performed was the speed the AEV was traveling. Overall, the first test saw that the AEV could not fully transport itself along the monorail. Eventually coming to a complete stop and would not move along the track any longer. The code was revised and increased the revolutions of the motors by 20% in hopes to create a much stronger propulsion for the AEV. However, the 20% increase proved to be much too powerful for the AEV to control, as it had almost ran out of track and fell off the monorail. The code was then revised a second time and reduced the revolutions of all the motors by 10%. This medium allowed for a much smoother and refined transportation of the AEV, but it still lacked the proper speed and consistency required for the AEV to perform at.

Overall, the AEV was a very straightforward and simple concept that required tested data and adjustments that could only be provided through the lab performed. However, there were some difficulties in resolving the tasks required of the code given in the lab procedures. The more complicated tasks required more time to properly map out and perform as described in the lab guidelines, however the code was created and the AEV traveled along the track nonetheless.

Conclusion:

After carefully and thoughtfully designing the AEV to ensure proper balance of mass, the next step was to code the arduino. Choosing to use the less powerful two bladed propellers proved to be a challenge but after trial and error much progress was made in both accommodating the design and modifying the code to ensure the AEV moved down the track as designed. Most of the major setbacks were related to the lack of power but braking and stopping proved to be an issue as well.These flaws in both the design and the code are continually worked out as testing continues. The design is continually improving and should be running as intended after further trials and prototypes of the code.

Arduino Code:

```
motorSpeed(1,45);
motorSpeed(2,45);
goFor(2.5);
brake(1);
celerate(2,45,47,0.7);
brake(2);
reverse(1);
reverse(2);
```

```
motorSpeed(1,45);
motorSpeed(2,45);
goFor(3);
brake(2);
celerate(1,45,0,3);
brake(1);
goFor(1);
reverse(1);
celerate(1,48,35,2);
celerate(2,48,35,2);
motorSpeed(2,45);
motorSpeed(1,39);
goFor(2);
brake(1);
brake(2);
```

Lab 1: Creative Design Grading Rubric		
Memo Content		
Introduction		10
	Purpose	
	Background	
Results		50
Individual	Objective presentation of designs (see Note below)	30
	Analysis of concepts	
	Individual Concept Description	
	Sketch	
	Design Considerations	
Conclusions		5
Writing Total		
	Spelling/Grammar Language Usage	35
Total		100

NOTE: *Objective presentation* and *Analysis of results* are not an item you need to discuss but refers to the way, you present the information that is required. The questions on the previous page should be used as a guide to the information needed.
Also remember that *Language Usage* is a big part of you grade for the memo. (Look at the table on the following page for details.) Make sure you proofread and check both grammar and spelling. Errors in both may be marked but not corrected by the instructor. If you have questions ask.

Instructor signature _____

Work division for this summary

Student Name: Description of work

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